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April Program
Abstracts

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EDITORIAL POLICY

General

The Ohio Journal of Science (OJS) has published peer-reviewed, original contributions to science, education, engineering, and technology since 1900. The OJS encourages submission of manuscripts relevant to Ohio, but readily considers all submissions that advance the mission of The Ohio Academy of Science to foster curiosity, discovery and innovation to benefit society. Annually the Academy distributes two printed issues: peer-reviewed April Program Abstracts and peer-reviewed full papers in December. The Ohio State University Libraries publish Open Access online OJS program abstracts and articles accepted throughout the year. Because the OJS is an international multidisciplinary journal, authors should write clearly, concisely, and avoid excessive jargon to assure broad understanding of their work by readers in diverse fields.

The OJS considers original contributions from members and non-members of the Academy in all fields of science, technology, engineering, mathematics and education. Submission of a manuscript is understood to mean that the work is *original* and *unpublished*, and is not being considered for publication elsewhere. All manuscripts considered for publication will be peer-reviewed. Any opinions expressed by reviewers are their own, and do not represent the views of The Ohio Academy of Science or the OJS.

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FUTURE ACADEMY MEETINGS

2019 – to be announced

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About the Journal

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127th Annual Meeting

The Ohio Academy *of* Science

Hosted by
Bowling Green State University
April 14, 2018

Cover photo: Students in front of Hayes Hall, Bowling Green State University - Photo courtesy of Bowling Green State University, https://www.bgsu.edu

The Ohio Academy of Science 127th Annual Meeting

Hosted by
Bowling Green State University
Bowling Green, OH 43403
April 14, 2018

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 pre-college, undergraduate, and graduate students, and interested lay citizens in the Ohio region.

Welcome!

Bowling Green State University welcomes you to the 127th Annual Meeting of The Ohio Academy of Science. We invite you to explore our campus and to share in the excitement and opportunities provided in this program.

REGISTRATION

Registration is required for all meeting attendees and is included in the abstract submission fee. Register online at: **http://www.ohiosci.org/am-2018 .**
On-site registration will be available at a higher rate. The Ohio Academy of Science must receive registration by **March 31, 2018**.

If registering by mail, send completed form and fee to:

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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 14: Registration at the Bowen-Thompson Student Union, 2nd floor.
7:30 AM - 10:00 AM. On-site registration at a higher rate by check, VISA, or MasterCard. Cash is discouraged.

PARKING ON CAMPUS: ***On Saturdays, BGSU does not require parking permits or the payment of parking meters in pre-pay areas.*** Short term parking lots 7B, 7C, and 7D are near the Bowen-Thompson Student Union. The only exception is Parking Lot 7A, which is reserved on Saturdays until 4 PM for Admissions. Parking areas can be found at https://www.bgsu.edu/content/dam/BGSU/parking-services/documents/Campus-Parking-Map.pdf .

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MEALS: Saturday, April 14th – Box lunches may be pre-ordered with registration for $10.00 and will be available for pick-up at noon on the 2nd floor of the Bowen-Thompson Student Union in the B-Side of the Lenhart Grand Ballroom (BTSU 202B).

GENERAL SCHEDULE

Saturday, April 14, 2018

All events take place on the 2nd and 3rd floor of the Bowen-Thompson Student Union (BTSU).

7:30 AM - 9:00 AM	Breakfast (BTSU 228)
7:30 AM - 10:00 AM	Meeting Registration (table outside BTSU 228)
8:45 AM	Annual Business Meeting for the Membership Mylander Room (BTSU 207) (see agenda below).
9:00 AM - 10:00 AM	Poster Session (Room 202) Note: all posters will be displayed in both morning and afternoon sessions.
10:15 AM - 12:15 PM	Podium Sessions
Noon	Box lunch pick up (at registration table)
12:15 PM - 1:15 PM	Lunch State of the Academy All-Academy Lecture (BTSU 228)
1:30 PM - 3:00 PM	Poster Session (Room 202) Note: all posters will be displayed in both morning and afternoon sessions.

Annual Business Meeting Call and Agenda

There shall be an Annual Business Meeting for the membership of the Academy during the Annual Meeting. The business session shall be conducted in accordance with the most recently published edition of *Robert's Rules of Order*. The order of procedure shall be as follows:

A. Call to Order by the President
B. Reading of the Minutes
C. Presentation of the report of the tellers of the election of officers and other positions
D. Voting on any proposed amendments to the *Constitution* or *By-Laws*
E. Business from the floor
F. Adjournment.

Quorum: The members present shall constitute a quorum for the transaction of business.

All-Academy Lecture

Dr. Michael A. Tamor
Henry Ford Technical Fellow,
Energy Systems & Sustainability
Ford Motor Company (retired)

Energy Sustainability in the Transportation Industry

Mike Tamor received his PhD in Physics from the University of Illinois at Urbana-Champaign in 1982, whereupon he joined the Ford Scientific Research Laboratory. From 1982 to 1993 he conducted research on optical properties of novel semiconductor alloys, anomalous properties of disordered materials, electronic devices for high temperature operation and applications of superhard, low-friction diamondlike materials.

Starting in 1994, he led research and development of hybrid electric vehicle (HEV) and fuel cell (FCV) propulsion systems. In 2013 he was appointed Henry Ford Technical Fellow for Energy Systems and Sustainability, responsible for research on the future of cities and mobility needs, and pathways to a carbon neutral economy. Dr. Tamor retired from Ford in 2017 and is continuing his research in association with the Arizona State University School for the Future of Innovation in Society.

Dr. Tamor is a Fellow of the American Physical Society, has published over 80 refereed journal articles, authored chapters in four books, and holds 56 US patents. In 2010 he was named to the Automotive News list of the 'Electrifying 100' contributors to the transition to carbon-free transportation.

Our Institutional Host

Bowling Green State University provides experiences that enhance lives. Students are prepared for lifelong career growth, lives of engaged citizenship and leadership in a global society. U.S. News and World Report names BGSU as one of the top public universities nationwide with a strong commitment to first-year programs that lead to success. Within our transformative learning community, we build a welcoming, safe and diverse environment where the creative ideas and achievements of all can benefit others throughout Ohio, the nation and the world.

The College of Arts and Sciences at Bowling Green State University offers innovative and engaging academic programs, educating young leaders through a rich liberal arts curriculum and offering areas in the sciences that take you from the depths of the Great Lakes to the farthest corners of the universe. At the core of many of our science programs is the opportunity for undergraduates to be involved in research with our nationally and internationally recognized faculty who are creating new knowledge to advance humanity in the sciences, as well as the social sciences, humanities and arts.

At BGSU, we help students create meaningful and productive lives, transform our communities and serve the public good. They are able to fill the demand for critical, creative and innovative problem-solvers. Our science programs include biological sciences, chemistry, computer science, data science, forensic science, geology, mathematics and statistics, physics and astronomy, and the opportunity for pre-professional study (including pre-dental, pre-medical, pre-pharmacy, pre-physician assistant, pre-occupational therapy, pre-optometry, pre-veterinary).

The Center for Undergraduate Research and Scholarship (CURS). The Center supports and fosters undergraduate research, scholarship, and creative activities across all disciplines by providing financial support for students to conduct projects with faculty mentors. Students also have the opportunity to disseminate their findings at various on-campus and off-campus events to practice their presentation skills. By participating in such projects, undergraduate students here at BGSU are not only able to deepen their understanding of their chosen discipline through hands-on experience, but are also able to take pride in their intellectual contribution to their field while at the same time preparing themselves for graduate studies or work-life.

Brief Schedule of Abstracts

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and **First Author index** on page 56

Poster Session 9:00 - 10:00 AM
and
Poster Session 1:30 - 3:00 PM

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

Located in the
Bowen-Thompson Student Union (BTSU)
Lenhart Grand Ballroom - BTSU 202
(2nd Floor, Room 202)

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College and Professional
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Podium Sessions 10:15 AM - 12:15 PM

Located in the
Bowen-Thompson Student Union (BTSU),
2nd Floor

Wildlife Biology, Spiders
10:15 - 11:45 AM
McMaster Room – BTSU 308
See page 5

Wildlife Biology, Plant Extracts, and Algae
10:15 - 11:45 AM
Sky Bank Room – BTSU 201
See page 6

Materials Science
10:15 AM - Noon
Union Theater – BTSU 206
See page 8

Ecology and Environmental Science
10:15 AM - Noon
Mylander Room – BTSU 207
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STEM Education, Genetics, Taboo Words, and Whiskey
10:15 AM - 12:15 PM
Family Room – BTSU 208
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10:15 - 11:45 AM
Podium Session 1
Wildlife Biology, Spiders
McMaster Room – BTSU 308

10:15 - ASSESSMENT OF BLACK BEAR (*URSUS AMERICANUS*) RESPONSE BEHAVIOR TO HUMAN PRESENCE IN YELLOWSTONE NATIONAL PARK THROUGH OBSERVATIONAL STUDY. Ryan T. Ashcraft, r.ashcraft@vikes.csuohio.edu, Robert A. Krebs, r.krebs@csuohio.edu, Cleveland State University, Dept. of Biological, Geological and Environmental Sciences, 2121 Euclid Ave., Cleveland OH 44115.

As visitation continues to increase in National Parks, natural resource protection must be balanced with the growing tourism industry. Yellowstone National Park experiences more than four million visitors annually, and many expect to see and interact with large mammals, including black bears (*Ursus americanus*). The main goal of this study was to produce an extensive database garnered from park reports of each bear sighting during 2016 (n=171) and 2017 (n=311) within the Tower/Lamar Valley District of Yellowstone National Park (the district with the highest concentration of bears). Behavioral patterns and habits of bears were assessed from a descriptive tally record on key social subgroups, partitioning sows with cubs (174 sows), lone adults (182 adults), lone sub-adults (77 sub-adults), and courting couples (19 couples). Each report noted time of day (usually 6:00 to 21:00), location, distance from humans (range 0 m to 2200 m), and bear response to human presence. Categorical assessment of frequencies suggested that negative behavioral patterns have declined compared to summary reports from the park before 1994. These results suggest that current hazing practices (scaring a bear away from humans using loud noises or non-lethal projectiles) have discouraged future negative behaviors especially when combined with efforts to limit humans from facilitating interactions. Sows with cubs tended to approach the near roads the majority of the time in 2017 versus lone adults in 2016 which enables a focus on reducing negative behavior in these social groups. These results may help the Park Service better promote positive wildlife experiences.

10:30 - SENSORY CONTROL OF WHIP SPIDER SPATIAL BEHAVIOR. Patrick Casto[1], pcasto@bgsu.edu, Verner P. Bingman[2,3], vbingma@bgsu.edu, Eileen A. Hebets[4], ehebets2@unl.edu, Daniel D. Wiegmann[1], ddwiegm@bgsu.edu, Bowling Green State University, [1]Dept. of Biology, [2]Dept. of Psychology, [3]JP Scott Center for Neuroscience, 121 McFall Center, Bowling Green OH 43403, and [4]University of Nebraska – Lincoln.

Whip spiders (Arachnida: Amblypygi) are a group of nocturnal arachnids that exhibit robust navigational abilities hypothesized to be under multi-sensory control. In addition to their eight, simple camera-type eyes, their antenniform forelegs are covered in thousands of receptor setae, tuned to different environmental stimuli, that provide sensory information that guides their spatial behavior. The rich sensory toolbox of whip spiders suggests that multiple sensory modalities can be used and perhaps integrated to enable their impressive navigational ability; although, existing data point to olfaction as playing a predominate role in navigation. To examine the relative contribution of different sensory stimuli that guide spatial behavior, a sensory-rich, mesocosm-like arena (diameter, 1.81 m) was developed to computer track the movements of whip spiders (n=10) over a 3-week period as they homed to an artificial shelter. The controlled stimuli included point sources of visual, olfactory and tactile cues, one in each quadrant. Subjects were given 3 orientation nights to roam followed by randomized, pre-dawn displacement trials of 4 treatments: control (all environmental cues present), light-removed, odor-removed and shelter-removed (shelter replaced halfway through each trial) (n=160 trials, 40 per treatment). Deletion of any one stimulus had little impact on subjects' ability to home or on a variety of dependent measures of spatial behavior including distance traveled, latency to home, quadrant occupancy, and homing path kinematics. The accumulated results lay a foundation for more sophisticated experimentation to disentangle the relative contributions of each sensory input used in guiding the spatial behavior of whip spiders.

10:45 - HABITAT ASSOCIATIONS OF GRASSLAND BIRDS ON EXOTIC COOL-SEASON VERSUS UNMANAGED WARM-SEASON PRAIRIE PATCHES ON A RECLAIMED SURFACE MINE. Donny Ingold, dingold@muskingum.edu, Allissa Brown, allissab@muskingum.edu, Jim Dooley, jdooley@muskingum.edu, Danny Ingold, ingold@muskingum.edu, Muskingum University, Biology Dept., 163 Stormont St., New Concord OH 43762.

Grassland bird specialists are more abundant on reclaimed mines on sites dominated by cool-season, exotic grasses versus sites that have been replanted with native warm-season grasses and forbs. During May and June of the 2017 breeding season line transects were conducted to compare numbers of obligate grassland birds on patches dominated by exotic cool-season grasses versus recently established warm-season prairie patches, and longer-established warm-season prairie patches. In addition, several habitat measures were made at the sites of actual bird observations along these transects to detect potential habitat associations of birds among these habitats. The goal was to compare habitat use between each grassland species and a combined group of shrubland species within cool season habitat. Grasshopper sparrows (*Ammodramus savannarum*), Henslow's sparrows (*A. henslowii*), and eastern meadowlarks (*Sturnella magna*) were found in habitats that differed significantly from habitat used by the shrub-land species. Though the magnitude of the loadings varied among grassland species, for all four species the percent cover of sod grasses was positively associated with occupancy while percent of bare ground and density of shrubs were negatively associated with species presence. Grassland birds in this study were not attracted to areas with a high density of shrubs nor with a high percentage of bare ground and clump grasses which is often characteristic of restored warm-season prairie patches.

11:00 - RESTORING TROPICAL GRASSLANDS FOR BIODIVERSITY IN BENI BOLIVIA: UNDERSTANDING LINKS BETWEEN DISTURBANCE, HABITATS AND BIRDS ACROSS THE CERRADO GRASSLAND GRADIENT. Joanne L. Kingsbury[1], kingsbury.20@buckeyemail.osu.edu, G. Matt Davies[1], davies.411@osu.edu, Chris Tonra[1], tonra.1@osu.edu, Ross Macleod[2], ross.macleod@glasgow.ac.uk, [1]Ohio State University, School of Environment and Natural Resources, Kottman Hall, 2021 Coffey Road, Columbus OH 43202, [2]Institute of Biodiversity Animal Health and Comparative Medicine, Glasgow University, Graham Kerr Building, Glasgow, Scotland, G12 8QQ.

The structure and composition of savanna ecosystems is driven by complex interacting disturbance processes, including fire, flooding and grazing. Within the Beni Savanna Ecoregion of Bolivia, the distribution and habitat use of 3 key avian cerrado-grassland specialists, the cock-tailed tyrant, *Alectrurus tricolor*, black-masked finch, *Coryphaspiza melanotis*, and wedge-tailed grass-finch, *Emberiziodes herbicola*, were contrasted to explore how disturbance may influence habitat use. To establish species density estimates and allow inference of distributional differences, we conducted distance sampling along line transects arranged systematically across the cerrado-grassland ecotone. Further, vegetation structural

surveys were carried out at locations where birds were observed and at a number of random locations along each transect. Finally, multivariate PCA techniques were used to characterize variation in habitat structure, which was then related to differences in species densities. Cock-tailed tyrants specialized on disturbance-sensitive micro-habitats such as tall mature grassland stands. Black-masked finch and wedge-tailed grass-finch were more generalistic but seemed to track seeding and fruiting vegetation, resources that could be influenced by the timing of disturbance events such as fires. Black-masked finch and cock-tailed tyrants may have greater sensitivity to disturbance than the more common wedge-tailed grass-finch, since their densities were found to be reduced in areas exposed to grazing and recent fire. Our results indicate a need to consider the scale, timing and severity of disturbance events when building land management protocols for the conservation of these species, particularly with respect to prescribed burns and grazing.

11:15 - COMPARATIVE ANALYSIS OF ODOR DISCRIMINATION IN WHIP SPIDERS. Meghan E. Moore[1], mooreme@bgsu.edu, Daniel D. Wiegmann[2], ddwiegm@bgsu.edu, Verner P. Bingman[1,3], vbingma@bgsu.edu, Bowling Green State University, [1]Dept. of Psychology, [2]Dept. of Biology, and [3]JP Scott Center for Neuroscience, Bowling Green OH 43402.

The subtropical whip spider *Phrynus marginemaculatus* (Amblypygi), can learn to discriminate between visually similar, but different shelters based on olfactory cues. The purpose of the study was to determine whether the tropical amblypygid, *Phrynus pseudoparvulus* would display the same discriminatory behavior, given the different selective pressures. It is hypothesized that when given a choice between two visually identical shelters, *Phrynus pseudoparvulus* will choose the shelter containing the odor to which they are trained. Amblypygids were placed in a white rectangular arena (29 cm × 14 cm) with two entrances to a shelter, one facing each short side of the rectangle. Each shelter contained one of two odors, hexanol or geraniol, and subjects (n=8) were randomly assigned to a shelter. Two tests and 3 conditioning trials (T,t,t,t,T), each lasting up to 10 minutes, were performed each day over a 5 day period. During test trials, the entrance to both shelters were blocked and the amblypygid could approach but not enter either shelter. In training trials, the conditioned shelter (hexanol or geraniol) was opened while the other shelter remained blocked. During training, subjects could enter only the training shelter and were scored by the latency to enter the shelter. Additionally, in both training and test trials, subjects were scored by the time spent in each quadrant of the arena. When subjects were given a choice between both shelters, they more often chose the shelter to which they were trained. Providing evidence that *P. pseudoparvulus* are able to discriminate between these two odors.

11:30 - FINE-SCALE MOVEMENT PATTERNS OF *TERRAPENE CAROLINA CAROLINA* IN THE OAK OPENINGS PRESERVE. Amanda K. Martin, amandkm@bgsu.edu, Karen V. Root, kvroot@bgsu.edu, Bowling Green State University, 300 East Napoleon Road Apartment C25, Bowling Green OH 43402.

Terrapene carolina carolina movements were monitored using radio telemetry and fluorescent powder in the Oak Openings Preserve to examine fine-scale movement patterns. Radio telemetry can be used to examine daily movement patterns of turtles by calculating straight-line distances between relocation points, however the actual movements between relocation points are unknown. Alternatively, researchers can illuminate detailed pathways taken at a finer-scale by utilizing fluorescent powder. The study's objective was to understand the factors that influence daily movements. Longer daily distances traveled were expected to occur as a result of more tortuous pathways from encountering fine-scale environmental factors, such as coarse woody debris. Eight individuals were tracked with both radio telemetry and fluorescent powder. Transmitters were glued onto the carapace, whereas fluorescent powder was painted onto the turtle's plastron. Powder trails were illuminated with a UV light at night and trails were analyzed the following day, recording GPS coordinates at angles >10°. On average, turtles traveled 29.22 m/d (fluorescent powder) and 24.85 m/d (radio telemetry). These averages are both slightly larger than previously reported using only radio telemetry. Turtles were found in forests (on average 85%) and in prairies (on average 15%). Turtles traveled generally in linear pathways but with some twists and turns, although pathways varied per individual. In conclusion, radio telemetry provides a general assessment of turtle movements for larger scale processes, but fluorescent powder highlights precise movements between relocation points. This helps park managers to examine daily movements in more detail for identifying fine-scale environmental features that influence movement pathways.

10:15 - 11:45 AM
Podium Session 2
Wildlife Biology, Plant Extracts, and Algae
Sky Bank Room – BTSU 201

10:15 - EFFECTS OF MANAGEMENT PRACTICES ON TERRESTRIAL VERTEBRATE ABUNDANCE AND DIVERSITY IN AN OAK SAVANNA ECOSYSTEM. Greg Gustafson, ggustaf@bgsu.edu, Bowling Green State University, Department of Biological Sciences, Bowling Green OH 43204.

Oak savanna and its associated species in the midwest United States are being depleted and degraded. Oak savanna, a globally rare ecosystem, is dwindling because of hardwood encroachment, agricultural conversion and fire suppression. Disturbance is critical in an oak savanna ecosystem to maintain proper habitat structures for native species. Land management practices like herbicide applications, mechanical vegetation removal, and prescribed fire are all utilized to restore and maintain these early successional habitats in northwest Ohio by subduing tree encroachment. It is critical to understand the relationship between management intensity and wildlife diversity and abundance in such a highly managed and diverse ecosystem. To examine these relationships, 15 sites were established in two parks in Lucas County, in northwest Ohio. Point counts were conducted to detect and count avian and mammalian species day and night, May to October. Camera traps were used to assess wildlife within sites. Management data, provided by land managers, was aggregated per site via GIS and compared to diversity and abundance measures. Analysis included using a pair-wise correlation test, found that increasing management instances per site yielded a significantly higher avian abundance per site ($p=0.0417$). We also found, using non-parametric Spearman's test, that sites with more instances of prescribed fires had a greater abundance of snags ($p=0.025$). These snags provide a resource for many wildlife species including woodpeckers, which were significantly and positively related to snag density (non-parametric Spearman's test, $p=0.0475$). Adaptive and properly mimicked management practices are critical to sustaining the structure of these globally rare oak savanna ecosystems.

10:30 - A POPULATION VIABILITY ANALYSIS OF GREEN ASH TREES WITH EMERALD ASH BORER IMPACTS. Rachel H. Kappler[1], rackapp@bgsu.edu, Bowling Green State University, Kathleen S. Knight, ksknight@fs.fed.us, USDA Forest Service, Rachel L. Bienemann, rlbiene@bgsu.edu, Karen V. Root, kvroot@bgsu.edu, [1]13240 Silver St., Weston OH 43569.

The introduction of the invasive emerald ash borer (EAB) (*Agrilus planipennis*) to North America has caused significant ash (*Fraxinus spp.*) decline and cascading forest dynamic changes. Northwest Ohio has had almost complete adult ash mortality in natural areas, leaving a remnant cohort of younger ash seedlings/saplings. Ash trees are an important part of the floodplain forest, serving as soil stabilizers, and to sustain these populations we need information on their probability of persistence. Utilizing a population viability analysis, stochastic stage-based population models were developed for a natural green ash (*Fraxinus pennsylvanica*) population at Oak Openings Preserve, Swanton, Ohio. The population abundance and probability of decline over 50 years was examined using the current conditions (2008 to 2017) versus the addition of future EAB catastrophes and evaluating the effect of fecundity (low=260 or high=2665) on both. The baseline risk of extinction was 6.6% with high fecundity, which increased to 26% with lower fecundity. Changes in extinction risk were greater with additional EAB catastrophes than with lower fecundity, but lower fecundity exacerbated the risk of population decline. Scenarios where future EAB catastrophes occur increased the probability of extinction by 46% for the high fecundity model and by 73% for the low fecundity model. These results highlight that ash populations need protection from EAB to improve the future outcome. This approach can be valuable in developing effective conservation strategies for the recovery of native species in the face of invasive species.

10:45 - SCRATCHING THE SURFACE OF UNDERSTANDING HOW CERTAIN PLANT EXTRACTS CAN PREVENT POISON IVY INDUCED CONTACT DERMATITIS RASH. Kristina Myers, k-myers.5@onu.edu, (Stephen Deyrup, Siena, David Kinder, Raabe College of Pharmacy, Ohio Northern University, Linda Young and Vicki Motz, ONU, Department of Biology and Allied Health Sciences), Ohio Northern University, Department of Biology, 402 W. College Ave. Unit 1532, Ada OH 45810, Alyson Milks, a-milks.4@onu.edu, Karolyn Bedore, karolynbedore15@gmail.com, Siena College, Department of Chemistry and Biochemistry, Loudonville NY.

Jewelweed, *Impatiens capensis*, reduces rash development following poison ivy (PI) exposure, *Toxicodendron radicans*. Soaps also minimizes poison ivy rash; in particular,Saponins are natural soaps. Saponins in *I. capensis* were identified as active components in preventing PI dermatitis. The Sienna group isolated 1,2,4-trihydroxynaphthalene- 1-O-glucoside (THNG), a presumptive precursor of the active component from *I. capensis*. ONU researchers activated THNG with ß-glucosidase, yielding 1,2,4-trihydroxynaphthalene (THN).In this IRB-approved study, PI was brushed onto forearms of 25 volunteers in 6 locations. PI exposed areas were treated with: distilled water, 10% Dawn® dish soap, THN from jewelweed at 1× and 2× the natural concentration, and saponin-containing, MeOH extract from leaves of *Verbascum thapsus*, and common mullein which has reported anti-inflammatory activity. Rash development was tracked for 14 days and scored on a scale of 0 to 14. After 1 week, 5 people (20%) had no dermatitis and 4 people had severe rash in all areas. Week 1 mean scores of remaining participants indicated no difference between water wash (5.1±3.9) and 10% dawn (5.9±3.6) ($t_{11}=-0.86$; $p=0.20$). Neither mullein nor jewelweed extracts exhibited dose dependent responses. Mullein (5.9±3.8) was not significantly different from water or soap [($t_{11}=-1.60$; $p=0.068$); $t_{11}=-0.05$; $p=0.48$, respectively]; which is expected as the saponins act as natural soaps. Thus, mullein saponins are not potential candidates for treating PI rash at natural concentrations. However, worsening of the rash with (6.6±4.4) THN was observed [jewelweed vs water ($t_{11}=-1.86$; $p=0.044$)] and developed earlier than PI alone indicating either a sensitivity to the THN itself or synergistic exacerbation of the rash. Sensitivity to jewelweed has been previously noted.

11:00 - MULLEIN OVER ETHNOBOTANICAL USE OF *VERBASCUM THAPSUS*. Cole Pelger, c-pelger@onu.edu, Ohio Northern University, 402 W. College Ave., Unit 2798, Ada OH 45810, Sara Landis, s-landis.1@onu.edu, Dustin Rieman, d-rieman.1@onu.edu, Rand Abdullatef, r-abdullatef@onu.edu, Alyson Milks, a-milks.4@onu.edu, (David Kinder, d-kinder@onu.edu, Linda Young, l-young@onu.edu, Kelly Hall, k-hall.6@onu.edu, Chris Bowers, c-bowers@onu.edu and Vicki Motz, v-motz@onu.edu).

Common mullein, *Verbascum thapsus*, has been used for thousands of years as an antibiotic and anti-inflammatory. Anecdotal evidence supports these uses, but few scientific studies provide validation. Previous work in this lab demonstrated antibiosis against bacteria, with greatest efficacy against respiratory pathogens. This inhibition of cell division does not extend to HT29 cancer cells. The current research focus is threefold: ascertain the antibiotic and anti-inflammatory active component(s); determine the contribution of factors affecting plant growth on efficacy; and compare the two main methods of ethnobotanic use of mullein leaves (tea infusions and smoking). Leaf samples were collected across the US, June to August 2017, in different developmental stages. Extracts prepared in 50 mM pH 4 phosphate buffer were fractionated and the active constituents evaluated by NMR. Antibiotic efficacy was ascertained by Kirby-Bauer analysis against *S. pneumoniae*, and anti-inflammatory action was assessed against HT29 colon cancer cells irritated with carageenan. Mullein "cigarette" smoke was collected via vacuum filtration, then assessed for antibiotic efficacy. To date, all smoke samples exhibited antibiosis against *S. pneumoniae* (zones of inhibition – 10 mm dots: 29.7±2.9 mm) comparable to extracts (zones of inhibition – 6 mm dots: 16.8±1.3 mm). Antibiosis by the extract was equally effective when tested against a capsule-free mutant *S. pneumoniae*(t_{16} = 2.119, $p=0.123$; no significant difference); however, it did not inhibit growth of the gram negative respiratory pathogen, *K. pneumoniae*. The study of anti-inflammatory assays is in progress.

11:15 - EFFECTS OF LANDSCAPE CHARACTERISTICS ON THE ACTIVITY, DIVERSITY, AND DISTRIBUTION OF NATIVE BATS. Tyler N. Turner[1,2], tylernt@bgsu.edu, Karen V. Root[1], kvroot@bgsu.edu, [1]Bowling Green State University, [2]338 Palmer Avenue Apt. 32, Bowling Green OH 43402.

Despite their ecological value, bats face nationwide population declines due to numerous threats, including habitat loss. A driving factor of this is agricultural expansion, which can fragment and degrade natural forests. These forests are heavily used by native bats for both foraging and roosting, so managing them properly can be critical to species survival. The Oak Openings Region, an area of incredible biodiversity in northwest Ohio and home to eight different bat species, is one of these regions facing pressure from agriculture and development. Sixteen sites were chosen within the Oak Openings Preserve to set up paired overnight monitoring stations in both core and edge habitats. Using Anabat SDII monitors, bats were recorded during foraging hours over 32 nights from June to September. Vegetation characteristics such as density, canopy cover, and distance to riparian systems were measured to determine what promotes foraging activity. All eight native species were identified within the park, though three species (*Eptesicus fuscus*, *Lasiurus borealis*, and *Lasionycteris noctivagans*) made up 95% of the 1283 recorded calls. Most (930 calls) were recorded between 8 PM and midnight. Most also demonstrated

a strong preference for the forest habitat, though some species showed preferences for oak savanna (*Nycticeius humeralis*) and edge (*L. noctivagans*) habitats. There was not an even distribution of activity among sites of the same habitat type, suggesting that there are certain features at heavily used sites which promote activity and diversity. By understanding how the bats are using the landscape, we can improve management in order to protect and promote bats.

11:30 - TOLERANCE OF *PLANKTOTHRIX AGARDHII* TO NITROGEN DEPLETION: CYANOPHYCIN UTILIZATION. Michelle J. Neudeck, mneudec@bgsu.edu, George S. Bullerjahn, PhD, bullerj@bgsu.edu, R. Michael McKay, PhD, rmmckay@bgsu.edu, Bowling Green State University, 525 Life Sciences Building, Bowling Green OH 43403.

Sandusky Bay has been increasingly threatened by cyanobacterial algal blooms (cHABs). The 2015 bloom persisted from early summer to late fall despite nitrogen levels dropping to below detection in late summer. *Planktothrix agardhii* is the main bloom-forming organism present, but it is nondiazotrophic, does not fix atmospheric nitrogen. Water samples were taken every 2 weeks and RNA was prepared for metatranscriptomics. The metatranscriptomes were analyzed for gene expression using CLC Genomics Workbench 9.5.3. There are two systems by which *Planktothrix* spp. can mobilize internal nitrogen pools: by utilizing cyanophycin, a nitrogen storage molecule, and through degradation of the phycobilisome. Cyanophycin synthetase is encoded by *cphA*. Cyanophycinase, the enzyme that hydrolyzes is encoded by the *cphB* gene. These genes are cotranscribed as part of an operon. *Planktothrix* also has a monocistronic copy of *cphA* located elsewhere in the genome. Under severe N depletion, cyanobacteria can also degrade the N-rich phycobilisome light-harvesting complex to regenerate nitrogen. Representative phycocyanin apoproteins are encoded by *cpcA* and *cpcB*. *cpcE* and *cpcF* encode subunits of the phycocyanobilin lyase that incorporates bilin pigment into the complex. The monocistronic *cphA* was expressed from early to midsummer during N replete conditions, while the *cphBA* operon was only expressed following N depletion. These data suggest that under N replete conditions, the cells are storing excess N as cyanophycin (so-called 'luxury uptake'), and degrading cyanophycin when N becomes limiting. By contrast, genes encoding phycobilisome functions showed no obvious expression pattern, suggesting that the phycobilisome is not a major source of internal N under low nitrogen conditions.

10:15 AM - Noon
Podium Session 3
Materials Science
Union Theater – BTSU 206

10:15 - INVESTIGATING SURFACE FINISH AND BURR FORMATION IN MICRO-MILLING OF POLYCARBONATE GLASS. Craig E. Hanson Jr., hansonce@miamioh.edu, Muhammad P. Jahan, jahanmp@miamiOH.edu, Miami University, Department of Mechanical and Manufacturing Engineering, Oxford OH 45056.

Polycarbonate glass is a material most commonly known for its application as optical lenses. However, in recent years, this material has had a multitude of other applications including uses in automotive and biomedical industries. Many of the microfluidic applications of polycarbonate glass require micro-channels, which are currently made through time consuming photolithography and etching processes. In this study, micro-milling has been evaluated as a better alternative process to obtain these micro-channels. The goal was to investigate the surface finish and burr formation in the micro-milling of polycarbonate glass under varying feed rates, depths of cut, and tool coatings. In terms of surface finish, it was found that a critical depth of cut range (0.3 to 0.5 mm) produces the best surface finish of polycarbonate glass. The titanium aluminum nitride (TiAlN) coated tools produce a better surface finish than titanium nitride (TiN) and uncoated carbide tools do. We found that the higher the feed rate, the better the surface finish. The surface finish was analyzed optically with a light microscope, and quantitatively with atomic force microscope (AFM). In terms of burr formation, the same critical depth of cut range of 0.3 to 0.5 mm produced the least amount of burrs at the edges of the micro-channels. The uncoated carbide tool produced the least amount of burrs. We found that increasing the feed rate decreases the burr formation. The burrs were also optically analyzed with a light microscope. In conclusion, polycarbonate glass can be produced in ductile mode machining. A careful choice of tool and machining parameters generates a better surface finish and low burr formation.

10:30 - EFFECT OF MICROSTRUCTURES ON LUMINESCENCE KINETICS IN TRANSPARENT CERAMICS. Sahil Agarwal[1,2], asahil@bgsu.edu, Le Zhang[1,3], Petr Stepanov[1,2], Micah Haseman[2], Farida Selim[1,2], faselim@bgsu.edu, [1]Bowling Green State University, Center for Photochemical Sciences, Bowling Green OH USA 43403, [2]Bowling Green State University, Department of Physics and Astronomy, [3]Jiangsu Key Laboratory of Advanced Laser Materials and Devices, School of Physics and Electronic Engineering, Jiangsu Normal University, Xuzhou, Jiangsu, P.R. China 221116.

Transparent ceramics are emerging as promising candidates for laser-host materials and scintillation applications because of their high purity, uniform composition, fewer residual pores, isotropic lattice, reduced light scattering, ease in fabrication and controlled growth processes for bulk manufacturing. The luminescence properties of two differently fabricated Ce: YAG transparent ceramics and single crystal have been studied using photoluminescence (PL) and thermoluminescence (TL) and the dependence of the luminescence kinetics on microstructure has been investigated. Positron annihilation spectroscopy (PAS) measurements comprising of PALS and Doppler broadening spectroscopy shows that PL temperature difference kinetics is different between as-grown TC and commercial TC is because of defects clusters and grain boundaries and the difference in amount makes a difference in the luminescence characteristics of the transparent ceramics. This work can serve as foundation for tuning the desired PL according to grain size and microstructure of transparent ceramics.

10:45 - IN SEARCH OF EXTRATERRESTRIAL RESOURCES: TO THE EARTH'S MOON AND BEYOND. Claire L. McLeod[1], mcleodcl@miamioh.edu, Mark P. S. Krekeler[2], krekelmp@miamioh.edu, [1]Miami University, Department of Geology and Environmental Earth Science, 203 Shideler Hall, 250 S. Patterson Ave., Oxford OH 45056, [2]Miami University Hamilton.

Rare Earth Elements (REEs) are a group of transition metals which include the lanthanide series of the periodic table (lanthanum to lutetium) in addition to scandium (Sc) and yttrium (Y). These elements are integral components of devices used by humankind on a daily basis: smart phones, flash drives, computer monitors, and magnets for example, and are therefore considered a crucial resource to society. However, the REE budget of Earth is limited with <2500 years of reserves left of several of these elements: lanthanum, neodymium, europium and yttrium. With an increasing human population projected to reach 8.5 billion by 2030, and a limited terrestrial REE budget, exploration of extraterrestrial REEs is inevitable with Earth's nearest neighbor in space a logical first target. The majority of Moon rocks contain minor amounts ($\leq 3\%$) of REE-bearing

minerals: apatite ($Ca_5(PO_4)(F,Cl)$) merrillite ($((Ca_3)(PO_4)_2)$) and/or monazite ($((Ce,La,Nd,Th)(PO_4)(SiO_4))$). Yet to date there is no geological, mineralogical, or chemical evidence to support REEs being present on the Moon in concentrations that would be considered viable REE resource targets for economical exploration. Beyond the Moon, Mars and other extraterrestrial materials (chondritic meteorites for example) also contain REE-bearing minerals, including apatite and merrillite, yet these phases are again minor components of samples studied to date (<0.6%). Therefore, extraterrestrial materials are not presently suitable REE resource targets. However, they are host to other resources that will likely be fundamental to the future of space exploration, for example metals (iron and aluminum) and water.

11:00 - ION TRANSPORT IN THIN-FILM PHOTOVOLTAICS. Anuja Parikh, aparikh@bgsu.edu, Marco Nardone, marcon@bgsu.edu, Bowling Green State University, 179 Overman Hall, Bowling Green OH 43403.

Ion migration plays a critical role in cadmium telluride (CdTe) and copper indium gallium diselenide (CIGS) based thin film photovoltaic device performance. In this work, we review the physics of ion transport in solids (crystalline and polycrystalline), develop a general numerical simulation tool for ion drift-diffusion, and validate it against literature data and analytical expressions for the technologically important cases of phosphorous and copper in CdTe, and sodium in CIGS. Calculations are conducted by the finite element method using COMSOL Multiphysics® software. Our preliminary results show the regions of slow and fast diffusion of phosphorous and copper in single crystalline CdTe with the transition depth between 10 nm to 20 µm from the surface. Given the fact that grain boundaries exist in thin-film device components, diffusion mechanisms require special attention. Our present focus is on incorporating diffusion through grain boundaries in polycrystalline material. After validation of this initial model, the simulation tool will be extended to predict the effects of ion migration on the performance of CdTe and CIGS devices by coupling it to a device simulator.

11:15 - PHOTOCONDUCTIVE ZNO FILMS PRINTED ON FLEXIBLE SUBSTRATES BY INKJET AND AEROSOL JET TECHNIQUES. D. J. Winarski[1], Djwinar@bgsu.edu, E. Kreit[2], E. M. Heckman[2], E. Flesburg[1], M. Haseman[1], R. S. Aga[2], F. A. Selim[1], [1]Bowling Green State University, Center for Photochemical Sciences, Bowling Green OH 43402, [2]Air Force Research Laboratory Sensors Directorate, Wright-Patterson Air Force Base OH 45433.

Zinc oxide (ZnO) thin films have remarkable versatility in sensor applications. Here, we report simple ink synthesis and printing methods to deposit ZnO photodetectors on a variety of flexible and transparent substrates, including polyimide (Kapton), polyethylene terephthalate, cyclic olefin copolymer (TOPAS), and quartz. X-ray diffraction analysis revealed the dependence of the film orientation on the substrate type and sintering method, and ultraviolet–visible (UV–Vis) absorption measurements revealed a band edge near 380 nm. Van der Pauw technique was used to measure the resistivity of undoped ZnO and indium/gallium-codoped ZnO (IGZO) films. IGZO films showed lower resistivity and larger average grain size compared with undoped ZnO films due to addition of In3+ and Ga3+, which act as donors. A 365 nm light-emitting diode was used to photoirradiate the films to study their photoconductive response as a function of light intensity at 300 K. Experiments revealed that ZnO films printed by aerosol jet and inkjet techniques exhibited five orders of magnitude photoconductivity, indicating that such films are viable options for use in flexible photodetectors.

11:30 - SINGLE CaO ACCELERATED DENSIFICATION AND MICROSTRUCTURE CONTROL OF HIGHLY TRANSPARENT YAG CERAMIC. Tianyuan Zhou[1,2], zhout@bgsu.edu, Sahil Agarwal[1], asahil@bgsu.edu, Farida Selim[1], faselim@bgsu.edu, Le Zhang[1,2], Hao Chen[2], [1]Bowling Green State University, Center for Photochemical Sciences, Department of Physics and Astronomy, Bowling Green OH 43403, [2]Jiangsu Key Laboratory of Advanced Laser Materials and Devices, School of Physics and Electronic Engineering, Jiangsu Normal University, Xuzhou, Jiangsu, P.R. China 221116.

Full densification (pore-free microstructure) is the basic requirement to obtain transparent ceramics with good optical quality and tetraethyl orthosilicate ($Si(OC_2H_5)_4$, TEOS) is often served as a common sintering additive to promote densification of transparent yttrium aluminum garnet ($Y_3Al_5O_{12}$, YAG) ceramic. The microstructure of YAG ceramics can be tuned by many factors such as the raw materials, the content of sintering aid and the sintering strategy. Literature suggests the fast grain growth of YAG ceramics at high sintering temperature when TEOS is employed. In addition, owing to charge compensation, Si^{4+} ion that decomposed from TEOS would immensely deteriorate the conversion of Cr or Yb ion into a higher valence state. Recently, we reported a YAG transparent ceramics using divalent dopants (CaO and MgO) as sintering aids and found that CaO dopant was more effective in the suppression of grain growth than MgO. In this work, a small amount of CaO single dopant was adopted to realize the densification and microstructure control of fine-grained YAG ceramic by a simple solid-state reaction and one-step vacuum sintering method and highly transparent YAG ceramics (T = 84.4% at 1064 nm) were obtained after vacuum sintering at 1820 °C for 8 h. The average grain size was determined to be 2.7 µm, when the amount of CaO used was as low as 0.045 wt.%. Using scanning electron microscopy (SEM), it was found that the CaO dopant promoted both densification and grain growth of YAG ceramics when the sintering temperature was lower than 1660 °C, however it dramatically inhibited grain growth when the sintering temperature was further increased. This study provides an alternative approach of synthesizing high quality YAG transparent ceramics by the use of CaO alone as a single dopant sintering additive.

11:45 - SERENDIPITOUS DISCOVERY OF ELEMENTAL ANOMALY IN AMBER. Thomas D. Farron, farronts@mail.uc.edu, Amanda M. Hunt, huntad@ucmail.uc.edu, University of Cincinnati Clermont College, Dept. of Geology-Geography, 4200 Clermont College Drive, Batavia OH 45103.

Amber specimens are organic materials derived from plant and tree fluid exudates. Their chemical composition varies, depending on several factors, including the plant from which they were derived and inclusions. A specimen was tested from a collection to determine its elemental constituents using a Niton™ XRF T3 GOLDD+ hand-held analyzer by Thermo Fisher Scientific Inc. The first sample tested indicated the presence of iridium. It was re-tested 4 more times with the same result. These results were completely unanticipated. Additional specimens were then tested yielding similar results. A literature search was conducted in order to learn about the occurrence of iridium in amber. No previously reported occurrences of iridium in amber have been found. Prior to analysis, the tool was calibrated by the manufacturer, then at regular intervals in the lab using manufacturer recommended protocol. The testing surface was cleaned, according to recommended protocol, between each test. Iridium, an anomalous element in amber, was detected in concentrations of between 10 to 15 ppm ±2σ, in ~25 samples, with each individual sample being analyzed a minimum of 3 times for verification. Iridium is rare on the surface of the Earth. It may be present in meteorites

and associated with meteorite impact events such as the K-Pg Boundary. It may also be associated with flood basalts such as the Deccan Traps of India and some deep seated volcanic eruptions. There are no known impact craters or flood basalts that are chronologically correlative with earliest Cenomanian deposition of the amber in a pyroclastic and clay matrix. There is no known associated geographic location for impact craters or flood basalts for this occurrence of Iridium. The amber is reported as being possibly partially stream transported and deposited in pyroclastic and clay matrix. Iridium has reportedly been mined on a small scale in the area. Further study is required to ascertain possible origins for this anomalous occurrence of iridium in amber. Sample analysis of the local volcanic and clay matrix is believed to be critical to further study.

10:15 AM - Noon
Podium Session 4
Ecology and Environmental Science
Mylander Room – BTSU 207

10:15 - MAUMEE RIVER POTAMOPLANKTON: CYANOBACTERIA AND THEIR TOXICITY. Douglas D. Kane[1,2], dkane@defiance.edu, 701 N. Clinton St., Defiance OH 43512, Thomas B. Bridgeman[2], Thomas.Bridgeman@utoledo.edu, R. Michael McKay[3], rmmckay@bgsu.edu, Timothy W. Davis[3], timdavi@bgsu.edu, [1]Defiance College, [2]University of Toledo, [3]Bowling Green State University.

Cyanobacterial Harmful Algal Blooms (cHABS) have been resurgent in Lake Erie during the past two decades; however, less is known about the occurrence and toxicity of cHABS in the Maumee River. Although, previous studies in the last decade have found abundant cyanobacteria in the river, none had found appreciable amounts of toxin-producing strains or toxins in the river. This changed in 2016 when a very toxic bloom of *Planktothrix* was discovered reaching from Defiance, Ohio, to Napoleon, Ohio. In 2017, approximate monthly samples were taken from late May to early September at 4 sites between Defiance, Ohio, and Waterville, Ohio, to further investigate the composition of Maumee River phytoplankton. Fluoroprobe was used to determine algal biomass at a coarse taxonomic resolution and used ELISA to test total microcystins of river water samples. It was found that diatoms dominated phytoplankton biomass at all times (typically 50% or more of total phytoplankton biomass) followed by green algae (20 to 30%), cyanobacteria (10 to 20%), and cryptophytes (<10%). None of these samples exceeded the State of Ohio Recreational Public Health Advisory level (6 µg/L total microcystin). However, additional samples taken during the large late-September cHAB bloom in the Maumee River near downtown Toledo were toxic, with 9 out of 13 sites sampled exceeding the Recreational Public Health Advisory level and 6 of 13 sites sampled exceeding the Elevated Recreational Public Health Advisory (20 µg/L total microcystin). It is planned to conduct more extensive temporal and spatial sampling in 2018, along with adding analyses for additional toxins.

10:30 - THE CONUNDRUM OF DAMS TO FRESHWATER MUSSELS IN SMALL RIVERS. Robert A. Krebs, r.krebs@csuohio.edu, Rachel E. Andrikanich, r.andrikanich@vikes.csuohio.edu, Cleveland State University, Dept. of Biological, Geological and Environmental Sciences, 2121 Euclid Ave., Cleveland OH 44115.

The 90,580 registered dams in the United States are an average of 56 years old and provide drinking water, irrigation, hydropower, flood control, and recreation to our communities and economy. Each dam also creates areas of impoundment upstream that together compose about 17% of stream reaches, but downstream effects are less well known. The effect of dams on stream flow and freshwater mussel (Unionidae) assemblages was assessed in two river systems, the Cuyahoga River that famously led to the Clean Water Act, and the nearby Mahoning River, currently considered one of the most degraded systems in the nation. Timed searches throughout the length of both rivers were made to characterize differences in mussel richness above versus below dams. Dams and their impoundments isolated populations upstream, but also homogenized flow rates and reduced variation in habitat types downstream for long stretches of each river. Where headwater dams built as reservoirs for flood control limited habitat variation, species richness declined to 5 or less. Adult mussels appeared to persist over time, but little evidence of recruitment was found, especially for lotic species, and two species generalists, *Lampsilis siliquoidea* and *Pyganodon grandis*, have become dominant even where water quality improved. Moderate assemblage diversity, defined as a richness of about 10 species, was found only downstream where riffle-run habitat occurred. Throughout the nation, single stream studies continue to document enigmatic mussel loss, where removal of point source problems fail to lead to improvements in the fauna. Flow rate variation may be an important factor.

10:45 - THERE'S NOTHING STANDARD ABOUT DATA STANDARDIZATION — ASKING THE RIGHT QUESTIONS WHEN ANALYZING ECOSYSTEM CHANGE. G. Matt Davies, davies.411@osu.edu, The Ohio State University, School of Environment and Natural Resources, Kottman Hall, 2021 Coffey Road, Columbus OH 43210.

Analyzing changes in ecological communities relies on the use of complex multivariate statistical methods such as PERMANOVA or Non-metric Multidimensional Scaling (NMDS). It is not unusual for ecologists to pre-treat their data prior to such analyses. This might include removing rare species that add "noise" or standardizing their data. Some statistical packages or functions may include standardization as a default setting. The uncritical selection of data standardization approaches is concerning, not because any particular method is necessarily incorrect, but rather because different methods ask different ecological questions. Standardization methods were compared using data from 15 experimental fires burnt on Scottish heathlands of different pre-fire ages. In these ecosystems differences in stand age are associated with variation in species-specific regeneration rates but little change in the suite of species present. The data were subjected to increasing levels of standardization: i) raw data, ii) standardization by species maximum cover, iii) standardization by species maximum then by plot total cover—so called "Wisconsin" double standardization, iv) conversion of cover data to presence/absence. Analysis via NMDS and PERMANOVA provided conflicting messages on the ecological and statistical significance of stand age. Analysis of raw data yielded significant differences in composition between stand ages, but effect sizes declined with increasing standardization. The results demonstrate the need for ecologists to define standardization when setting research objectives and to tie their analytical methods to specific ecological questions.

11:00 - USE OF PLANT FUNCTIONAL TYPES TO IMPROVE RESTORATION SUCCESS OF A PRAIRIE ON RECLAIMED MINE LAND IN SOUTHEASTERN OHIO. Rachael E. Glover[1], glover.194@osu.edu, G. Matt Davies[1], davies.411@osu.edu, Rebecca M. Swab[2], rswab@thewilds.org, [1]The Ohio State University, School of Environment and Natural Resources, 2021 Coffey Rd., Columbus OH 43210, [2]The Wilds, Cumberland OH.

Strip mining for coal has left a legacy of environmental issues, including poor soil quality and loss of ecosystem function. The Wilds is conservation facility in southeastern

Ohio that sits on 10,000 acres of reclaimed strip mine land. Prairie offers one option for restoration of highly degraded ecosystems where re-establishing pre-mining forest habitat is impractical. The goal of this research is to evaluate the species and functional composition of a prairie that has been left unmanaged for 8 years following its implementation in 2008. Originally, the 20-acre site was created to evaluate biomass production following differing land preparation treatments, fertilizer and deep ripping, and addition of 6 different seed mixes. After surveying community composition in 2016, each species was characterized according to key functional traits: including growth form, phenology and nitrogen fixation. Cluster analysis classified plots into 6 different community types and broadly identified 61 plots where the treatments resulted in well-established populations of prairie grasses and 180 plots where there was low abundance of prairie species. All plots lacked native forbs. Further analyses suggested that the functional makeup of the community is associated with the original seed mix ($p<0.05$), whether plots were fertilized ($p<0.05$), and location across the site (block; $p<0.05$). Lack of follow-up management and poor establishment of seeded species likely led to the current, depauperate community. Understanding the functional makeup of an ecosystem can be an important tool for selection of successful management, such as an effective seed mix, to restore diversity and ecosystem function.

11:15 - DATA ANALYTICS APPLICATION FOR THE ASSESSMENT OF OHIO'S INTERSTATE POLLUTION TRANSPORT. Muhammad M. Mereb, mmereb@cscc.edu, Columbus State Community College, Physical and Biological Sciences Department, Room NH 432, 550 E. Spring St., Columbus OH 43215.

The Ohio Environmental Protection Agency (Ohio EPA) operates 153 air monitoring sites in the state of Ohio. The monitoring stations sample ambient air for 6 US EPA criteria pollutants: particulate matter (PM_{10}), SO_2, CO, O_3, NO_2 and Pb. Ohio EPA also monitors fine particulates ($PM_{2.5}$) and various meteorological parameters. Samples are collected on an hourly basis for all of the criteria pollutants except particulate matter and lead, which are monitored on a 24-hour basis. Other states are required to have their own monitoring sites for criteria pollutants. Big data sets have been collected by these monitoring sites nationwide. Data analytics is an emerging field that applies fundamental scientific principles to analyze large, complex data sets. The Clean Air Act (CAA) section 110(a)(2)(D)(i)(I) "Good Neighbor provision" requires each state, in its state implementation plan (SIP), to address how interstate transport of air pollution affects downwind states' ability to attain and maintain the National Ambient Air Quality Standard (NAAQS). In this study, analysis of the air quality data and national emissions inventory data, that were provided by US EPA, has been used to evaluate Ohio's contribution to nonattainment or interference of maintenance of the 2012 annual $PM_{2.5}$ NAAQS in other states. A special focus is placed on Allegheny County in Pennsylvania as a nonattainment area.

11:30 - USING MATCH STICK ARRAYS TO ANALYZE FOREST FIRE PROPAGATION ALONG A SLOPE. Abigail E. Ambrose[1], aambrose20@wooster.edu, Niklas Manz, nmanz@wooster.edu, The College of Wooster, [1]C-1038 1189 Beall Avenue, Wooster OH 44691.

The effect of a forest floor slope θ on the propagation speed v of forest fires was experimentally analyzed using physical, 3D-printed models with match stick arrays (7 matches × 9 matches) to represent the trees. Various models (5° to 45°, 5° increments) for 3 specific distance conditions between neighboring match heads were created. In each model type the distance between the match heads Δd was kept constant along the horizontal (x-model with $\Delta d=10.0$ mm), along the vertical (z-model with $\Delta d=1.0$ mm), and along the slope (r-model with $\Delta d=2.8$ mm). For all three models, the slope-speed relationship $v(\theta)$ along the incline for both, the upward and downward propagation of the fire fronts was determined by measuring the time the front needed to propagate through the length of the model. Each model was best fit with a different mathematical function: the x-model with an exponential curve, $v=13.0-1.4^{0.05\theta}$, the z-model with a quadratic curve, $v=9+0.01\theta+0.003\theta^2$, and the r-model with a straight line, $v=5.4+0.032\theta$.

11:45 - USING HYPERSPECTRAL REMOTE SENSING TO EVALUATE THE IMPACT OF WATER LEVEL FLUCTUATIONS ON NUTRIENT CONCENTRATION AT OLD WOMAN CREEK ESTUARY. Patrick A. Reil[1], preil@bgsu.edu, Anita Simic Milas[1], asimic@bgsu.edu, Kristen Arend[2], kristin.arend@dnr.state.oh.us, Tharindu Abeysinghe[1], tharina@bgsu.edu, Katerina Konstantinidis[1], konstak@bgsu.edu, Ross Combs[1], rcombs@bgsu.edu, [1]Bowling Green State University, Dept. of Geology, Bowling Green OH 43402, [2]Ohio Department of Natural Resources, Division of Wildlife, Huron OH.

The fluctuating barrier beach at the mouth of Old Woman Creek (OWC) estuary impacts the water level within the estuary, and it is a driving mechanism behind the algal and nutrient distribution. The barrier beach separates Lake Erie from OWC. During storm events, the barrier beach recedes allowing the water bodies to intermix. Our primary goal is to evaluate the impact of storm events and surface water levels on nutrient composition and to develop a statistical research framework based on hyperspectral remote sensing data and algorithms, developed in this study, that will be applicable to other tributaries of Lake Erie. Surface reflectance measurements and water samples were collected at 26 sites within OWC. Water samples were collected at 2 different depths, and processed for total phosphorus. Concurrent with data collection, the NASA Glenn Research Center provided overhead flights with the hyperspectral HSI3 sensor. Results from the Mann-Whitney test indicate that there are differences in water quality properties when the mouth of the barrier beach is open vs. closed. Examination of slope components from iterative linear models indicate that wavelengths in the red, green and infrared portion of the electromagnetic spectrum will be suitable for this study. Using a simple band ratio derived from hyperspectral wavelengths we have success in predicting levels of total phosphorus with adjusted r^2 values of 0.68. These results support our hypothesis that the barrier beach impacts nutrient concentrations, and that time series remote sensing measurement is an effective tool to quantify water quality properties.

10:15 AM - 12:15 PM
Podium Session 5
STEM Education, Genetics, Taboo Words, and Whiskey
Family Room – BTSU 208

10:15 - INCREASING MINORITY STEM PARTICIPATION THROUGH THE CREATION OF A SCIENCE FAIR PROGRAM FOR HIGH SCHOOL STUDENTS. Rickey C. Terrell[1], terrelrc@mail.uc.edu, (Greg Hollon, hollone@ucmail.uc.edu), University of Cincinnati, [1]3553 Carmelle Woods Dr., Mason OH 45040.

Minorities comprise only a small fraction of the national STEM workforce. To ensure the growth of minority representation in STEM, it is imperative to expose these populations to these career opportunities early in their educational career. A program that offers a pathway to achieve this goal is a science fair. Hughes High School, located in Cincinnati, Ohio, was chosen as the location to develop a science fair program for the 2016-2017

academic year. During the inaugural year of the program, the following data were measured: student participation, student retention, and financial support. Analysis of this data led to various improvements that are currently being applied to the program during the 2017-2018 school year. A majority of the students in the program are in their final year and it is expected that participation will increase the number of students pursuing a STEM major in college. To evaluate the level of success of the program's first year, an exit survey will be given to the students to inquire about their college plans, their level of interest in STEM fields, and any new information they learned throughout the duration of the program. Results of this study will help in planning the future of this program and increase the overall interest and participation of minority students in STEM fields.

10:30 - HOST MICROBIOME REGULATION OF HYPERTHERMIA MEDIATED BY 3,4-METHYLENEDIOXYMETHAMPHETAMINE (MDMA, MOLLY). Emily A. Ridge, eridge@bgsu.edu, Jon E. Sprague, jesprag@bgsu.edu, Bowling Green State University, 325 Life Science Building, Bowling Green OH 43403.

Hyperthermia is one of the most acute and life-threatening consequences of 3,4-methylenedioxymethamphetamine (MDMA) use. The hyperthermia induced by MDMA involves a complex interaction between heat generation and loss of heat dissipation. Recent studies have demonstrated a role for gut microbiome in the regulation of body weight and temperature. Here, we investigated the potential role of the gut microbiome in MDMA-mediated hyperthermia. For 14 days prior to treatment with MDMA (20 mg/kg, sc) male, Sprague-Dawley rats were provided regular drinking water or drinking water laced with the non-absorbable antibiotics, bacitracin (0.5 mg/mL), neomycin (2 mg/mL), and vancomycin (0.2 mg/mL). Antibiotic (ABX) treatment reduced gut bacteria and increased cecal size. MDMA-induced a hyperthermic response that resulted in a maximal temperature change (ΔT_{max}) of 4.6 ± 0.1 °C and only a 50% survival rate 60 minutes after treatment. Conversely, ABX treatment prior to MDMA attenuated the hyperthermic response with a ΔT_{max} of 3.4 ± 0.6 °C and a 100% survival rate 60 minutes after treatment. An acute intraperitoneal injection of ABX 30 minutes before MDMA had no effect on the hyperthermic response, eliminating the possibility of a pharmacodynamics interaction between ABX and MDMA. Overall, these findings demonstrate that the gut microbiome contributes to the hyperthermia mediated by MDMA.

10:45 - EFFECT OF NANO-DYSFERLIN ON MEMBRANE REPAIR IN A/J MOUSE MUSCLE. Bhageerathi Ganesan, bhageerathi.ganesan@osumc.edu, Sayak Bhattacharya, sayak.bhattacharya@osumc.edu, Eric X. Beck, eric.beck@osumc.edu, Roger B. Sutton, Roger.B.Sutton@ttuhsc.edu, Matthew Hirsch, mhirsch@email.unc.edu, Noah Weisleder, noah.weisleder@osumc.edu, The Ohio State University, Department of Physiology and Cell Biology, Dorothy M. Davis Heart and Lung Research Institute, 473 W. 12th Ave., Columbus OH 43210.

Dysferlin is a skeletal muscle enriched gene whose protein product is well-known to play a critical role in the regulation of plasma membrane repair. Mutations in the dysferlin gene can lead to the pathologies associated with several different types of myopathies, particularly limb-girdle muscular dystrophy type 2B and Miyoshi Myopathies. Previous studies have also indicated that, in adult skeletal muscle cells, the dysferlin protein concentrates at transverse tubules to mediate membrane repair. As there is currently no treatment for dysferlin deficiency, there is interest in using gene therapy to replace mutant dysferlin genes; this is complicated, however, by the large size of the dysferlin gene. Here it was tested the efficacy of nano-dysferlins (engineered shortened dysferlin cDNAs) in replacing full-length dysferlin and rescuing plasma membrane repair by electroporating 3 dysferlin variants into the muscles of A/J mice that do not normally express dysferlin. Membrane repair capacity was assessed by dye influx analysis following laser injury induction. Additionally, co-immunoprecipitation following overexpression in HEK cell lines was used to evaluate the extent of the interaction of different mutated forms of dysferlin variants with another membrane repair protein MG53/TRIM72. We report that 2 dysferlin constructs can rescue membrane repair to levels comparable to that seen in wildtype cells. Additionally, we report that dysferlin variants formed from deletion constructs mimicking loss-of-function point mutations demonstrated markedly less association with MG53/TRIM72, suggesting that the interaction of dysferlin with MG53/TRIM72 is critical to maintaining membrane repair capacity.

11:00 - MACROPHAGE-INDUCED CHEMOKINE PRODUCTION FOLLOWING TREATMENT WITH HEAT-KILLED *STAPHYLOCOCCUS AUREUS* IS NOT ALTERED BY TLR3 ACTIVATION. Sarah K. Grossman, sgrossman15@students.ndc.edu, Angela C. Johnson, acjohnson@ndc.edu, Notre Dame College, 4545 College Road, South Euclid OH 44121.

Staphylococcus aureus is commonly found on the surface of the body; however, it is of significant medical concern with the emergence of methicillin-resistant *Staphylococcus aureus* (MRSA). Macrophage-derived Toll-like receptors (TLRs) are necessary for the recognition and response to pathogens such as *S. aureus*; therefore, to understand the innate immune response against *S. aureus*, heat-killed *S. aureus* was utilized to treat macrophages. Furthermore, as previous data indicates crosstalk amongst the TLR signaling pathways, the study evaluated the role that TLR3-TRIF signaling may play during the innate immune response to *S. aureus*. Briefly, the macrophage cell line J774 was treated with the following ligands: the synthetic lipopeptide Pam2Cys-Ser or P2C (TLR2 ligand), the synthetic lipopeptide Pam3Cys-Ser-(Lys)4 or P3C (TLR2 ligand), the synthetic dsRNA polyinosinic:polycytidylic acid or Poly(I:C) (TLR3), heat-killed *S. aureus* HKSA (primarily TLR2). After 24 hours of treatment, supernatants were collected and subjected to ELISA to test for the presence of CXCL2/MIP-2, CXCL1/KC, and CCL5/RANTES. Preliminary experiments indicate that crosstalk between TLR2 and TLR3 is not occurring, as there was essentially no difference between macrophages treated with *S. aureus* only and macrophages treated with *S. aureus* and Poly(I:C) in combination. Therefore, it is thought that HKSA-induced inflammatory responses in the macrophage are unaffected by TLR3-induced signaling.

11:15 - EXAMINING RESPONSES TO TABOO WORDS AND WORDS VARYING IN VALENCE AND AROUSAL. Samantha E. Tuft[1], s.tuft@vikes.csuohio.edu, Rachel B. Fernandes[1], r.fernandes@vikes.csuohio.edu, Sara Incera[2], sara.incera@eku.edu, Conor T. M[c]Lennan[1], c.mclennan@csuohio.edu, [1]Cleveland State University, Language Research Laboratory, Department of Psychology, 2121 Euclid Avenue, Cleveland OH 44115, [2]Eastern Kentucky University, Multilingual Laboratory, Department of Psychology, Richmond KY.

Attentional biases to emotional words have frequently been investigated using an emotional Stroop task. Researchers are interested in examining when the affective dimension of the word, although irrelevant to the task, interferes with the color-naming task (e.g., longer reaction times to emotional words relative to neutral words). This interference is referred to as an emotional Stroop effect. Previous research has primarily focused on negative and/or taboo words, not positive words or arousal. Furthermore, previous investigations have resulted in mixed findings due to presentation (e.g., blocked vs. mixed), or a lack of sensitivity in traditional measures (e.g., reaction time & accuracy). In the present study, we used computer mouse tracking to investigate whether taboo Stroop effects

(Experiment 1) were similar to emotional Stroop effects (Experiment 2). In Experiments 1 and 2, we used a mixed presentation and participants were instructed to respond to the font color of each word by clicking on response options on the screen. In Experiment 2, we examined the effects across all levels of valence (negative, neutral, positive) and arousal (low, medium, high). In Experiment 1, we found that taboo words were responded to less efficiently than neutral words. In Experiment 2, we found that negative words were responded to less efficiently than neutral words, but only for low arousal words. Interestingly, for high arousing words, there was a trend that positive words were responded to less efficiently than neutral words. The results of the current study have important theoretical implications for theories of emotional language processing.

11:30 - DETERMINATION OF THE ROLE THAT *CBX* AND *CG12744* PLAY DURING *DROSOPHILA MELANOGASTER* CRYSTAL CELL DEVELOPMENT. Hannah M. Schwab[1,2], hschwab@students.ndc.edu, Joseph Rose[1], jrose16@students.ndc.edu, M. Logan Johnson[1], mjohnson@ndc.edu, and Angela C. Johnson[1], acjohnson@ndc.edu, [1]Notre Dame College, South Euclid OH, [2]4545 College Road, South Euclid OH 44121.

Hematopoiesis or differentiation of the repertoire of immune cells is an essential and well conserved process between mammalian and *Drosophila* lineages. While *Drosophila* hematopoiesis results in the development of 3 unique cell types, crystal cells that specifically express PPO1, the protein responsible for melanization, have demonstrated a protective effect against infection. Interestingly, previous studies have assigned *cbx* and/or *CG12744* as significant factors in crystal cell development. However, recent changes in the annotation of the genomic region of 46B4 and 46C1, which contain *cbx, CG12744*, and 2 other protein coding genes, have created uncertainty in regards to the function of each gene. This study utilized complementation assays to assign the proper gene identity of several alleles within this genomic region and demonstrated that a null of *CG12744* is both viable and fertile. In order to assess the immune response of mutants of *cbx* and *CG12744*, an infection model was developed, in which *D. melanogaster* hind legs were pricked with a *Staphylococcus aureus* inoculated needles. Future research will combine the use of the identified alleles within the genomic region with the $PPO1^{bc}$ (black cell) allele to assess the development of the crystal cells and determine their role during *S. aureus* infection. Taken together, it is anticipated that these studies will further elucidate the process of hematopoiesis in *D. melanogaster* and potentially in mammalian systems.

11:45 - UNPRECEDENTED WHISKEY FLAVORS PART 1: GC-MS ANALYSIS OF UNPRECEDENTED WHISKEY FLAVORS CREATED BY A NOVEL AGING PROCESS. Clayton Mastorovich, mastorovichc@gmail.com, Regan Silvestri, rsilvestri@lorainccc.edu, Lorain County Community College, Dept. of Chemistry, 1005 N. Abbe Rd., Elyria OH 44035.

Gas chromatography-mass spectroscopy (GC-MS) can be readily utilized to generate an analytical profile of flavor compounds in whiskey such as esters. This method has been successfully applied to bourbon whiskeys produced by a novel accelerated aging process which employs pressure, as opposed to conventional time, to mature the spirit. Using this innovative technology of accelerated pressure aging, spirits have been matured not only with traditional oak but also with alternative woods. As such, new experimental and completely original flavors of whiskey including black cherry, apple, hickory, sugar maple and honey locust have been created where the spirits are naturally flavored with these woods. The distinct flavor compounds in each of these unprecedented wood flavored bourbons were identified and profiled using routine straight injection GC-MS. Black cherry bourbon contains more ethyl octanoate, a compound known to impart a sweet fruity flavor, than traditional oak flavored bourbon. Further, cherry bourbon contains less phenethyl alcohol, a compound known to impart a floral and bready flavor, than traditional oak bourbon. Bourbons flavored with apple, hickory, sugar maple and honey locust woods showed analogous results for various flavor compounds. Ultimately, analytical profiles of the flavors of these unprecedented whiskeys were generated, which aids in product development.

12:00 - UNPRECEDENTED WHISKEY FLAVORS PART 2: GC-MS ANALYSIS OF CHINESE BAIJIU SPIRIT FLAVORED AS AMERICAN WHISKEY. Daniel McKeighen, d.mckeighen1@gmail.com, Regan Silvestri, rsilvestri@lorainccc.edu, Lorain County Community College, Dept. of Chemistry, 1005 N. Abbe Rd., Elyria OH 44035.

Gas chromatography-mass spectroscopy (GC-MS) is routinely used to profile the flavor compounds in alcoholic beverages such as esters. This method has been applied to unique experimental samples of Chinese Baijiu liquor, flavored to taste more similar to American bourbon whiskey. Chinese Baijiu is a clear spirit, usually considered by the Western palate as strong-in-exotic-Eastern-flavors. In an effort to modify this liquor into something more familiar to the Western palate, experimental samples of Chinese Baijiu liquors, flavored to taste similar to American bourbon, were produced by aging the liquors with wood. This has been accomplished by subjecting Chinese Baijiu spirit to a novel accelerated aging process which employs pressure, as opposed to conventional time, to mature the spirit quickly and impart wooden barrel flavors. By processing the Baijiu using accelerated pressure aging, the clear spirit becomes colored and wood flavored within a few days. The distinct flavor compounds in these experimental liquors have been identified and profiled using routine straight injection GC-MS. The flavor of Chinese Baijiu aged with American oak is dominated by a series of unbranched ethyl ester compounds. Foremost, oak aged Baijiu flavor is characterized by an increase in ethyl hexanoate, which imparts a sweet and fruity nuance to the liquor. Ultimately, analytical profiles of the flavors of these unprecedented spirits were generated, which aids in product development.

Pre-college Poster Sessions
9:00 – 10:00 AM
and
1:30 – 3:00 PM
Lenhart Grand Ballroom - BTSU 202

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

Poster Board No. 001 - EXAMINING DIFFERENTIAL EXPRESSION OF *COL9A3* BETWEEN CAVE AND SURFACE MORPHOTYPES OF *ASTYANAX MEXICANUS* TO EXPLAIN PHENOTYPIC DIFFERENCES. **Michael A. Warden[1], mawarden2@gmail.com, 1410 Blackstone Place, Loveland OH 45140, Andrew T. Raczka[2], raczkaat@mail.uc.edu, Heidi M. Luc[2], luchm@mail.uc.edu, Christine R. Cao[3], ruichencao@gmail.com, Joshua B. Gross[2], joshua.gross@uc.edu, 2161 Grandin Rd., Cincinnati OH 45208, [1](Summit Country Day School), [2]University of Cincinnati, Department of Biological Sciences, Cincinnati OH, [3]Seven Hills School, Cincinnati OH.**

Astyanax mexicanus is a species of fish with an extant cave and surface morphotype. These two morphotypes exhibit drastic phenotypic differences such as pigment and cranio-facial bone structure. This model presents a unique opportunity to study gene expression variations in closely related organisms. *In Situ* Hybridization (ISH) was used to qualify gene expression for the gene *col9a3*, a Type IX collagen gene, and determine if differential expression exists between the two morphotypes at various stages of embryonic development. This gene is known to be a strong marker of the neural crest cells which derive into melanocytes or craniofacial cartilage and bone. These cells are largely responsible for the differences seen between morphotypes at later stages in development. Thus, differential expression of *col9a3* would reflect variance in the development of neural crest cells in the embryos. The *col9a3* probes revealed similar expression in the notochord in 24 hours post-fertilization (hpf) and 36 hpf cave and surface embryos. However, in the 36 hpf embryos, there was weaker expression in the notochord for surface embryos and an increased expression in the chondrocranium. At 3 days post-fertilization (dpf), cave and surface embryos showed similar expression in the chondrocranium. Because *col9a3* is a strong marker of the neural crest, the stronger expression in the chondrocranium in 36 hpf surface fish embryos indicates an earlier specification of the neural crest which may contribute to later phenotypic differences between the morphotypes. Further research is needed in older specimens to fully understand the gene's effect on later phenotypes.

Poster Board No. 002 - ASSESSING THE OCCURRENCE OF MICROPLASTIC UPTAKE BY LAKE ERIE PERCH AND WALLEYE AND UNIONID FRESHWATER MUSSELS. **Bryan J. Rego, brego19@us.edu, 9680 Creawood Forest, Waitehill OH 44094 (University School).**

Microplastics are defined as plastics under 5 mm in diameter, and can be divided into five groups: fragments, microfibers, beads, foams, and films. Microplastics have been documented to have harmful effects on aquatic organisms as they can emit toxins and cause blockage in the digestive tracts resulting in irritation and malnutrition. In an ongoing study, 3 different freshwater taxa (Yellow Perch, *Perca flavescens*, n=4; Walleye, *Sander vitreus*, n=4; and Unionid mussels—genus: Anodonta, n=8) were evaluated to assess the prevalence of microplastics accumulation in digestive tracts or surrounding tissue. Fish were collected from Lake Erie (Fairport Harbor) and mussels were purchased commercially and placed in a mesocosm. The mesocosm consisted of two 25 gallon tanks; one contained microplastics proportional to the composition of microplastics found in the tributaries of the Great Lakes and one did not. The digestive tracts of all species were removed and dissolved using 4N KOH and 30% H_2O_2. Contents were extracted using a Büchner funnel and dissected for microplastics under a dissection scope. The gill tissue was analyzed separately using the same method for the mussels. 100% of sampled Perch and 50% of Walleye contained microfibers in their digestive tracts. 12% of mussels sampled contained plastic fragments; found in the gill tissue. These data suggest that both fish and mussels are capable of ingesting or accumulating microplastics.

Poster Board No. 003 - THE EFFECTS OF MEDITATION AND PRAYER ON HEART RATE VARIABILITY AND EMOTIONAL INTELLIGENCE. **Sara G. Yacoub, saragyacoub@yahoo.com, 441 Timberlea Trail, Kettering OH 45429 (Archbishop Alter High School).**

What is the effect of meditation and prayer on heart rate variability and emotional intelligence? Sixty-one subjects, from ages 14 to 17, were asked to participate in either meditation, prayer, or no activity for 2 weeks. Before and after the 2-week experience, the subjects took the standardized Maetrix Emotional Intelligence Test (EIT) and had their heart rate variabilities (HRV) taken while watching an emotionally stimulating video. It was hypothesized that the students participating in meditation during the 2 weeks would show the greatest improvement, or greatest increase in EIT scores and HRV. Those who prayed during the 2 weeks improved the most overall, while those who meditated improved only in the subgroup of low EIT scorers. Those in the prayer group showed the greatest increase in EIT scores and HRV for the subgroup of low EIT scorers and medium EIT scorers, respectively. Additionally, those in the meditation group showed the greatest increase in both EIT scores and HRV for the subgroup of low EIT scorers. Other research supports the conclusion that meditation plays a strong role in cardiovascular health for certain groups of people, while no research has compared the effects of meditation with those of prayer, finding that there is an increase in autonomic regulation and HRV during mindfulness meditation. This study supports the conclusion that there is a connection between meditation and autonomic activity. In a clinical setting, for patients with cardiac diseases or heart-related issues, meditation or prayer could be a beneficial activity in improving cardiovascular health.

Poster Board No. 004 - SOCIAL HIERARCHY IN HIGH SCHOOL. **Faith C. Myers, myersfc10@gmail.com, 4251 N. County Line Rd., Sunbury OH 43074 (Big Walnut High School).**

The purpose of this observational-survey study was to determine if high school students recognize social hierarchy, participation in it, and difficulties of outsider acceptance. This study also determined if participation in the social hierarchy decreases with increasing severity of actions. Research led to the hypotheses: a majority of high school students will recognize social hierarchy, but not participation in it or difficulties of outsider acceptance; as severity of actions increases, willingness to participate in the social hierarchy will decrease. A survey for high school students was developed and implemented: 78% recognize social groups/cliques *exist*,however only 28% *acknowledge being in* multiple cliques and 71% responded it would be *easy* to bring an outside friend. For 6 survey questions with increasing severity of actions (S1 to S6) responses did not fit a uniform pattern. A majority of students (62%) were willing to participate in activities they *do not like* to belong (S1). Only 18% of students were willing to *change into "cooler" clothes* (S2) while 48 to 54% were willing to *"talk behind someone's back" or be a bystander to it* (S3), 9% would *no longer be friends* with someone outside of the clique (S4), and 8% would *allow grades to drop* (S5) while a higher percentage (18%) would *drink alcohol* (S6). Study

data supported the first hypothesis that high school students recognize cliques exist, but not participation in them nor the difficulties of outsider acceptance. The second hypothesis was not supported as with increasing severity of actions, participation did not uniformly decrease.

Poster Board No. 005 - EFFECT OF COLOR ON HEART RATE VARIABILITY. Simon G. Yacoub, yacoubsi@alterhs.org, 441 Timberlea Trail, Kettering OH 45429 (Archbishop Alter High School).

Visual cues, like other sensations, can influence physiological functions. The effect of colors on heart rate variability was studied. It was hypothesized that if a subject's heart rate is monitored while looking at a color, then the heart rate will vary depending on the color; more specifically, the color red will increase heart rate variability more than green, yellow, and blue. This hypothesis was supported by previous research done which showed that there were different reactions with an array of different colors, most importantly, a growth of awareness when subjects were exposed to red. In this experiment, 30 subjects were asked to gaze at boards with different colors, for 3 minutes at each board. The subjects' heart rates were monitored, and heart rate variability compared to baseline is recorded while each subject looked at the 4 different boards with the colors red, green, yellow, and blue respectively. Red and yellow increased the heart rate the most. Green also increased the heart rate but less than red and yellow. Blue increased the heart rate the least. The difference in each color's effect on a subject's heart rate shows that each color has a different effect on physiological response and could potentially affect emotional disposition or decision making. In conclusion, colors do affect an individual's heart rate and could lead to the strategic use of colors to persuade an emotion or idea.

Poster Board No. 006 - "SMART" INSULINS. Ajeet Kalepu, akalepu19@us.edu, 429 Medway Road, Highland Heights OH 44143 (University School), Dr. Faramarz Ismail Beigi, faramarz.ismail-beigi@case.edu, Case Western Reserve University, Dept. of Biochemistry, Cleveland OH.

Type 1 diabetes is diagnosed when there is little or no insulin produced by the beta cells in the pancreas; in type 2 diabetes tissue resistance against insulin is an important underlying problem. Using synthetic insulins to treat type 1 diabetes can be problematic, as the synthetic insulin is capable of surpassing the normal blood glucose concentration threshold of 90 to 110 mg/dL. The goal is to create "smart" insulins, a type of insulin that is active at high blood glucose levels and not active at low blood glucose levels. It is expected that the "smart" insulin, due to its active-inactive properties, will be safer. The experiment was done once by giving 16 rats Streptozotocin to induce diabetes and 8 were injected intravenously with the 2 tested insulins. Insulin KP was used as the control and B30 DOPA KP was the first tested prototype. Insulin KP is a fast-acting insulin that is commonly used to treat diabetic patients. The fraction of the initial blood glucose level for the first hour of the experiment was 0.378 for insulin KP and 0.355 for B30 DOPA KP. These data suggest that B30 DOPA KP was active at high blood glucose levels. Further tests need to be done to determine if it is not active at low blood glucose levels. A "smart" insulin will help type 1 diabetic patients by providing a synthetic insulin that will remain active at high glucose levels, but prevent hypoglycemia by not being active at low blood glucose levels.

Poster Board No. 007 - STUDY OF THE NUCLEOLUS IN YEAST CELLS (*S. CEREVISIAE*). Daria Gitiforooz, dgitiforooz19@hb.edu, 8615 Park Ridge Ln., Macedonia OH 44056 (Hathaway Brown School), Alan Tartakoff, amt10@case.edu, Case Western Reserve University, Cleveland OH.

Although basic information about the nucleolus in yeast (*S. cerevisiae*) is known, there still remain questions about this organelle's structure and function. Discovering more about the arrangement of the nucleolus could also lead to learning more about ribosomes and proteins found in the nucleolus. When studying the nucleolus and proteins that congregate at different locations in the structure, it was suspected that the nucleolus holds sub-compartments that each contain factors that aid in either the assembly of large ribosomal subunits or small ribosomal subunits. Therefore, when components for the assembly of large and small ribosomal subunits are stained with different fluorescents, the factors from different subunits should localize in distinct regions and the factors involved in the assembly of the same subunit should congregate together, indicating the presence of nucleolar sub-compartments. There were two separations formed when this staining was performed. Nucleolar factors involved in the assembly of large ribosomal subunits gathered in an arc-like field along the nucleolar envelope; this field was called the "edge." Nucleolar factors involved in the assembly of small ribosomal subunits gathered in an overlying field that follows the shape of the nucleolar crescent; this field was called the "cloud." These results showed that there are two sub-compartments in the nucleolus, each sub-compartment responsible for assembling a specific ribosomal subunit. It is anticipated that this information regarding the structure of the nucleolus in yeast can also be translated to the nucleolus in animal cells, resulting in a better understanding of the organelle.

Poster Board No. 008 - BIODEGRADABLE ARTIFICIAL BLOOD VESSEL: A NOVEL METHOD OF TISSUE ENGINEERING. Claudia M. Hamilton, 19hamcla@hawken.edu, 516 Misty Lane, Copley OH 44321 (Hawken School).

Transplanting blood vessels frequently fails because the recipient rejects the donor arteries due to their genetic properties. In addition, many available synthetic products on the market have shortcomings. The main aim of this research is the study of polymer blend solution process and the influence of different combinations of Poly(lactic acid) (PLA) and Polycaprolactone (PCL) combined with N_2-plasma treatment to create a biodegradable scaffold of an artificial blood vessel capable of all functions of an artery. The N_2-plasma-enhanced chemical vapor deposition method created chemical bonds because of the presence of gases like oxygen, nitrogen, and inert gases close to the surface of the film. The results indicated that the best blend ratio of PCL/PLA was 25/75 with thickness of 230 nm, which resulted in a scaffold with strength of 31.14 mPa and 62.36% elasticity compared to 20.00 mPa and 30.00% elasticity for majority of the vessels available on the market today. The N_2-plasma treatment was used to reduce crosslinking degrees, decrease cracking, minimize imperfections in the polymer films and increase the anti-clot characteristics of the scaffold. The polymer gels were imaged under Rat aortic smooth muscle cells and were seeded on the gels at a count of 50,000 cells per 10 cm^2 of gel in a CO_2 incubator at 37 °C. In addition, to promote cell adhesion, RGD Peptide was used. The positive results of this research will likely impact the future design of artificial cardiovascular products.

Poster Board No. 009 - 3D PRINTED POLYMER SCAFFOLDS FOR BONE TISSUE ENGINEERING. Nipun U. Jayatissa[1], 19njay@mvcds.org, 6053 Sunny Lake Ct., Sylvania OH 43560, Janitha Unagolla[2], Sarit Bhaduri[3], [1](Maumee Valley Country Day School), [2] University of Toledo, Department of Bioengineering, Toledo OH, [3] University of Toledo, Departments of Mechanical Engineering and Surgery, Toledo OH.

The regeneration of bone defects caused by trauma, fracture, and disease is a significant clinical challenge for patients world-wide. Annually, the cost for bone fracture repair exceeds $19 billion. Annual fractures and costs are projected to increase by 50% by 2025. The ideal scaffolds for bone repair should provide biocompatibility, pore ar-

chitecture, biodegradability, mechanical support, and cell attachment sites. Conventionally fabricated polymer scaffolds are still unable to make ideal scaffolds for bone repair. In this study, new 3D printing technology was used to print porous scaffolds using poly (ethylene glycol) methacrylate (PEGMA) and nano-hyrdroxyappiate (nHA) as main components. The hypothesis of this study was that 3D printed porous scaffolds will mimic porosity, pore morphology, mechanical properties, biocompatibility and cell attachment similar to human bone. Two different types of scaffolds with pore sizes 800 µm and 1000 µm were computer-designed. Scaffolds were printed and cured using visible light energy in a 3D printer. These scaffolds were characterized for pore architecture and morphology using a scanning electron microscope (SEM), and evaluated for cell viability and cell proliferation with murine osteoblasts. The pH of the scaffolds immersed in phosphate buffered saline (PBS, pH=7.4) was measured over 2 months. The scaffolds show biocompatibility and cell proliferation as determined by *in vitro* Live/Dead cell assay. The scaffolds did not degrade over 2 months and did not have a huge pH drop. Potentially 3D printed porous scaffolds can be used for bone tissue regeneration applications.

Poster Board No. 010 - THE EFFECTS OF MICROWAVE OVEN RADIATION LEAKAGE ON YEAST CELL GROWTH. Phillip Kogan, Phillip.kogan@gmail.com, 1975 Madison Rd., Cincinnati OH 45208 (Walnut Hills High School).

Microwaves surround people in the modern world. The objective of this experiment was to determine the effects of electromagnetic radiation leaking from a conventional microwave oven (2.45 GHz) on live cells. A custom setup was built to expose *Saccharomyces cerevisiae* (yeast) cells to radiation leaking from a 1000-watt microwave oven at 3 locations outside the oven, and 2 remote control locations. The cells were cultured in sugar-water (135 mg/mL) in 24-well plates (5 plates/3 to 4 sampling wells per plate) at room temperature. During the experiment, 3 plates were placed at locations outside of the oven where radiation is likely to leak (in front of the door, on top and next to the power cord, which can serve as a waveguide) and exposed to microwave radiation when the oven was turned on (1 hr/day, 5 days, repeated twice). Two other plates served as controls (same room and adjacent room). The average concentration of the cells was measured using a microscope, trypan blue dye (to identify dead cells) and hemocytometer. There was a significantly lower cell concentration in the power-cord plate ($p<0.05$), while no difference was observed between two other exposed plates and control plates. More dead cells were observed in the plates near the oven, particularly near the cord. There was no effect of temperature variation on the measured cell concentration. The results support the hypothesis that radiation leakage from a microwave oven can negatively affect living cells, suggesting potential need for additional safety regulations.

Poster Board No. 011 - PREDICTING BINDING AFFINITY BETWEEN CYCLODEXTRINS AND PHARMACEUTICAL MOLECULES WITH QSPRS. Alison W. Xin[1], axin19@hb.edu, 39620 Patterson Ln., Solon OH 44139, Dr. Edgardo Rivera-Delgado[2], edgardo.rivera@case.edu, Dr. Horst A. von Recum[2], hav1@case.edu, [1](Hathaway Brown School), [2] Case Western Reserve University, Department of Biomedical Engineering, Cleveland OH.

Affinity-mediated drug release utilizes electrostatic, hydrophobic, and other non-covalent interactions between pharmaceuticals and a delivery system, extending drug release and increasing stability. Cyclodextrin polymers, chains of glucose rings, exhibit affinity interaction; however, experimentally testing the affinity between cyclodextrin and drugs is time-consuming, making computational predictions with Quantitative Structure-Property Relationship Models (QSPRs) an attractive alternative. Previously published literature suggests QSPRs with cyclodextrin can achieve high predictive capacity, but these models are not publicly available. To build an openly accessible model, the experimental affinities of approximately 1585 complexes were imported from published research. Filtering molecules for biological conditions (pH of 7, solvent of water, etc.) resulted in 615 observations. Of these, only 589 3D molecular structure files could be obtained from the National Cancer Institute Chemical Identifier Resolver. The software PaDEL-Descriptor calculated over 1000 quantitative chemical descriptors for each molecule, which were then analyzed with R to create several QSPRs with different statistical methods. When trained on a variety of molecules (including pharmaceuticals and non-pharmaceuticals), QSPRs produced an R^2 of 0.61 to 0.71 on test sets (1 indicates perfect fit, 0.6 indicates acceptable predictability according to QSPR best practices). When trained and tested on data curated for pharmaceuticals, R^2 reached as high as 0.86. On external validation sets containing molecules completely new to the model, the QSPRs yielded an average R^2 of 0.4, with SVMs achieving as high as 0.84. These results indicate that open-source QSPRs can achieve high predictive capacity, allowing for freely accessible and efficient analysis of cyclodextrin affinity interactions.

Poster Board No. 012 - EFFECT OF PRENATAL ALCOHOL EXPOSURE ON NERVES AND BLOOD VESSELS IN THE DEVELOPING HEART. Angela H. Zhu*[1], azhu19@hb.edu, 23506 Quail Hollow Dr., Westlake OH 44145, Nikhita Kumar*[1], nkumar19@hb.edu, Yehe Liu[2], yxl448@case.edu, Michael W. Jenkins[2], michael.jenkins@case.edu, Michiko Watanabe[2], mxw13@case.edu, [1](Hathaway Brown School), [2]Case Western Reserve University, Department of Pediatrics, Cleveland OH, * have equally participated.

Fetal Alcohol Syndrome (FAS) is a persisting worldwide problem that occurs when a pregnant woman consumes alcohol and causes abnormalities in the fetus, which may result from abnormalities in neural crest cell biology. The hypothesis tested is if alcohol causes abnormalities in neural crest cells, then its derivatives—the smooth muscle cells around coronaries and the autonomic cardiac nervous system—would be abnormal as well. Quail eggs were injected with alcohol to mimic a session of binge drinking early in pregnancy. One set of control eggs was injected with saline to see whether the injection itself causes abnormalities, while another set remained not injected. The eggs were incubated until embryos formed with four chambered hearts with coronaries and autonomic innervation. To visualize the cardiac innervation and endothelial cell development, which grow into coronaries, surviving hearts were permeabilized with detergent and were immunostained with fluorescent antibodies. Neuron-specific tubulin (TUJ1) marked the innervation, and quail endothelial antibody (QH1) labeled the developing coronaries. A novel technique, Scatter labeled imaging of microvasculature in excised tissue (SLIME) also helped detect coronaries by injecting a titanium-containing colloid solution into the aorta. Vessels were visualized with optical coherence tomography during the filling of the coronaries. Analysis of the abnormalities of the innervation was done by tracing each separate nerve. FIJI Image J, an image processing program, was used to quantify the thickness and branching of the nerves to find abnormalities. Qualitatively, the nerves and coronaries developed atypical branching. This suggests that early ethanol exposure causes abnormalities in the heart.

Poster Board No. 013 - THE EFFECTS OF WIND VELOCITY ON THE ROOTS OF TOMATO PLANTS. Bryce D. Hoehner, bdhoehner@yahoo.com, 1348 Kensington Boulevard, Bowling Green OH 43402 (Bowling Green High School).

Wind velocity has an impact on plants during most phases of growth and development. Although there is limited research to show how wind affects the roots of plants,

there is research to support that tree roots are directly proportionate to the wind speeds they are exposed to. Therefore, it was hypothesized that if wind velocity affects root growth, higher winds would result in heavier root mass for *Solanum lycopersicum* (tomato plants). Six weeks after the seeds were planted, 3 sets of 6 *S. lycopersicum* were exposed to wind speeds of 3, 7, or 11 miles per hour using 3 box fans (120 VAC, 60 HZ, 68 AMPS) for 15-minute intervals 2 times per day for 4 weeks. Six additional plants received no wind. This was replicated 2 additional times. Final data were collected after 4 weeks of wind brushing. As *S. lycopersicum* were uprooted, visual observations showed that plants exposed to the highest wind speed had roots with a denser, wider base. Before each plant was weighed, the soil was removed from the roots. Then the roots were detached and weighed. The final root mass averages increased as wind speeds intensified (2.70 grams for no wind; 3.07 grams for 3 mile per hour winds; 3.97 grams for 7 mile per hour winds; and 4.83 grams for 11 mile per hour winds), showing a correlation between the two. Consistent data suggested that higher winds result in heavier root masses for *S. lycopersicum*, providing valuable insight for tomato growers on the possible advantages of exposing tomato plants to wind. Further research is needed to find if higher wind velocities ultimately effect maximum fruit harvest.

Poster Board No. 014 - DROPLET VITRIFICATION — A FAVORABLE METHOD OF CRYOPRESERRVATION FOR SELECTED PAWPAW SPECIES. Caroline F. Karbowski[1,2], carolineshouse@fuse.net, 8772 Arcturus Dr., Cincinnati OH 45249, Valerie C. Pence[2], valerie.pence@cincinnatizoo.org, 2161 Grandin Road, Cincinnati OH 45208, [1](The Summit Country Day School), [2] Cincinnati Zoo & Botanical Garden, Center for Conservation and Research of Endangered Wildlife (CREW).

Genetic diversity is crucial to the survival of species. To preserve plants threatened by natural and human causes, seed banks have been established; however, not all plants produce seeds or have seeds that bank successfully. Therefore, *ex situ* conservation and cryopreservation are unique protocols to produce reserves for these "exceptional species" in the wild. Pawpaws are one of these exceptional species that cannot be preserved through traditional methods. The purpose of this experiment was to determine if a newer cryopreservation protocol, droplet vitrification (DV), is a better method of preservation for *Deeringothamnus rugelii*, *Deeringothamnus pulchellus*, and *Asimina tetramera*, compared to encapsulation vitrification (EV). Shoot tips and nodes (n=10) were dissected and cryopreserved for one hour using the droplet vitrification method, followed by a recovery on gel plates for 6 weeks, and a transfer to culture tubes that was monitored for an additional 12 weeks. Survival of these species post DV was favorable since 62% of *Asimina tetramera* shoot tips were alive at 18 weeks, followed by *Deeringothamnus rugelii* at 40%, and *Deeringothamnus pulchellus* at 9.0%. Surprisingly, the *Deeringothamnus rugelii* nodes had the highest survival, 70% survival. Even though further testing is required, DV may be an alternative method to effectively conserve these essential species.

Poster Board No. 015 - NATURAL OR SYNTHETIC ANTACIDS: EFFECTIVENESS AT ELEVATING THE PH OF STOMACH ACID IN THE SHORTEST AMOUNT OF TIME. Grace E. Bradley, bradleyg@alterhs.org, 940 East David Road, Kettering OH 45429 (Archbishop Alter High School).

Do natural or synthetic antacids raise the pH of stomach acid more efficiently? This topic was chosen due to the commonly disputed question whether one should treat heartburn with natural or synthetic antacids and to assist the millions of people who suffer from heartburn-related issues. It was hypothesized the synthetic antacids would raise the pH of stomach acid more efficiently because they all contain calcium carbonate, a known chemical component for raising the pH of gastric acid. To test this hypothesis, a synthetic gastric acid solution was prepared, and the pH was measured at 0, 2, 10, 20, and 30 minutes after an antacid was added and churned. The mean percent increases in the pH of the"gastric acid" before and after the addition of the antacids, after 30 minutes, were 223% for Tums®, 122% for Pepto-Bismol®, 43% for Rolaids®, 88% for chamomile, 58% for ginger, and 92% for turmeric. According to the above information, the most efficient antacid was the Tums®. The data collected shows that synthetic antacids, especially Tums®, raised the pH of stomach acid more efficiently than natural antacids for heartburn treatment.

Poster Board No. 016 - THE EFFECTS OF BIOFUELS ON A KEROSENE OIL LANTERN. Lillian K. Jones, joneslillian2021@gmail.com, 2944 Fairfield Ave., Cincinnati OH 45206 (Walnut Hills High School).

The goal of this experiment was to determine which plant-based biofuel performed most efficiently in a kerosene powered oil lantern to find an alternative to fossil fuels. It was hypothesized that the canola oil biofuel would perform the most efficiently because it has the highest energy content of all the oils and this has been previously determined by other scientist. Four different oils were prepared by adding lye and methanol to either canola, vegetable, waste vegetable, or olive. Kerosene was used as a control. Then the biofuels and kerosene were put separately into a kerosene oil lantern and burned for 2 hours. A portable combustion analyzer was used to test the carbon monoxide levels and the temperatures to show the overall efficiency of each fuel and the kerosene. Out of all the fuels, the olive oil biofuel was the most efficient in terms of both its high temperature and its low carbon monoxide levels. The least efficient biofuel was the vegetable oil, but the kerosene performed the worst with an average CO level of 61.33 ppm, double the safe limit of carbon monoxide. The waste vegetable oil performed well but it was neither the best nor the worst. Waste vegetable oil is free to obtain, and it is fairly cheap to make biofuels, making it a good alternative to fossil fuel both in efficiency and safety for the general populous.

Poster Board No. 017 - EFFECTIVENESS OF COMMON SURFACE CLEANING PRODUCTS TO REMOVE PEANUT RESIDUE. Kayla E. Reidy, kaylaer109@gmail.com, 3546 Hader Ave., Cincinnati OH 45211 (Walnut Hills High School).

The purpose of this project was to determine what cleaning product would most effectively remove peanut residue, and to determine if different surface materials have an effect on retaining peanut residue. This was a relevant topic because there are many people with peanut allergies. This project is beneficial for schools, restaurants, day care centers, and homes that have children with peanut allergies to know what product to use when cleaning an area that has peanut oil or residue, to prevent allergic reactions. Seven different cleaning products were used: Clorox Wipes®, Baby Wipes®, Clorox Spray®, water, a dry paper towel, dish soap, and a vinegar and water mix. The hypothesis was that Clorox Wipes® would leave behind the least amount of peanut residue because that product is designed specifically to clean surfaces, and that Formica® would be the most effective surface among textured hardwood, smooth hardwood, vinyl, and Formica® because it was believed to be the smoothest of the 4 surfaces. To test this, the Hygiena company provided 50 ProClean™ swabs and test kits to measure (in micrograms) peanut residue remaining after cleaning a teaspoon of peanut butter off the test surfaces with the cleaning product. One trial for each cleaning product was used on each surface. There were fewer than 20 micrograms of peanut residue remaining on the surfaces when Clorox Wipes® were used. Other products left more than this amount.

Clorox Wipes® were the most effective cleaning product. Moreover, there was also no peanut residue remaining on any of the smooth hardwood surfaces.

Poster Board No. 018 - THE EFFECTS OF VOLTAGE LEVEL AND SALT CONCENTRATION ON HYDROGEN GAS PRODUCTION IN THE PROCESS OF ELECTROLYSIS. Andrew W. Ying, andrewy2020@gmail.com, 3030 Glenfarm Ct., Cincinnati OH 45236 (Walnut Hills High School).

The purpose of this study was to determine the effects of voltage and salt on hydrogen gas production in electrolysis. Electrolysis is a chemical process occurring at two electrodes, submerged in an electrolyte solution, through the passage of an electric current. The hypothesis was that increasing the voltage or salt concentration would reduce the time for electrolysis to produce 3.5 mL of hydrogen gas. An apparatus was set up for the experiment consisting of a beaker filled with a saline solution, 2 wires submerged in the water with test tubes over one of their ends, and crocodile clips connecting the other end to the terminals of a battery holder. Hydrogen gas bubbles produced at the submerged wire end were contained by the test tube for measurement. For the tests on the effect of the voltage on electrolysis, the number of batteries was changed from 1 battery with 1.5 V to 4 batteries with 6 V total. The concentration of salt was kept constant at 3.8%. For each voltage, 1.5, 3, 4.5, and 6 V, the average times for 3 trials were 109.19, 18.61, 10.76, and 8.97 minutes respectively. For the tests on the effect of salt, the salt concentration was changed while the voltage, 6 V, was kept constant. For the concentrations of salt, 2%, 3.8%, 5.7%, and 7.4%, the average times for 3 trials were 11.92, 8.97, 6.44, and 5.23 minutes respectively. The data show that increasing the voltage or salt concentration decreased the time for collecting 3.5 mL of hydrogen gas during electrolysis.

Poster Board No. 019 - SODIUM ION BATTERIES AS LOW-COST ALTERNATIVE FOR RECHARGEABLE LITHIUM-ION BATTERIES. Pravin S. Jayatissa[1], pravinj2003@gmail.com, 6053 Sunny Lake Ct., Sylvania OH 43560, Reza Rizvi[2], reza.rizvi@utoledo.edu, [1](Sylvania Northview High School), [2]The University of Toledo, Mechanical, Industrial and Manufacturing Engineering Department, Toledo OH 43606.

Batteries are an effective way to store and release energy. As the market demand increases, so do the basic raw materials for battery manufacturing. The need for lithium has subsequently increased with the popularity of Lithium-ion batteries. Because lithium is hard to find, we investigate the use of an alternative raw material to make batteries. Sodium, more abundant than lithium, can be a good substitute. In metal ion based rechargeable batteries, cathode and anode materials are the most important components. We hypothesized that the use of stable sodium ion compound may enhance the durability and performance of sodium ion batteries. To test this hypothesis, we use 2 sodium containing metallic compounds that have identical basic elements, but different material stability and natural occurrence. In this investigation, an attempt was made to fabricate a cathode material using novel sodium containing chemical, which can store more sodium ion than other cathode materials. The battery assembly was carried out using polymer-based electrolyte and a carbon anode. We have conducted research in the direction of material fabrication, material testing, and electrochemical characterization of coin cell battery structure using a swage lock split batter battery arrangement. It was found that this battery performed to the level of a typical sodium ion battery, which has an energy density near 280 mAh/kg. These results indicate that the sodium ion battery capacity can be increased by appropriate selection of cathode material based on sodium derivatives as the cathode material.

Poster Board No. 020 - VIBRATION ENHANCED FLAME SPREAD. Satya Nayagam[1], sat4yan@gmail.com, 20164 Wynnewood Pl., Strongsville OH 44149, Brian Sun[2], 18sunbri@hawken.edu, Suraj Srinivasan[3], surajsrinivasan00@gmail.com, Evan Rose[4], enr19@case.edu, Vedha Nayagam[4], vxn6@case.edu, [1](Strongsville High School), [2](Hawken School), [3](Strongsville High School), [4]Case Western Reserve University, Cleveland OH.

The rate at which flames spread can have significant implications for fire safety both on earth and in microgravity space environments. In this study, the effect of longitudinal vibration on opposed-flow flame spread over thin solid fuels was investigated. It is hypothesized that the longitudinal vibration of the fuel alters the boundary layer characteristics adjacent to the fuel surface, and accelerates the flame spread process. Strips of ashless filter paper were vibrated vertically and ignited in air. An electrodynamic shaker was used to vibrate the fuel at frequencies (ω) ranging from 0 to 45 Hz and corresponding g levels between 3 and 25 g/g0, where g0 is normal gravity. Video of the experiment was analyzed to determine the flame spread rate. Tests in normal gravity resulted in a 0.2 cm/s spread rate in the absence of vibrations. However, the addition of 30 Hz vibrations at 12 g/g0 increases the flame spread rate to 0.4 cm/s. In general, an increase in acceleration and a decrease in frequency of vibration resulted in increased flame spread rates. A simple scaling shows that spread rate varies linearly with g/ω32. Microgravity tests are planned aboard Blue Origin's New Shepard rocket to determine whether this finding extends to space environments. We expect to observe a similar enhancement of flame spread in microgravity when the fuel is vibrated. The results from this investigation show that vibrating equipment fires could pose advanced safety risks, as the flames would spread more rapidly than anticipated.

Poster Board No. 021 - AN ANALYSIS OF AIR POLLUTION DISTRIBUTION PATTERN AND THE CAUSES OF OZONE EXCEEDANCES IN GREATER CINCINNATI. Shangqing Cao[1], zyfxdtn@gmail.com, 6925 Lynnfield Ct., Apt. 112, Cincinnati OH 45243, Mingming Lu[2], lumg@ucmail.uc.edu, Anna Kelley[3], anna.kelley@hamilton-co.org, [1](The Summit Country Day School), [2]University of Cincinnati, College of Engineering and Applied Science, Cincinnati OH, [3]South West Ohio Air Quality Agency, Cincinnati OH.

Cincinnati is one of the major metropolitan areas in the US that faces the most severe air pollution because of its geography as a river valley and its large number of industrial plants in the region. The Southwest Ohio Air Quality Agency (SWOAQA) currently has 15 continuous monitoring stations in 5 counties under its purview. It monitors the pollution level and publishes daily forecasts for several key pollutants, including $PM_{2.5}$ (particulate matter less than 2.5 μm), ozone, carbon monoxide, and nitrogen dioxide. Using the data from the agency, the difference in air pollution levels between an urban station and a nearby highway station was investigated, and the accuracy of several meteorological parameters for the ozone forecasting process was analyzed. In this current work, we compared carbon monoxide, nitrogen dioxide, and $PM_{2.5}$ data from both pollution monitoring stations with the respect to the concurrent weather condition to identify the factors that contribute to the formation of the pollutant peaks. For the ozone analysis, the meteorological data from ozone exceedance days was analyzed to determine the importance of each parameter. The analysis of the pollution data demonstrates that carbon monoxide concentration has a strong correlation with the location whereas nitrogen dioxide and $PM_{2.5}$ has a relatively weak affiliation. However, based on graphical analysis, all three pollutants rise on low-pressure, cloudy, and rainy days, especially at the near-by highway site. Of the 7 meteorological parameters considered in the ozone forecast (max/min temperature, max/min solar radiation, wind

direction, wind speed, and dew point), a strong statistical correlation is demonstrated between wind direction, wind speed, maximum temperature, and minimum solar radiation. Future studies will continue to analyze the meteorology that contributes to the formation of peak pollutant periods using a larger pool of data. As a result of this study, the SWOAQA might lower the importance of dew point in the forecasting process for ozone since this analysis demonstrated that dew point is poorly correlated to ozone exceedances.

Poster Board No. 022 - CAN THE USE OF NATIVE PRAIRIE GRASSES ALONG WITH COW MANURE COMPOST DECREASE SOIL EROSION AND MAINTAIN CARBON SEQUESTRATION? Alexandra H. Cox, coxal46@alliancecityschools.org, 300 West Bayton St., Alliance OH 44601 (Alliance High School).

Soil erosion is a global concern. Keeping carbon sequestered in the soil keeps excess carbon from air and water. Applying cow manure compost and planting native grasses can sequester carbon and slow wind erosion. Four (27 cm × 54 cm) trays were used to hold soil. One was the control. One had soil with cow manure compost. One had native prairie grasses, and one had native prairie grasses with cow manure compost. The trays were placed individually inside a garbage bag with a ductwork connector and nylon attached at the end. A hair dryer was placed at the other end and blew across each tray for 5 minutes. Ten trials were completed for each tray. Sediment from each tray and trial was collected and placed in a labeled bag. Mass and volume were determined. The average sediment lost for the control tray had a mass of 16 g and volume of 15.2 mL. The cow manure compost tray had an average loss of 13.6 g and volume of 18.9 mL. The native prairie grass tray lost an average mass of 9 g and volume of 10.5 mL. The combination of native prairie grasses and cow manure compost lost an average mass of 6.5 g and volume of 9.6 mL. The carbon for each tray was calculated before and after the experiment. The native prairie grass and cow manure compost tray showed the least carbon lost. The results confirmed the hypothesis.

Poster Board No. 023 - ENHANCEMENT OF CRUDE OIL PHYTOREMEDIATION USING BIODIESEL: A COMPARATIVE ASSESSMENT OF METABOLITES. Kavin Srikanth, kavin4804@gmail.com, 4804 Sapwood Dr., New Albany OH 43054 (New Albany High School).

Phytoremediation is a process to remove pollutant concentrations in contaminated soils, water, and air using plants that are able to contain or eliminate contaminants. The approach of using genetically engineered plants is a promising alternative for low cost conventional environmentally friendly soil cleanup. Wild type (WT) and variants (VT) of *Arabidopsis thaliana* (AT) were grown in crude oil (CO) and/or biodiesel (BD) treated (by mass)/ and untreated soil (0% to 8%). Plant shoot (leaves and stem) were the samples of control, CO and BD treated groups were harvested after 4 weeks and processed using different solvent extraction methods and analyzed by gas chromatography and mass spectrometry (GC-MS), using polar and non-polar columns. The mass retention time of different components and comparison with the database of known standard compound identities, was performed. GC-MS spectral signatures of the plants grown in CO and BD mixed soil were comparatively different (there were more metabolized compounds of crude oil in these plants such as styrene (retention time 7.3 minutes) and diphenylcyclopropyl-sulfanyl (retention time 20.8 minutes)), as expected. Various crude oil components and plant antioxidant derived metabolites were observed in the shoot, which indicates phyto-remediating capacity and plant defense mechanism. Oxidative derivatives were observed in the WT plant extracts, further confirming the pro-oxidative mechanism and phyto-remediating capacity, which reiterates the potential use of AT in restoration of CO contaminated soil. Lignin mutant VT was not a viable candidate. In addition, BD augmented the uptake of CO components. Future focus would be a strategic matrix development in a profitable phytoremediation process and biofuel production.

Poster Board No. 025 - GLOBAL WARMING AND DISSOLVED OXYGEN: MEASURING THE RELATIONSHIP BETWEEN TEMPERATURE AND THE AMOUNT OF DISSOLVED OXYGEN IN SALTWATER AND FRESHWATER. Oviya Srikanth, oviyasmomndad@gmail.com, 4804 Sapwood Dr., New Albany OH 43054 (New Albany Middle School).

Dissolved oxygen (O_2) denotes the amount of O_2 dissolved in water. Aquatic organisms become stressed when the dissolved O_2 levels fall below about 5 mg/L, and generally do not survive below 1 to 2 mg/L. Based on models, a reduction in the amount of dissolved O_2 in the oceans is already evident in some parts of the world; this will affect large regions of the oceans between 2030 and 2040, if greenhouse gas emissions are unchecked. Oxygen is in constant motion and its concentration in water is equal to the amount of O_2 molecules leaving and entering the water, which is partially dependent upon water temperature. This study was conducted to determine the relationship between water temperature and dissolved O_2 concentration in the water. Freshwater (tap) and saltwater (35 g/L NaCl added to tap water) (~300 mL of both) were collected and subjected to temperatures of 10, 25, 27, 30, 35, and 50 °C. Dissolved O_2 was measured using a Hach® dissolved oxygen test kit. Results showed that the warmer the water, the less dissolved O_2 was present. This was observed in both fresh and saltwater. An increase in global warming would lead to less dissolved O_2 in aquatic ecosystems, thus reduced food production from ocean and freshwater bodies.

Poster Board No. 026 - GENE EXPRESSION LEVELS OF ZFP407 AND ZBTB9 IN RELATION TO GLUT4 DURING FASTING AND REFERRING IN C57BL/6J MALE MICE. Simran P. Patwa[1], spatwa19@hb.edu, 6875 Arias Way, Painesville OH 44077, Alyssa L. Charrier[2], alc153@case.edu, Li X. Wang[2], lxw253@case.edu, Dr. David Buchner[2], david.buchner@case.edu, [1](Hathaway Brown School), [2]Case Western Reserve University, Cleveland OH.

Type 2 diabetes affects over 300 million people worldwide. Initially, insulin resistance leads to decreased glucose uptake by peripheral metabolic organs. This decreased uptake of glucose is in part due to the impaired function of Glucose transporter (Glut)-4, which is an insulin-dependent glucose transporter that primarily functions in muscle and fat cells. Previous studies demonstrated that Glut4 expression is regulated by food intake, but that this effect is blunted by obesity. We previously demonstrated that zinc finger protein 407 (Zfp407) controls Glut4 expression together with its interacting protein Zinc finger BTB domain containing 9 (Zbtb9). Therefore, we hypothesized that expression of Zfp407 and Zbtb9 during fasting and refeeding would correlate with that of Glut4. To test this, and better understand the physiological roles of these proteins, we studied two mouse models of obesity: 1) C57BL/6J male mice fed a control diet or high-fat diet or 2) wild type (WT) or mice with a genetic mutation in the leptin gene that induces obesity. Mice were subjected to fasting overnight for 16 hours and then a subset were refed. Adipose tissue was collected at both time points for quantitative polymerase chain reaction analyses to determine gene expression levels. As expected, Glut4 expression patterns in both mouse models were as previously demonstrated, however, we saw no correlation between either Zfp407 or Zbtb9 gene expression and Glut4. This suggests that while these proteins interact and regulate Glut4 expression, regulation of Glut4 during refeeding is not controlled by changes in Zfp407 or Zbtb9 levels.

Poster Board No. 27 - FEEDING THE WORLD: SALT WATER FARMING. Gabrielle E. Burns, grburns@fuse.net, 2933 Fairfield Ave., Cincinnati OH 45206 (Walnut Hills High School).

Rising sea levels are causing the loss of productive arable land worldwide due to contamination of groundwater and aquifers with saltwater. This project's purpose was to determine in what concentrations of water salinity it is still possible to grow crops. The project consisted of growing radish plants with varying concentrations of water salinity (0 grams of salt/liter of fresh water, 4 g/L, 8 g/L, and 16 g/L). The hypothesis was that the plants watered with 0 g/L and 4 g/L salinities would produce more growth than those grown with 8 g/L and 16 g/L. Sixteen 7.6 cm diameter pots were filled with potting soil and fertilizer (2-14-0). One radish seed was placed in each pot. The seeds were germinated utilizing fresh water. The plants were then separated into equivalent sample sizes and watered with the various salinity concentrations. Plant growth was measured, and the resulting biomass was weighed. The plants watered with the 4 g/L concentration had the greatest mean height (19.2 cm/plant) and the greatest mean biomass (4.975 g/plant). The 0 g/L, 8 g/L, and 16 g/L plants had mean height and biomass of 18.5 cm and 4.275 g, 18.1 cm and 4.700 g, and 0.0 cm and 0.850 g, respectively. The data indicate that radishes can grow in salinities at least as high as 8 g/L, which equates to salinity levels approaching 25% sea water, but not as high as 16 g/L. It also suggests that the land might be made productive again by switching to crops that are more saltwater tolerant.

Poster Board No. 28 - TRADING FOURS. Miguel A. Martinez, mmartinez18@us.edu, 5171 Hemmington Blvd., Solon OH 44139 (University School).

"Trading fours" is a musical term for when two musicians improvise with each other in a call and response method. The first musician improvises for four bars/measures, while the second listens. The second then improvises using what he/she heard from the first musician, changes it, making his or her own improvised four measures. The process is then repeated. The goal of this project is to create a computer program that a musician can use to "trade fours" with, called "Trading4s.java." First, it is hypothesized that pianists improvise in their own unique patterns, changing three variables—rhythm, pitches, and dynamics. Three subjects were prompted with two different backing tracks, one being a swung C 12-bar blues chord progression, and then a Bossa Nova style track. Each played an improvised solo over these tracks on a piano keyboard. The improvised solos were recorded via MIDI. The analysis of the solos included checking for patterns in rhythm, pitches, and dynamics. The data, collected from the improvised solos of each subject, show distinct patterns repeated in terms of rhythm and pitches, specific to each pianist. The data supports the original hypothesis. The Trading4s algorithm builds off the experiment's findings that there are patterns in the pitches and rhythm. Trading4s.java mimics "trading fours" by intaking a short MIDI file and creating a new MIDI file that either copies the rhythm from the input and randomly assigns pitches, or copies the pitches from the input and strategically assigns a rhythm, creating a new responding improvisation.

Poster Board No. 29 - MACHINE LEARNING: DISCRIMINATING HUMAN- VERSUS COMPUTER-GENERATED RANDOM NUMBERS. Ajai K. Nelson, ajaikhatrinelson@gmail.com, 1137 Delta Avenue, Cincinnati OH 45208 (Walnut Hills High School).

Machine learning is an important method for creating complex computer programs. Machine learning algorithms may be the basis for artificial intelligence and can be applied in a wide range of areas. The goal of the project was to show whether a machine learning algorithm can accurately distinguish human-generated "random" numbers from computer-generated pseudorandom numbers. The random forest machine learning algorithm can distinguish sequences of computer-generated random numbers from human-generated numbers more accurately than an algorithm that classifies them randomly. Humans were asked to write sequences of 20 "random" integers from 1 to 5, inclusive. A computer generated the same number (n = 1019) of sequences. The programmer generated possible features that may be important to classify sequences as human versus computer-generated. Half of the human and computer-generated sequences were put into a training set, and half into a test set. The random forest algorithm was given the training data to learn how to classify the data based on those features, and the accuracy of test data classification was assessed. A program was also created that chose randomly whether a sequence was human- or computer-generated, and this program was also tested for accuracy. The random forest algorithm had an accuracy of 85.12% on the test data. The random choice algorithm had an accuracy of 50.64%. The random forest algorithm had greater accuracy than the random choice algorithm. The data supported the hypothesis. The random forest algorithm was able to find meaningful patterns in the features of the sequences.

Poster Board No. 30 - MODELING THE PRESCRIPTION DRUG EPIDEMIC WITH MATHEMATICAL FUNCTIONS. Neel Agarwal, nagarwal20@us.edu, 3940 Waterford Ct., Beachwood OH 44122 (University School).

The prescription drug epidemic is skyrocketing due to their addictive qualities. Using the Flesch Reading Ease Number and Flesch-Kincaid Grade Level Number of a specific prescription drug, one can predict its number of abuse cases. This is because drug literature is complex and may lead people to misuse drugs due to lack of specific knowledge/terminology, thus misunderstandings of usage and/or side-effects. The math-models would relate the complexity (scales) of the drug literature to the amount of abuse cases. The Flesch Reading Ease scale is used to measure the complexity/comprehensibility of the literature, defined by: $206.835 - 1.015(\text{words} \div \text{sentences}) - 84.6(\text{syllables} \div \text{words})$. The Flesch-Kincaid Grade Level scale is used to measure the amount of education required to understand the literature, defined by: $0.39(\text{words} \div \text{sentences}) + 11.8(\text{syllables} \div \text{words}) - 15.59$. Seven drugs were randomly picked from 7 prescription drug categories. Using the National Library of Medicine, Microsoft® Word and regression software, the Flesch Reading Ease and Flesch-Kincaid Grade Level numbers were calculated to generate a model to predict the number of abuse cases for each drug. The equation: $23.9276 \times 1.90166^{x}$ ($r^2 = 0.95$, $p = 0.000230168$), predicted the number of abuse cases given by the Grade Level Number scale. The equation: $3896470 - 1084330 \times ln(x)$ ($r^2 = 0.90$, $p = 0.003863714$), predicted the number of abuse cases using the Reading Ease scale. These models, with high correlation coefficients (r^2), suggest the complexity of prescription drug facts can predict the number of abuse cases. These models can be used to force drug manufacturers to reduce the scales' numbers, thus complexity of the drug literature, perhaps lessening abuse cases, solving the prescription drug epidemic.

Poster Board No. 31 - ONCOSTATIN-M INDUCES EPETHELIAL-MESENCHYMAL TRANSITION IN TRIPLE NEGATIVE BREAST CANCER CELLS. Zehra F. Ashruf[1], zfashruf@gmail.com, Jenny Parvani[2], jgp41@case.edu, Mark Jackson[2], mwj7@case.edu, [1]37330 Broadstone Dr., Solon OH 44139 (Hathaway Brown School), [2]Case Western Reserve University, Department of Biomedical Engineering, Cleveland OH.

Triple negative breast cancer (TNBC) is a subtype of breast cancer that lacks estrogen receptor, progesterone receptor, and human epidermal growth factor receptor 2. Elevated expression of Oncostatin-M (OSM), a pleiotropic cytokine of the Interleukin 6 family, is associated with increased STAT3, ERK, and AKT signaling, and has been described

in breast cancer cells. Previous studies demonstrate that increased expression of OSM in estrogen receptor expressing luminal breast cancer cells induces epithelial-mesenchymal transition (EMT), whereby epithelial cells undergo morphological and phenotypic changes that are consistent with a gain in mesenchymal/fibroblastoid characteristics. However, the role of OSM in TNBC remains incompletely understood. It is hypothesized that OSM overexpression in TNBC BT549 cells will further exaggerate EMT phenotypes. To evaluate the effects of OSM overexpression on EMT and STAT3, ERK, and AKT signaling pathways in TNBC cells, Oncostatin-M and Green Fluorescent Protein (GFP; control), were each overexpressed in BT549 cells via lentiviral transduction in 10 cm plates. After 14 days, western blot analysis revealed elevated expression of EMT transcription factors Snail, Slug, Zeb 1, and Twist and elevated pSTAT3 and pERK activation in the OSM cells in comparison to the control GFP cells. As hypothesized, OSM overexpression in BT549 cells induces increased mesenchymal phenotypes. Elevated OSM expression in TNBC cell line, BT549, induces EMT, which is associated with elevated Snail, Slug, Zeb, and Twist expression. OSM overexpression induces elevated STAT3 and ERK activation. The effects caused by overexpressed OSM have confirmed its position in the development of TNBC cells.

Poster Board No. 32 - BOLAAMPHIPHILES FOR TARGETED MOMIPP DRUG DELIVERY. Margaret E. Bohmer, 730960@sylvaniastudents.org, 2339 St. Roberts Ln., Toledo OH 43617 (Sylvania Southview High School).

Bolaamphiphiles are rod-shaped surfactants with two hydrophilic headgroups on either end, connected by a hydrophobic chain. When saturated in an aqueous solution, they create micelle-like monolayer emulsions. The purpose of this ongoing research project is to study the novel idea of using bolavesicles to deliver chemotherapy drug MOMIPP to glioblastoma multiforme tumors, in which there is currently no effective long-term method of treatment. In the current study, synthesis of the bolaamphiphilic micelles (referred to as bolavesicles) was optimized by testing n=5 types of bolaamphiphiles with varying chain lengths. The chain length will determine the size of the resultant bolavesicles. Additionally, different organic solvents were used to determine the materials and methodology to formulate the bolavesicles. Each type of bolaamphiphile was formed into vesicles and characterized using dynamic light scattering and zeta potential. The data demonstrates that bolaamphiphile Bis-Malt 20 formulated using 1:1 ethanol+water resulted in the formation of optimal soluble bolavesicles that exhibited the closest to an ideal diameter for MOMIPP delivery (241.8 nm) and the highest stability (χ^2=16.79), compared to Bis-Malt 18, 22, 24, and 28, all of which were also tested. These results suggest that for the next step of this project, the Bis-Malt 20 bolavesicles will be formed with MOMIPP and tested to see how much of the drug they encapsulate. This research is intended to find a more effective way to deliver chemotherapy to patients with GBM tumors.

Poster Board No. 33 - A NOVEL TREATMENT FOR CROHN'S DISEASE ASSOCIATED ARTHRITIS USING BONE MARROW-DERIVED MESENCHYMAL STEM CELLS (MSC). Enea M. Cominelli, ecominelli19@us.edu, 16670 South Park Blvd., Shaker Heights OH 44120 (University School).

A significant number of patients with Crohn's Disease (CD) suffer from significant arthritis. However, the treatment for these conditions is limited to non-specific anti-inflammatory therapies. Therefore, there is a need for developing novel therapies that specifically target the joints during CD. Mesenchymal stem cells (MSC) have generated great interest for their potential regenerative effects in chronic arthritis. The hypothesis of this project is that administration of human bone marrow-derived MSCs may have beneficial effects on experimental CD-associated arthritis. For this study, TNFΔARE mice with CD-like ileitis and associated arthritis were used. These mice, which overexpress tumor necrosis factor (TNF) systemically, display both chronic CD-like-ileitis and a central and peripheral arthritis that closely resembles the human condition. Experimental groups of 6 male TNFΔARE mice were treated with an intravenous (IV) injection of 5×10^6 human-derived MSC and were sacrificed after 4 weeks. Control groups received either no treatment (negative control) or dexamethasone (1 mg/day) for 1 week (positive control) before sacrifice. The severity of arthritis in ankles and knees were evaluated using a validated histological assessment of cartilage repair developed by the ICRS based on 6 different parameters. Preliminary results demonstrate that TNFΔARE mice treated with MSC have decreased inflammatory scores in their joints compared to control mice without treatment. The anti-inflammatory effects were similar to those in mice treated with dexamethasone. These results suggest that human-derived MSC have potential therapeutic affects in the TNFΔARE mouse model. This may represent a novel treatment modality for these devastating conditions.

Poster Board No. 34 - FAMILY HISTORY OF OTHER CANCERS ON BREAST CANCER RISK. Sinead H. Li[1], sli20@hb.edu, Cheryl L. Thompson[2], clw8@case.edu, [1]32560 Stony Brook Lane, Solon OH 44139 (Hathaway Brown School), [2]Case Western Reserve University, Department of Nutrition, Cleveland OH.

Women who have a family history of breast cancer are well known to have a higher risk of developing cancer themselves. However, there is little information on the association of family history of other types of cancer with breast cancer risk. The aim of the study was to study the risk of breast cancer associated with family history of other types of cancer, specifically breast, cervical, lung, leukemia, lymphoma, colorectal, thyroid, skin, and prostate cancers. Breast cancer cases (n=1232) and mammography-screened controls (n=937) from University Hospitals Cleveland Medical Center filled out questionnaires on their family history of cancer and other demographic, reproductive, and lifestyle questions. Multivariate logistic regression adjusting for age, race, and parity was conducted. The ORs were 0.91 (95% CI: 0.12 to 7.07, p=0.93) for cervical, 1.64 (95% CI: 0.61 to 4.43, p=0.33) for lung, 1.15 (95% CI: 0.15 to 8.76, p=0.89) for leukemia, 1.28 (95% CI: 0.16 to 9.81, p=0.81) for lymphoma, 1.08 (95% CI: 0.39 to 3.01, p=0.88) for colorectal, 0.29 (95% CI: 0.06 to 1.39, p=0.12) for thyroid, 2.16 (95% CI: 0.71 to 6.57, p=0.18) for skin, and 1.53 (95% CI: 0.49 to 4.79, p=0.45) for prostate. None of these associations were statistically significant in our study population. However, because many of these cancers are uncommon, the lack of statistical significance may be due to small sample size. Further directions include conducting a meta-analysis with other similar studies, and focusing more on breast cancer subtype.

Poster Board No. 35 - IDENTIFYING NATURAL COMPOUNDS AND GENES THAT WILL PROTECT FROM ULTRAVIOLET RADIATION. Aniv Ray, anivray@yahoo.com, 831 Clayton Drive, Worthington OH 43085 (Columbus Academy).

Ultraviolet radiation (UVR) is a health hazard that causes several diseases including cancer, neurodegenerative disease, XP syndrome, cataracts of the eye, and sunburn, raising the importance of development of therapies for UVR-exposed diseases. The central hypothesis of this research is that several dietary natural products, low in toxicity, have a high potential for protection against UVR. Several natural dietary compounds rich in anti-oxidants were tested and compared with 2 sunscreens as the control. Apigenin (in celery), Zerumbone (in ginger), Resveratrol (in grapes and berries), and Curcumin (in turmeric) were examined for their efficacy in UVR protection. Bacteria was plated on

petri dishes containing the compounds, and half of each plate was exposed to UVR. The other half was used as a control. Then, the bacterial growth was determined. All of the compounds protected bacterial cells from UVR similar to or better than the 2 sunscreens tested. Remarkably, both synthetic Apigenin and Apigenin extracted from celery showed a significantly higher level of protection compared to other compounds. The results demonstrate that natural compounds and specifically Apigenin can be used in medicines and treatments for UVR protection. To find the genes/pathways that are altered in UVR-induced skin cancer, bioinformatics analysis was done. The skin cancer databases in FIREBROWSE and Oncomine were used. Several important pathways/genes were identified. The future goal is to examine if the alterations of these genes are inhibited by the natural compounds tested. Inhibiting these genes/pathways further the development of drugs that will protect us from UVR-related health hazards.

Poster Board No. 36 - THE EFFICIENCY OF ANTIBACTERIAL HAND SOAP VERSUS THAT OF NON-ANTIBACTERIAL HAND SOAP. Annie W. T. Xia, axpinkie@yahoo.com, 2317 West Clifton Ave., Cincinnati OH 45219 (Walnut Hills High School).

The purpose of this study was to test whether or not antibacterial hand soaps really eliminate bacteria more effectively than regular hand soaps. It is a common belief that antibacterial soaps are much more efficient than non-antibacterial soaps, but the FDA recently banned the production and marketing of antibacterial soaps. The hypothesis was that the bacterial colony reduction percentage for antibacterial soap would not have a substantial difference with that of regular soap, since antibacterial agents have not been actively proven to be more efficient than agents in non-antibacterial soap. To test this hypothesis, the percent decreases in bacterial growth on LB medium in petri dishes before and after hand washing with the given soaps were studied. Dial® Regular, Dial® Antibacterial, Softsoap® Regular, and Softsoap® Antibacterial liquid soaps were tested, 5 trials each. Dial® Antibacterial contains 0.2% Benzethonium Chloride, and Softsoap® Antibacterial contains 0.13% Benzalkonium Chloride. Five volunteers made handprints on petri dishes before and after washing their hands thoroughly. After 3 days' culture, the percent reductions in bacterial growth between the sets were calculated. According to the data, there was an 88.8% average decrease for Dial® Regular, 94.02% for Dial® Antibacterial, 91.5% for Softsoap® Regular, 94.4% for Softsoap® Antibacterial. From the results, the hypothesis was supported. Antibacterial soaps did have a slightly higher reduction percentage than that of regular soaps, although they were only a few percent away from each other. The data clearly shows that there was no substantial difference between the efficiencies of antibacterial and regular soaps.

Poster Board No. 37 - ENGINEERED MICROBES TO SENSE AND RESPOND TO ETEC. Anna Bete, lmnbete@gmail.com, 3579 Sunset Bluff Dr., Beavercreek OH 45430, Jonah Carter, mcarter@carrollhs.org, Max Herrmann, Hayley Jesse (Carroll High School).

Every year, enterotoxigenic *Escherichia coli* (ETEC), the most common form of traveler's diarrhea, affects thousands of deployed military personnel. The goal of this project is to engineer non-pathogenic *E. coli* to sense ETEC, respond to its presence, and package it in a cellulose matrix to enable environmental detection of ETEC. In this work, two plasmids were constructed: "sense-respond" and "packaging." The sense-respond plasmid sensed Auto-Inducer 2 (AI-2), a quorum sensing molecule created by most ETEC strains, by expressing LsrR which switches on the Lsr promoter. Activation of the Lsr promoter expresses Super-Folder Green Fluorescent Protein (sfGFP), indicating the presence of ETEC. The packaging plasmid expresses a fusion protein consisting of curli fibers and cellulose binding domains. These modified surface proteins permit the bacteria to bind to cellulose, encapsulating the sense-response module. This genetically engineered biotechnology could be deployed in both the internal and external environment to detect ETEC.

Poster Board No. 38 - EXPRESSION AND FUNCTION OF THE TRANSCRIPTION FACTOR *HNF4a* IN KIDNEY DEVELOPMENT. Ainsley M. Bradbury[1], abradbury19@hb.edu, Oliver Wessely[2] wesselo@ccf.org, [1]8380 Stoney Brook Dr., Chagrin Falls OH 44023 (Hathaway Brown School), [2]Cleveland Clinic Main Campus, Department of Cellular and Molecular Medicine, Cleveland OH.

The kidney is an essential organ for water homeostasis, solute homeostasis, and waste excretion. However, several aspects of its development are still unknown. The genes *HNF4a*, *MAFB*, and *C-MAF* are known to play a role in kidney development; therefore, the effects of eliminating these genes from *Xenopus* embryos, an amphibian model system of kidney development, are explored. It was hypothesized that the embryos lacking *HNF4a* will cause defects in the proximal tubule of the kidney. *Xenopus* embryos were injected with *HNF4a* antisense oligos. Three independent biological batches of injected and control embryos were analyzed by immunofluorescence and whole mount *in situ* hybridization. To visualize kidney structure, 2 antibodies were used: 3G8, which stains proximal tubules, and 4A6, which stains distal tubules. In addition, an *in situ* was preformed to examine kidney patterning and *HNF4a* expression. Comparison of frog to mouse immunofluorescence was performed on paraplast sections of postnatal day P1 and P10 mouse pups stained with antibodies against *HNF4a*, *MAFB*, and *CMAF* and counterstained with *Lotus tetragonolobus* Lectin to visualize proximal tubules, and Podocin to visualize podocytes. The mouse immunofluorescence staining found that *HNF4a* is only expressed in the proximal tubules, *MAFB* is restricted to podocytes, and the *CMAF* antibody needed further improvement. There was no change in the expression patter between the 2 stages examined. Based on these data it was concluded that *HNF4a* is expressed in the proximal tubules of both mice and *Xenopus* and is important for establishment of kidney proximal tubules.

Poster Board No. 39 - PROTECTION OF RETINAL CELLS FROM LIGHT-INDUCED APOPTOSIS. Parker J. Ernst[1], pernst20@us.edu, Mieko Matsuyama[2], Shigemi Matsuyama[2], sxm193@case.edu, [1]37000 Fairmount Boulevard, Chagrin Falls OH 44022 (University School), [2]Case Western Reserve University, Case Comprehensive Cancer Center, Cleveland OH.

atRAL, a cytotoxic byproduct of the visual cycle, is removed from the eyes' photoreceptors by ATP-binding cassette transporter (ABCA4), which transports atRAL from the disc lumen to the cytoplasm. Inhibiting mutations in ABCA4 result in a buildup of atRAL, causing disturbances in visual function and leading to apoptosis-based retinal degeneration, seen in Stargardt's disease, cone-rod dystrophy, and recessive retinitis pigmentosa. This degeneration is mediated by Bax, a pro-apoptotic protein, which is activated by atRAL. The present study aimed to prevent the atRAL-induced retinal cell apoptosis by using newly discovered Bax inhibitors BBI-2 and BBI-4 in ARPE19 cells (human retinal cells) as a model. Baseline death rates of 0.77%±0.15 and 1.81%±0.09 were found for control groups and 30%±5.23 and 33.87%±3.08 for groups treated with 10 µM atRAL. Cells treated with increasing dosages BBI-2 and 10 µM atRAL had a death rate of 25.8%±2.83, 25.3%±1.82, and 23%±3.33, respectively. Cells treated with increasing dosages of BBI-4 and 10 µM atRAL experienced a death rate of 20.4%±0.38, 20.1%±1.98, and 13.3%±0.61, respectively. In a second test group, cells treated with 2 increasing dosages of BBI-4 and 10 µM atRAL had a death rate of 23.58%±2.57 and 19.6%±4.08, respectively. In summary, results indicate that atRAL-induced retinal cell

apoptosis can be reduced by BBI-based selective Bax inhibition. Because atRAL-induced apoptosis is associated with retinal degeneration, this study also provides evidence that BBI-based treatment leads to prevent retinal degeneration, which holds exciting potential for future research into helping prevent cell death and tissue degeneration.

Poster Board No. 40 - THERMODYNAMIC AND STRUCTURAL ANALYSIS OF SPEN PARALOG AND ORTHOLOG C-TERMINAL DOMAIN AND NCOR COREPRESSOR COMPLEX. **Lauren Lautermilch[1,2], laurenlautermilch@gmail.com, Courtney Collins[2], Rhett Kovall PhD[2], [1]5075 Eagles View, Cincinnati OH 45244 (Summit Country Day School), [2]University of Cincinnati, College of Medicine, Department of Molecular Genetics, Biochemistry, and Microbiology, Cincinnati OH.**

The Notch signaling pathway is a highly conserved cell signaling system implicitly involved in the regulation of various cellular mechanisms including proliferation, migration, survival, and cell fate. Due to the Notch's role in fundamental biological processes, dysfunction in the pathway has been linked to a number of human diseases such as cancer, cardiovascular disease, and congenital defects, among others. Thus, a molecular understanding of the structure-function relationship of each Notch signaling component is necessary to effectively exploit the cell pathway to therapeutically regulate Notch target genes. In particular, characterizing the interactions of corepressors in the pathway provides valuable information about regulation of Notch signaling. The highly conserved corepressor MINT contains an essential SPOC (Spen Paralog and Ortholog C-terminal) domain, which binds additional corepressors such as NCoR (Nuclear Receptor CoRepressor) to completely repress Notch target genes. Through thermodynamic and structural analyses, we studied the interaction of SPOC and NCoR, specifically focusing on the effect of NCoR cyclization on SPOC/NCoR binding. Using isothermal titration calorimetry, we have determined the thermodynamic parameters of SPOC/cyclic NCoR binding, finding that cyclization results in less favorable binding compared to binding for wild-type linear NCoR. The SPOC/cyclic NCoR complex has been crystalized, and its three-dimensional structure will be determined by x-ray crystallography. An improved understanding of the SPOC/NCoR corepressor complex and the effect of cyclization on binding provides insight on molecular details of the pathway that can be applied to therapeutically address Notch signaling.

Poster Board No. 41 - EVALUATING NEW IMMUNOTHERAPY CONCEPTS IN PEDIATRIC BONE CANCERS IN VITRO. **Daniel H. Ryan[1], daniel-ryan@twc.com, John Letterio[2], john.letterio@uhhospitals.org, Seunghwan Lim[2], sxl269@case.edu, Nicholas Borkey[2], nb022316@ohio.edu, [1]35851 Sherwood Lane, Willoughby Hills OH 44094 (University School), [2]Case Western Reserve University, Case Comprehensive Cancer Center, Cleveland OH.**

Ewing Sarcoma is a pediatric cancer with high potential for metastasis to distant sites. Standard treatments (i.e., surgery, chemotherapy and radiation therapy) place survivors at risk for complications of therapy, indicating a need for new therapeutic targets. One such target is the signaling pathway activated by the Transforming Growth Factor-beta (TGF-ß). Activation of this pathway typically inhibits cellular growth in non-cancerous cells but promotes proliferation of cells of mesenchymal origin and has been linked to chemotherapy resistance in cancers. This study first examined whether inhibiting the TGF-ß pathway affects the proliferation and viability of Ewing Sarcoma cell lines *in vitro*, and then examined whether inhibiting the TGF-ß pathway prevents chemotherapy resistance. Ewing Sarcoma cells were treated with various concentrations of a TGF-ß type I receptor inhibitor (TEW-7197) or various concentrations of the chemotherapy agent Vincristine to address the first study objective. Various concentrations of both Vincristine and TEW-7197 were then added to Ewing Sarcoma cells to address the study's second objective. TEW-7197 consistently led to a decrease in cell proliferation, and in cultures exposed to both Vincristine and TEW-7197, proliferation was comparatively less than that of single-drug treatments. Inhibition of the TGF-ß pathway may augment the response of Ewing Sarcoma to standard chemotherapy.

Poster Board No. 42 - THRESHOLD OF FLUID FLOW REQUIRED TO TRIGGER THE CALCIUM RESPONSE IN PRIMARY CILIA. **Davyd T. Sadovskyy[1], ua.sadovskyy@gmail.com, Andrew Resnick[2], a.resnick@csuohio.edu, [1]2921 Woodview Dr., Broadview Heights OH 44147 (Brecksville Broadview Heights High School), [2]Cleveland State University, Department of Physics, Cleveland OH.**

The primary cilium is a non-motile cellular appendage capable of initiating cellular responses to mechanical stress. The calcium response to fluid flow, in which a bending of the cilium increases intracellular calcium concentrations, is particularly interesting as its absence has clear roles in the proliferation of several renal ciliopathies. While much is known about the mechano-chemical transduction event itself and the respective proteins involved, the mechanism by which it is initiated and adapts to differing flow conditions is not well characterized. To shed light on such questions, a set of experiments were performed to determine the threshold of fluid flow required to trigger a calcium response in cells subjected to 2 differing early culture conditions. Canine kidney epithelial cells (MDCK Line), the source of primary cilia for the investigation, were grown to confluence with and without imposed flow in Ibidi flow chambers. After differentiation conditions were induced, cells became ciliated and flow experiments were performed. The calcium indicator Fluo-4 was added, and fluorescence was imaged while flow was generated by a syringe pump at varying rates. In 6 trials, flow rates of 60 µL/min or higher consistently generated a substantial rise in fluorescence (calcium concentration) while a rate of 40 µL/min failed to produce a response on most occasions. Evidence of an adaptive response, or response influenced by earlier flow conditions during growth, were inconclusive since the results exhibited by cells grown in both conditions were nearly identical in nature.

Poster Board No. 43 - THE ROLE OF KLF3 IN THE PATHOGENESIS OF A *C. ELEGANS* PARKINSON'S MODEL. **Sai Karnati[1], skarnati20@us.edu, Paishiun Nelson Hsieh[2], pnh14@case.edu, Mukesh Jain[2], mukesh.jain2@case.edu, [1]5257 Hemmington Blvd., Solon OH 44139 (University School), [2] Case Western Reserve University, Cardiovascular Research Institute, Cleveland OH.**

Approximately 60,000 Americans are diagnosed with Parkinson's disease every year. Parkinson's disease is caused by the death of dopaminergic neurons in the midbrain. Previous work has identified Krüppel-like factor 3 (KLF3) as a regulator of aging and lifespan in *C. elegans.* Considering that Parkinson's disease is age-related, KLF3's ability to increase longevity could also affect the pathogenesis of Parkinson's disease. Three lines of *C. elegans*; KLF3 overexpression, KLF3 knockout, and Wildtype were used in a food response assay to determine dopamine neuron signaling. The assay is used because when a worm is placed in a plate with food, it makes less body bends than in a plate without food, and this difference is controlled by dopamine neurons. *C. elegans* were placed on an agar plate with food and without food, and the frequency of the worm's sinusoidal movement was counted in a period of 20 seconds. The antiaging effect of KLF3 may affect dopamine neuron health, and the dopamine neuron affects the worm's response to foods, therefore differences in the food response could be related to KLF3. KLF3 overexpression was expected to result in the highest difference in the food response assay, based on its ability to increase longevity. However, *C. elegans* with KLF3 overexpression saw the lowest difference in the food-response assay, only having a

difference of 0.3 and −0.7 body bends between the Off Food and On Food response. Further studies should be conducted to fully understand the role, if any, of KLF3 on Parkinson's.

Poster Board No. 44 - DYNAMIC CONVOLUTIONAL NEURAL NETWORKS FOR SENTIMENT ANALYSIS. Dylan B. Siegler, dsiegler19@us.edu, 35750 S. Huntington Dr., Solon OH 44139 (University School).

Neural networks are a subset of artificial intelligence that use a simplified mathematical model of the human brain in order to build models used for solving many problems, such as recognizing an image, grouping data into categories, or examining text. Many types of neural networks have been used to analyze text for tasks such as question answering, machine translation, summarization, or classification. The convolutional neural network (CNN) has been thought to perform poorly on text-based tasks. However, the dynamic convolutional neural network (DCNN), a modification to the traditional CNN, has previously shown promise in text-related tasks. Thus, the effectiveness of the DCNN for sentiment analysis, or deciding if a short body of text expresses positive or negative sentiment, was examined and compared to the CNN and the support vector machine (SVM), which are two other common architectures used for this application. Using TensorFlow™ and Python 3™, a DCNN, CNN, and SVM were implemented for sentiment analysis. The three architectures were trained using approximately 11,000 previously harvested short movie reviews from Rotten Tomatoes® and tested using approximately 2,000 previously harvested short movie reviews from IMDB®. After training, the DCNN performed significantly better than both the CNN and the SVM, with accuracies of 85% vs. 71.9% and 72%, respectively (N-1 chi squared test, DCNN compared to CNN, $p<0.001$; DCNN compared to SVM, $p<0.001$). These results show that the modification to the traditional CNN architecture improves its effectiveness on text-based tasks.

Poster Board No. 45 - SITE SPECIFIC RESPONSE OF MACROPHAGES TO PERIPHERAL NERVE INJURY. Katherine Wang[1], kwang19@hb.edu, Jon P. Niemi[2], jpn34@case.edu, Richard E. Zigmond[2], rez@case.edu, [1]1042 Ledgewood Trail, Lyndhurst OH 44124 (Hathaway Brown School), [2]Case Western Reserve University, Department of Neurosciences, Cleveland OH.

Macrophages infiltrate the dorsal root ganglia (DRG) and the sciatic nerve (SN) distal to the site of injury after peripheral nerve axotomy. Injury induced expression of the chemokine CCL2 in the DRG and SN attracts the macrophages to those sites. Macrophages accumulating in the ganglia and nerve have been shown to be beneficial for axon regeneration. However, the site-specific roles of macrophages have not been clearly determined, since most macrophage inhibition affects the cells at both sites. To inhibit macrophage accumulation at a specific site, the cre-lox system was used to knockout CCL2 in the DRG or SN by mating CCL2-floxed mice (CCL2fl/fl) with sensory neuron-expressing cre (Advillin-Cre) or Schwann cell-expressing cre (P0-Cre) mice, respectively. CCL2 mRNA expression was measured in the DRG and SN. Advillin-$Cre^{CCL2fl/fl}$mice showed significantly impaired CCL2 expression in both the DRG and SN, while P0-$Cre^{CCL2fl/fl}$ mice displayed impaired CCL2 expression in the SN only, compared to control mice. Macrophage accumulation was measured by staining for the marker CD68 in DRG and SN 7 days after SN transection injury. Interestingly, Advillin-$Cre^{CCL2fl/fl}$ mice showed no change in macrophage accumulation in both the DRG and SN compared to controls, while P0-$Cre^{CCL2fl/fl}$ mice displayed impaired macrophage accumulation in the SN only. In an *in vitro* DRG culture, measuring axon regeneration, Advillin-$Cre^{CCL2fl/fl}$ mice displayed significantly reduced neurite outgrowth compared to the other genotypes. Using this conditional knockout approach, we will be able to delineate the contribution of macrophages in the SN and the DRG to the overall regenerative process.

Poster Board No. 46 - COMPARATIVE TEMPERATURE CONTROL PERFORMANCE OF THREE PHASE CHANGE MATERIALS. Edward D. Dan, edw656@gmail.com, 33600 Inwood Road, Solon OH 44139 (Solon High School).

Insulation is commonly used to slow the rate of temperature change between a confined space and its surrounding environment. A new approach called phase change materials (PCMs) is apparently superior to insulation. PCMs absorb/release thermal energy when melting/freezing (latent heat) and without phase change (sensible heat). The hypothesis is that pails with PCMs will maintain constant temperatures when the outside temperature increases. Two trials were conducted using 3 stainless steel pails (29.5 cm diameter, 41 cm height, 0.6 mm thickness) per trial. One empty pail for control and 2 pails with 120 cm × 40.5 cm PCMs were placed outside overnight and tested under temperatures of 17.4 °C to 33.4 °C from 8 AM to 7:30 PM. Four different PCM materials of 25QGM27 (Q value of peak melting point = 25 °C; M value of heat capacity = 27 BTU), 23QGM27, 25QGM51 were placed in each pail. One thermocouple was placed inside of each pail. The state of the PCM was observed and the temperature was measured every 30 min. Boxplot and time-series chart demonstrated that higher heat storage ratings can maintain lower temperatures for longer periods of time. 25QGM51 maintained an average of 23.5 °C, while 23QGM27 maintained 23.9 °C and control averaged 24.8 °C. Paired T-tests indicated that the mean between control and 25QGM51 is significantly different ($p<0.00001$). Based on heat transfer calculations of an automated teller machine (ATM), PCMs can keep an ATM below 29 °C in the summer. These results suggest that further experimentation should be conducted to validate the use of PCM to replace air conditioning for ATMs.

Poster Board No. 47 - PHOTOVOLTAICS, FUTURISTIC SOLUTION, OPERATING TEMPERATURE OF PHOTOVOLTAIC PANEL AND ITS IMPACT ON VOLTAGE. Grace A. ElHindi, gelhindi@roadrunner.com, 377 Kirkshire Ct., Highland Heights OH 44143 (Beaumont School).

The experiment was designed to test the performance of photovoltaic (PV) panels in a simulated rooftop installation. The simulation included performance evaluation of the PV panels installed over a black rooftop and a white rooftop. In addition, the PV panels were also evaluated when installed flat and raised over the roof substrate at an angle. The hypothesis is "photovoltaic panels are installed outdoors on different substrates for exposure to the sun and to convert solar energy into direct electric current. The increase in the operating temperature of the panels will adversely affect the voltage produced by the panels." In this experiment, the PV panel was installed flat against both black and white substrate while collecting temperature and voltage data every 30 sec. Furthermore, the PV panel was installed at an angle of 18° to the substrate, with a 17.6 cm separation from the substrate at the base, to simulate convection while collecting temperature and voltage data every 30 seconds for 1 hour. Over 11,000 data points were collected and analyzed for the different configurations. The data indicated an inverse relationship between the operating temperature of the PV panel and the voltage it produced. Furthermore, it showed that the panel installed at an angle on a black substrate had the best performance by exhibiting the lowest operating temperature at 38.0 °C while producing 20.78 volts. The other three configurations

showed lower performance with an operating temperature between 43.4 °C and 44.1 °C and corresponding voltage between 20.57 V to 20.67 V. These results indicated that the increase in PV panel operating temperature has a negative impact on the voltage produced by the panel and that installing the PV panels at an angle can help reduce the operating temperature and increase the voltage level.

Poster Board No. 48 - APPLYING OPTICAL PROFILOMETRY TO BRUSHSTROKE ANALYSIS. Farah Sayed[1], fsayed19@hb.edu, Michael McMaster[2], msm170@case.edu, Kenneth Singer[2], kds4@case.edu, [1]1724 Sperry's Forge Trail, Westlake OH 44145 (Hathaway Brown School), [2]Case Western Reserve University, Cleveland OH.

Connoisseurship, a visual analysis done by an art historian, is heavily relied upon in determining attribution of paintings. In many cases, however, conservators will turn to material analysis to extract additional information. Optical profilometry, which uses low-intensity light to create 3-D profiles of a surface, is being investigated as a tool to analyze paintings. Stylometry is the theory that each painter possesses a characteristic manner of painting. It is hypothesized that this can be detected through measuring quantifiable properties of brushstrokes (e.g., spacing between grooves, average groove height, and surface roughness). To further characterize the limitations of optical profilometry, a standard number 2 paintbrush was used, but various changes were made in the application of the paint; these changes included bristle material, paint viscosity, and paintbrush pressure. The data were decomposed using Fourier transforms, and bristle material (e.g., synthetic fibers, badger, etc.) was compared. Regular peaks with wavenumbers below 20,000 (m^{-1}) differed noticeably between fiber types. Brushstrokes were also painted with 3 different ratios of pigment to oil. The highest viscosity paint (2.0 mg/mL) had a high count of oscillations up to a wavenumber of 17,000 (m^{-1}), whereas the middle (1.5 mg/mL) and lowest (1.0 mg/mL) viscosities only had oscillations to wavenumbers of 10,000 (m^{-1}) and 7,000 (m^{-1}),respectively. Paintbrush pressure was varied systematically using a custom-made device, but no quantifiable differences in the surface were seen through Fourier analysis. These results indicate that optical profilometry can extract relevant information from the surface of paintings, which can assist attribution of paintings.

Poster Board No. 49 - THE FUNCTION OF GASDERMIN D IN THE NON-PYROPTOTIC IL-1β RELEASE OF NEUTROPHILS. Jennifer R. Wang[1], jwang19@hb.edu, Mausita Karmakar[2], mxk501@case.edu, George R. Dubyak[2], gxd3@case.edu, [1]21987 Rye Rd., Shaker Heights OH 44122 (Hathaway Brown School), [2]Case Western Reserve University, Department of Physiology and Biophysics, Cleveland OH.

Inflammation is an innate immune response to stressors like pathogens and damaged cells, but when chronic, can lead to chronic inflammation and autoimmune diseases. One cause of inflammation is a form of programmed cell death called pyroptosis in which gasdermin D proteins create pores in the cell membrane, leading to the cell's collapse and a release of IL-1β to recruit additional immune cells. While pyroptosis is observed in macrophages, it is not observed in neutrophils; it remains unknown how neutrophils release IL-1β without pores and subsequent cell death. The ability of neutrophils to release IL-1β without pyroptosis was examined in neutrophils and the immortalized mPRO neutrophil progenitor cell line. The mPRO cell line was characterized to be a viable model for mouse-derived neutrophils through IL-1β ELISA assays, calcium assays, and LDH assays. A western blot assay was used to verify the expression of gasdermin D in differentiated mPRO neutrophils. Despite the absence of pyroptosis, the necessity of gasdermin-D in neutrophil IL-1β release was determined with IL-1β ELISA assays in which gasdermin-D regulatory steps were inhibited. In neutrophils, a lack of propidium iodide influx characteristic to pore-forming macrophages further establishes that gasdermin-D pores do not form in neutrophils. The release of IL-1β without pores, in concert with a lack of cell death following NLRP3 activation, suggests that in neutrophils and possibly other immune cells, gasdermin D affects inflammation through more than pyroptosis.

Poster Board No. 50 - EFFECTIVENESS OF VARIED OPTICAL LENS MATERIALS IN BLOCKING ULTRAVIOLET RADIATION. Ava J. Fornara, 20afornara@beaumontschool.org, 3301 North Park Blvd., Cleveland Heights OH 44118 (Beaumont School).

Excessive ultraviolet (UV) radiation is responsible for multiple health maladies—particularly to the human eye causing cataracts, pterygium, macular degeneration, and melanoma. This project was designed to investigate different optical lens materials and their ability to block the transmission of UV light, thus protecting the eyes. Lens materials tested consisted of tinted and un-tinted polycarbonate, Trivex®, high index and CR-39® plastic, polarized sunglasses, low-cost tinted lenses, high-cost tinted lenses, and glass lenses of varying tints. It was hypothesized that un-tinted polycarbonate would be most effective at blocking UV radiation, as research indicated that tint had no real effect on eye protection, and the structure of polycarbonate was the most radiation resistant. For the experiment, a box containing a terrarium heat lamp was constructed. The heat lamp (which produced UVA, UVB, and visible light) was directed at the lens. For the purpose of this experiment the distance between the light and lens material remained constant. A UV light meter, placed just behind the lens, was used to measure the amount of radiation that was transmitted through the lens. Measurement of the light in the absence of a lens (702 nm) served as the control. Each lens material was tested 5 times. The average measured wavelength transmitted by each lens material was as follows: tinted polycarbonate (81 nm), un-tinted polycarbonate (49 nm), tinted Trivex® (82 nm), un-tinted Trivex® (60 nm), tinted high index plastic (79 nm), un-tinted high index plastic (60 nm), tinted CR-39® plastic (90 nm), un-tinted CR-39® plastic (104 nm), un-tinted polarized sunglasses (148 nm), low-cost un-tinted lenses (137 nm), high-cost un-tinted lenses (100 nm), and tinted glass lenses (207 nm). The hypothesis was confirmed. Un-tinted polycarbonate had the lowest average transmitted wavelength measurement (49 nm) indicating that this material was most effective in blocking UV radiation. Lens tinting had differing effects on the amount of UV radiation that was blocked. This research could provide valuable insight to consumers regarding the UV protection offered by eyeglasses.

College Student and Professional Poster Sessions

9:00 – 10:00 AM and 1:30 – 3:00 PM Lenhart Grand Ballroom - BTSU 202

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

Poster Board No. 51 - POPULATION GENETICS AND MIGRATION OF *PEROMYCUS LEUCOPUS*, A LYME DISEASE RESERVOIR SPECIES. Keaka R. Farleigh, kfarleigh@capital.edu, (Christine S. Anderson, canders2@capital.edu), Capital University, Department of Biological and Environmental Sciences, 1 College Ave., Columbus OH 43209.

Peromycus leucopus, or the white-footed mouse, is widely distributed across the eastern United States. These generalist mice prefer to inhabit understory vegetation and play a critical role in the dispersal of Lyme disease. Acting as possible reservoirs for Lyme disease, white-footed mice may easily migrate throughout the landscape potentially distributing the disease. This study seeks to investigate dispersal between 2 populations in different habitats through use of bioinformatic techniques, and is the culmination of both field and laboratory work performed over the course of 2012 to 2017. Field work was completed at Capital University's Primmer Outdoor Learning Center in Logan, Ohio, in a secondary growth deciduous woodlot and an agricultural fencerow habitat. Mice were live-trapped, and tissue samples were collected and stored in 95% ethanol at −20 °C. DNA was extracted and multilocus microsatellite PCR was performed. Samples from Summer 2016 (n = 14) and 2017 (n = 14) have been genotyped using a 3100 Genetic Analyzer DNA sequencer at 5 loci to date. Statistical analysis with the programming language R using the HIERFSTAT package was used to calculate genetic variation, F_{IS},and F_{ST}. Results suggest that migration was bidirectional between populations. Additional loci are currently being screened, and migration between populations was estimated using Geneclass, MIGRATE, and GENEPOP. Extensive movement of mice, if confirmed, will challenge management strategies to limit the spread of Lyme disease.

Poster Board No. 52 - THE INFLUENCE OF A CONTROLLED PRE-BREEDING SEASON BURN ON BIRD SPECIES ABUNDANCE AND DIVERSITY IN A NATIVE WARM-SEASON PRAIRIE PATCH. Jolyn Shunk, jshunk@muskingum.edu, Alex Furst, afurst@muskingum.edu, Danny Ingold, ingold@muskingum.edu, and Jim Dooley, jdooley@muskingum.edu, Muskingum University, Biology Dept., 163 Stormont St., New Concord OH 43762.

Few studies have examined fire as a management tool for obligate grassland birds on eastern warm-season prairie patches. Line transects were conducted during the May to June 2017 breeding season on a 24-hectare warm-season tall-grass prairie patch that had been burned 3 months earlier in February 2017. Prior to burning, this patch was dominated by an accumulation of tall, dead switchgrass (*Panicum virgatum*), big bluestem (*Andropogon gerardii*) and a few forbs. The goal was to monitor for a potential change in the post-fire bird species abundance and richness compared to the pre-fire grassland bird occupancy. Prior to burning, obligate grassland species were essentially absent from the patch. In May post-burn, the mean height of the patch was ~30 cm and a substantial amount of bare ground persisted. In the May post-burn transects there was detected a modest number of savannah (*Passerculus sandwichensis*) and grasshopper (*Ammodramus savannarum*) sparrows, species attracted to shorter vegetation with less ground cover. Conversely, no Henslow's sparrows (*A. henslowii*) were detected. By June post-burn, as the mean vegetation height approached 140 cm, the dominant species once again were red-winged blackbirds (*Agelaius phoeniceus*), common yellowthroats (*Geothlypis trichas*) and swamp sparrows (*Melospiza georgiana*). Observations suggest that a pre-breeding season burn on this warm-season patch did promote a change in species diversity in May post-burn, but not in June post-burn. In order to attract obligate grassland species to warm-season patches, instead of weed/shrub generalists, additional management strategies such as fall or spring mowing might need to be implemented.

Poster Board No. 53 - RISK AVERSION AND ITS EFFECTS ON FORAGING BEHAVIOR IN SPRAGUE-DAWLEY RATS. K.A. Myers[1], myerska@bgsu.edu, Marko Filipovic, Ben Fry, H. C. Cromwell, [1]Bowling Green State University, 206 Psychology Bldg., Bowling Green OH 43403.

Gambling addiction has become a growing concern in national mental health. The current study involves a paradigm designed to isolate a "gambling" phenotype in a rat model. Using a "3 Box" apparatus, behavioral studies were conducted under 2 separate conditions in which the training and the quantity of the constant reward were varied. In condition 1 subjects were trained on a variable reward set at 1 lever press for 5 pellets with a variable reward of 70% (7 out of 10 trials were rewarded). During the experiment the reward on the constant side was set at 1 lever press for 2 pellets at 100% (10 out of 10 trials were rewarded). In condition 2 subjects were trained on a constant reward set at 1 lever press for 5 pellets at 100%. During the experiment the reward on the constant side was reduced to 1 lever press for 1 pellet at 100%. The remaining parameters of the experiment were the same for both condition groups. Subjects were weight restricted to 87% of their free feeding weight. The experiment was 4 weeks long and consisted of 4 separate ratios on the variable side; week 1 70/30, week 2 50/50, week 3 30/70 and week 4 10/90. Although the study failed to isolate any significant gambling behavior, significant group difference in completed trials were found which contradict optimal foraging theory.

Poster Board No. 54 - THE EFFECT OF STREAM ECOSYSTEM FACTORS ON BAT FORAGING. John R. Woloschuk, jwolosc@BGSU.edu, Kevin E. McCluney, kevin.e.mccluney@gmail.com, Bowling Green State University, Dept. of Biological Sciences, Bowling Green OH 43403.

Bat activity is influenced by a number of biotic and abiotic factors. The goal of this study is to investigate the influence stream ecosystem variables and time of day have on the behavior of bats. Ultimately, understanding the influence of these factors will allow for greater predictability of bat activity with time and local climate change. The main question is how exactly bats respond to variations in time and riparian ecosystem factors? One explanation is that later times, increased cover, and warmer temperatures, stimulate bat activity. Over the course of 1 month, September to October, climate data (humidity and temperature) were collected with a weather reader during each recording session. A Wildlife Acoustics Echo Meter® Touch 2 was used for each recording session in order to assess bat feeding activity. Recording intervals at each site lasted 15 minutes and fell between 7:00 to 10:00 PM. Warmer temperatures and humidity were not found to significantly affect the activity of bats. However, increased availability of cover and later recording sessions were positively correlated with bat activity. When considering what makes bats active over short periods of time, this study suggests that temporal and structural ecosystem factors like cover may have a greater influence over their stimulation than

quickly assumed climatic variables. These results support the importance of conserving forested land, as it provides shelter and foraging opportunities for bat species who help maintain stream ecosystems.

Poster Board No. 55 - STREAM FISH ASSEMBLAGES AND PHYSICAL HABITAT CHARACTERISTICS IN A DISTURBED HABITAT. Donald Adair, dadair@muskingum.edu, (Danny Ingold, ingold@muskingum.edu), Muskingum University, Biology Dept., 163 Stormont St., New Concord OH 43762.

Surface mining operations have been shown to have profound negative impacts on stream communities situated close to mining operations. Reclamation efforts should help to mitigate such impacts, and the amount of time since reclamation should be positively associated with stream recovery. Fish species abundance and diversity within stream communities serve as reliable indicators of overall stream health. During September and October 2017, fish species abundance and diversity were surveyed in 2 stream segments, each sampled twice per month, located in Muskingum County, Ohio. One segment is surrounded by surface-mined land that was reclaimed over 40 years ago while the other is bordered by roads and residential land plots. The objectives of this study were to determine the extent to which fish assemblages at these sites potentially differ and to compare these results with the findings of a similar study conducted at these sites 5 years prior. Physical habitat characteristics such as sediment composition, overhead cover, and woody debris in stream were noted. In addition, several water quality parameters were measured including pH, nitrogen and phosphate levels, and tests for coliform bacteria. The two streams had some overlap in species diversity including an abundance of Creek Chub (*Semotilus atromaculatus*) and various shiners (*Notropis* spp.), along with Trout-perch (*Percopsis omiscomaycus*). Rainbow Darters (*Etheostoma caeruleum*) were found only in the residential stream while Greenside Darters (*E. blennioides*) were found only in the reclaimed stream. The reclaimed stream segment also had a greater salinity and more total dissolved solids compared to the residential stream.

Poster Board No. 56 - ADDITIONS TO THE FRESHWATER DINOFLAGELLATE FLORA OF OHIO. Susan Carty, scarty@heidelberg.edu, Heidelberg University, Department of Biological and Environmental Sciences, Tiffin OH 44883.

Dinoflagellates are microscopic algae found among other algae in lakes and ponds. Algae are well studied in Ohio and there are many reports that include dinoflagellates. The hypothesis for this work is that there are more than the 54 taxa previously reported. Single samples were collected at each location with a 10 µm plankton net and micrographs taken using a compound microscope and a scanning electron microscope to aid identification. Five additional species are reported including *Borghiella tenuissima* from Willow Creek, *Palatinus apiculatis* from a pond in Tiffin, *Peridinium weirzejskii* from Sauerwein Pond at Heidelberg University in Tiffin, and *Chimonodinium lomnickii* and *Kansodinium ambiguum* from Cuyahoga Valley National Park. It is expected that there are additional species in Ohio.

Poster Board No. 57 - PRODUCTION OF ECONOMICALLY VIABLE PRAWN (*MACROBRACHIUM ROSENBERGII*) AND YELLOW PERCH (*PERCA FLAVESCENS*) BY UTILIZING BOTH WATER AND WASTE FROM A MULTI-TROPHIC AQUACULTURE SYSTEM. Neal E. Kolonay, nealk@bgsu.edu, Lana Neff, lneff@bgsu.edu, Kevin J. Neves, kneves@bgsu.edu, Bowling Green State University, 217 Life Sciences Building, Bowling Green OH 43403.

Aquaculture, the farming of aquatic organisms, and hydroponics, the farming of plants in a soilless environment, are two very important sources of food and nutrition throughout the world. Integrated multi-trophic aquaculture (IMTA) employs the use of several classes of organisms in a single system to create numerous organisms of economic viability, produce a large harvest in a brief amount of time, and to increase the sustainability and productivity of aquaculture systems. A system was built in the greenhouse at Bowling Green State University utilizing *Perca flavascens*, *Macrobrachium rosenbergii*, and 4 vegetable crops: *Lactula sativa*, *Brassica oleraea*, *Ocimum basilicum*, and *Thymus vulgaris*. Two goals were investigated during this project. The first was measuring the growth of *Perca flavascens* and *Macrobrachium rosenbergii* in a freshwater IMTA system. The other goal was to calculate the economic efficiency of the IMTA system by measuring growth parameters and costs. To date, there has been measurable growth in the *Perca flavascens* and *Macrobrachium rosenbergii*. After 49 days, the *Macrobrachium rosenbergii* increased from 0.98 grams to 3.70 grams, and the *Perca flavascens* increased from 2.25 grams to an average of 9.90 grams. Unfortunately, the *Macrobrachium rosenbergii* also proved to be opportunistically cannibalistic and survival has been fairly low. Our results show that *Perca flavescens* grow well in these systems, and it would be economically viable to conduct on a large scale.

Poster Board No. 58 - EFFECTS OF PLANT GROWTH IN AN INTEGRATED MULTI-TROPHIC LEVEL SYSTEM. Lana Neff, lneff@bgsu.edu, Neal Kolonay, nealk@bgsu.edu, Dr. Kevin Neves, kneves@bgsu.edu, Bowling Green State University, Department of Biological Sciences, 217 Life Sciences Building, Bowling Green OH 43403-0208.

Aquaculture and hydroponics are an important source of food and nutrition throughout the world and involve the farming of aquatic organisms and plants in environments without soil. Aquaponics is the combination of aquaculture and hydroponics and produces both aquatic organisms and plants efficiently. The idea of aquaponics has been taken to an additional level of complexity recently through the concept of integrated multi-trophic level aquaculture (IMTA). This allows for many different levels of organisms to be grown and reduces waste because the system allows for each organism to utilize the byproducts of another trophic level. A system was built in the greenhouse at Bowling Green State University utilizing 2 organisms *Perca flavascens*, *Macrobrachium rosenbergii*, and four vegetable crops: *Lactula sativa*, *Brassica oleraea*, *Ocimum basilicum*, and *Thymus vulgaris*. Two primary goals were investigated. The first was to measure the height and weight of the plants in the system to determine the growth rate of plants using the nutrients generated. The second goal was to calculate nitrogen and phosphorus consumption rates of the various plants. To date, the plants have grown well, especially the basil and kale, which have grown 4.5 and 13 times their starting weight since the start of the trial. Our results indicate that the plants have effectively removed nitrogen and phosphorus from the water.

Poster Board No. 59 - THE INFLUENCE OF SHADING AND MIXED LEAF LITTER NUTRIENT QUALITY ON THE DECOMPOSITION RATES PRODUCED BY STREAM SHREDDER INVERTEBRATES. Harrison D. Raub, hraub@muskingum.edu, (Jim Dooley, jdooley@muskingum.edu), Muskingum University, 199 Stormont St., New Concord OH 43762.

Changes in leaf litter inputs from riparian vegetation has been shown to have important impacts on abundance of shredder invertebrates and higher trophic levels within streams. The main mechanism of leaf litter decomposition is the consumption of coarse particulate organic matter within leaves by shredder invertebrates, but the rate is most dependent on the nutrient quality of leaves. Mixed nutrient leaf packs have been found to generally decompose faster than individually high or low nutrient quality leaf packs, while shading of leaf packs has had more varied results. The objective of this research was to determine

how both shading and mixed nutrient quality leaf litter can influence the decomposition rates by shredder invertebrate populations. Three treatments of leaves in 10 mm mesh bags were placed in both lighted and shaded reaches of Salt Creek in Muskingum County, Ohio, including: a high nutrient species, American elm (*Ulmus americana*); a low nutrient species, white oak (*Quercus alba*); and a mixed nutrient quality pack of both. Each leaf packet treatment (n=4) was retrieved after 2 and 6 week periods to record mass loss and invertebrate abundance. Initial results indicate decomposition occurred faster in both packs of mixed and high nutrient quality leaves over low quality, while overall lighted treatments decomposed faster than shaded ones. Shredder abundance also appeared to be low throughout all treatments. A two-way analysis of variance will be conducted to determine if significant relationships exist involving shading and nutrient quality treatments on both decomposition rates and shredder abundance.

Poster Board No. 60 - THERMAL REFUGE OF JUVENILE STEELHEAD TROUT IN THE CUYAHOGA VALLEY. Dillon Weik, dweik@bgsu.edu, Christopher Kemp, ckemp@bgsu.edu, (Jeffrey Miner, jminer@bgsu.edu), Bowling Green State University, Aquatic Ecology & Fisheries Lab, Department of Biological Sciences, Bowling Green OH 43403.

Steelhead Trout (*Oncorhynchus mykiss*) is a popular sport fish that has been introduced and stocked in the Great Lakes, creating a productive recreational fishery. However, the impact of non-native Steelhead Trout on the native fish community of cold-water tributaries in the region is unresolved. This study was conducted in 2 large mainstem tributaries of Lake Erie during summer 2017. It was hypothesized that juvenile Steelhead Trout would use the mainstem during early summer, but then move into cool-water refugia as mainstem temperature increased. Fish communities were characterized in these habitats during 6 sampling trips through summer. Continued studies will be comparing the communities in association with temperature variables (e.g., temperature differences, and temperature relative to critical thermal maxima). Preliminary results suggest that in mid-summer, juvenile Steelhead Trout were relegated to the cool-water streams and thus had the potential to compete with native species in this habitat. To access this potential, diets will be compared of the 3 species: Steelhead Trout, Redside Dace (*Clinostomus elongatus*), and Creek Chub (*Semotilus atromaculatus*). It is hypothesized that Steelhead Trout and Redside Dace feed primarily on terrestrial invertebrates, and thus will exhibit the greatest potential for food resource competition. From our study, we will compare the spatial and temporal overlap of juvenile non-native Steelhead Trout with native fish species in cool-water refugia of Lake Erie tributaries throughout the summer and highlight the potential for competition between the 2 groups.

Poster Board No. 61 - AN EVALUATION OF CHANGE IN THE UNIONIDAE IN THE LOWER ROCKY RIVER FROM 2011. Jamil H. Wilson, j.h.wilson@vikes.csuohio.edu, Robert A. Krebs, r.krebs@csuohio.edu, Cleveland State University, Dept. of Biological, Geological, and Environmental Sciences, 2121 Euclid Ave., Cleveland OH 44115.

The Rocky River is one of many moderately sized Ohio tributaries of Lake Erie sufficiently large to possess a diverse assemblage of freshwater mussels in the family Unionidae. The regional development of natural conservation efforts to improve water quality was hypothesized to improve the mussel assemblage. The present study sought to determine changes in freshwater bivalve populations since original surveys in the northern region of the river conducted in 2001. Visual and physical touch survey methods were incorporated to locate mussels, all conducted when water levels were low and clear. Water quality was assessed from the records of the Ohio Environmental Protection Agency. Time spent at each survey site ranged from approximately an hour and a half to almost 3 hours, and depended on the extent of its geographic structure, variation in habitat, and presence of live mussels. Live mussels (n=69) were collected along with empty shells (n=58), most of which were found in 2 distinct but separate locations. The total assemblage consisted of 8 species in comparison to the 9 that were seen in the same area in 2001, but large shifts in relative abundance occurred. *Leptodea fragilis* populations decreased precipitously. Populations of *Lasmigona costata* and *L. complanata* may be increasing, and the presence of young individuals suggested recruitment, but only of these two 2 species. Mostly older specimens of other species were found, which suggests overall a decrease despite improvements in water quality that has been taking place throughout the Lake Erie watershed.

Poster Board No. 62 - AN UPDATE OF MUSSEL POPULATIONS THROUGHOUT THE UPPER CUYAHOGA RIVER WATERSHED. Rachel E. Andrikanich, r.andrikanich@vike.csuohio.edu, Robert Krebs, r.krebs@csuohio.edu, Cleveland State University, Department of Biological, Geological, and Environmental Sciences, 2121 Euclid Ave., Cleveland OH 44115.

The Cuyahoga River is one of America's heritage rivers, the former poster-child for the Clean Water Act (1972), and in the upper reaches, part of Ohio's Scenic River program. As such, the Cuyahoga River has been one of the most protected streams in the country since the 1970s. Water quality is now within acceptable limits outlined by Ohio Environmental Protection Agency, shoreline integrity has increased throughout the watershed, and sediments mostly test free from toxins and heavy metals. With water quality recovery, freshwater mussels (family Unionidae) were expected to increase in the upper Cuyahoga River or at least sustain abundance and richness levels reported in the 1990s. To test for levels of change, timed surveys of 2 person hours were made at 25 sites chosen based on proximity of roads or foot paths along the river in 2012 and these surveys were repeated using the same approach in 2016. However, only 389 mussels of 8 species were found in 2012 and just 111 of 4 species in 2016. These results present a declining trend and significant losses at many sites based on categorical analysis of binomial probabilities. Mapping relative abundance against the physical habitat suggested that the decline of freshwater mussels is a complex problem that may involve impoundments, flow dynamics below dams, and sediment stability. Restoring natural flow regimes, in addition to protecting habitat, are critical to support successful reproduction and survival in this imperiled fauna moving forward.

Poster Board No. 63 - AQUATIC COMMUNITY CHARACTERISTICS ASSOCIATED WITH EMERGENT MACROPHYTES OF COASTAL LAKE ERIE WETLANDS. Jaimie L. Johnson, jaimiej@bgsu.edu, Jeffrey G. Miner, jminer@bgsu.edu, Bowling Green State University, Aquatic Ecology & Fisheries Lab, Department of Biological Sciences, Bowling Green OH 43403.

Wetlands are important features of an ecosystem, especially in the Great Lakes region because they provide habitat for many species of all taxonomical levels; add economic value to the area by means of hunting, fishing, trapping, birdwatching, and other recreational activities; and they act as a natural filter by removing excess nutrients and toxins prior to reaching main water reserves. However, invasive macrophytes, such as European frogbit(*Hydrocharis morsus-ranae*), may negatively impact wetlands and increase the difficulty to properly manage wetland ecosystems services. Thus, the central focus of this study is to determine the abiotic and biotic wetland community characteristics that differentiate these aquatic macrophyte habitats. Monotypic patches of 4 different species of macrophytes, including open water (n=27), were sampled at Ottawa National Wildlife Refuge in July and September of 2017. Data

was collected on water chemistry, sediment nutrients, macrophyte biomass, periphyton growth, zooplankton, macroinvertebrates, fish, and water birds associated with each sample site. Dissolved oxygen measurements were taken at each site and showed extreme hypoxic conditions within sites of *H. morsus-ranae,* reaching levels as low as 0.07 mg/L midday when dissolved oxygen is typically highest. Low oxygen levels, as well as low light attenuation, caused by *H. morsus-ranae* could drive organisms such as fish and macroinvertebrates out of these habitats and prevent the growth of periphyton and submerged vegetation vital for a healthy wetland. This study reinforces the need for more research on how to best eradicate and prevent *H. morsus-ranae* from further invading aquatic ecosystems.

Poster Board No. 64 - IS LAKE WINNIPEG THE NEXT LAKE ERIE? RECENT DREISSENID MUSSEL COLONIZATION MAY LEAD TO MORE TOXIC CYANOBACTERIAL BLOOMS. Katelyn M. McKindles[1], kmckind@bgsu.edu, George Bullerjahn[1], bullerj@bgsu.edu, Paul V. Zimba[2], paul.zimba@tamucc.edu, Alexander S. Chiu[2], alex.chiu@tamucc.edu, Sue B. Watson[3], jkswatson@shaw.ca, Danielle B. Gutierrez[2], Danielle.Gutierrez@tamucc.edu, Timothy W. Davis[1], timdavi@bgsu.edu, [1]Bowling Green State University, 217 Life Science Building, Bowling Green OH 43403, [2]Texas A&M University – Corpus Christi, Center for Coastal Studies, Corpus Christi TX 78412, [3]Water Science and Technology, Environment Canada.

Lake Winnipeg (Manitoba, Canada), the world's 12th largest lake by area, is host to yearly cyanobacterial harmful algal blooms (cHABs) dominated by *Aphanizomenon* and *Dolichospermum*. cHABs in Lake Winnipeg are primarily a result of eutrophication but may be exacerbated by the recent introduction of dreissenid mussels. Since the invasion of dreissenids into Lake Erie has been hypothesized to be one factor promoting the toxic *Microcystis* blooms currently seen in the western basin, this work aimed to analyze the current cyanobacteria population in Lake Winnipeg as an estimation of the effect of dreissenid mussel introduction in Lake Erie. Prior to the invasion, Lake Erie cHABs were a mixed community of *Microcystis*, *Aphanizomenon* and *Dolichospermum*. Surface water samples from Lake Winnipeg were collected in 2013 from 23 sites during summer and 18 sites in fall. Gene, ELISA, and MS-cyanotoxin profiles identified microcystins (MC) as the most abundant cyanotoxin across all stations, with MC concentrations highest in the North Basin. In the fall, *mcyA* genes were sequenced to determine which species had the potential to produce MCs, and 12 of the 18 sites were a mix of both *Planktothrix* and *Microcystis*. Current blooms in Lake Winnipeg produce low levels of MCs, but the capacity to produce cyanotoxins is widespread across both basins. If dreissenid mussels continue to colonize Lake Winnipeg, a shift in physicochemical properties of the lake due to faster water column clearance rates may yield more toxic blooms potentially dominated by *Microcystis*.

Poster Board No. 65 - EXAMINING VOCABULARY TEACHING STRATEGIES USED IN CHILDREN'S EDUCATIONAL TELEVISION SHOWS. Rebecca C. Wettstein, rwettst@bgsu.edu, Alyssa M. Hulthen, ahulthe@bgsu.edu, Mia I. V. Eberts, meberts@bgsu.edu, (Virginia L. Dubasik, vdubasi@bgsu.edu), Bowling Green State University, 706 Napoleon Rd., Apt. 134, Bowling Green OH 43402.

Research to date has offered insight into vocabulary teaching strategies used in educational television shows (Linebarger et al. 2017; Linebarger & Piotrowski 2010), and effects of show viewing on vocabulary learning (Linebarger & Walker 2005; Oetting, Rice, & Swank 1995). This work has examined the use of labeling, defining/mislabeling, repetition of target words, and onscreen print to teach vocabulary, all of which have a growing evidence-base. What has not yet been established is whether vocabulary teaching strategies are consistent within episodes or over time. Since typically developing children learn vocabulary differently than children with atypical development, some strategies may be more effective than others at positively influencing vocabulary learning. If educational programs are purposefully selected based on the use of strategies that work for children with different language profiles, vocabulary outcomes may improve. The aims of this study are to a) explore the frequency with which vocabulary teaching strategies are used in educational television shows for young children, and b) determine whether strategy use is consistent over show air time. Television show selection was determined based on a) show content, b) main focus, and c) age of intended audience. *Word Girl*™, *Sesame Street*®, *Martha Speaks*™, and *Reading Rainbow*® met inclusion criteria. To date, vocabulary teaching strategies in 18 episodes of *Word Girl*™ were coded using a researcher developed coding system and episodes from *Sesame Street*®, *Martha Speaks*™, and *Reading Rainbow*® are in progress. Preliminary data analysis revealed inconsistent patterns of strategy use across episodes of *Word Girl*™ and over time.

Poster Board No. 66 - VARIETY EFFECTS AND MOTIVATED BEHAVIOR. Brittany A. Halverstadt, bhalver@bgsu.edu, H. Casey Cromwell, hcc@bgsu.edu, Bowling Green State University, 212 S. Prospect St., Apt. D11, Bowling Green OH 43402.

Humans and animals respond to diversity in food items by increasing intake and appetitive behaviors; this observed variety effect reflects changes in the motivational value of such rewards. Previous work on the effects of food variety posits 2 main mechanisms by which these motivational changes may come about. Variety may slow habituation processes by decreasing exposure to any one food item, or variety effects may be due to incentive contrast, whereby comparisons between items impact their relative value. The current work uses an experimental operant paradigm with more than 1 level of variety to build on what is known about how reward variety affects motivational processes. Three flavors of sucrose rewards were used to investigate rats' responses to qualitative reward variety in 4 contexts: no, low, and high variety, and a context with no variety but high satiety. The current study also used predictive cues about impending outcomes, allowing examination of the impact of factors such as predictability, and short-term ("micro") variety. The results of this study showed only slight variety effects on incentive contrast and relative reward processes, but several confounding factors could have obscured larger variety effects. The results have implications for deepening our understanding of motivational processes in general, as well as for informing potential clinical approaches to motivation and eating disorders.

Poster Board No. 67 - SYNTHESIS AND CHARACTERIZATION OF NITROSYLATED TRIS-(ETHYLENEDIAMINE) COBALT (III) COMPLEX. Emily A. Cronin, ecronin1@walsh.edu, (Michael J. Dunphy, mdunphy@walsh.edu), Walsh University, 2020 East Maple Street, North Canton OH 44720.

Prior work in our lab demonstrated that nitric oxide release from nitrosylcobalamin is cytotoxic to a variety of cancer cell lines. The nitrosylation (addition of nitric oxide, NO) to tris-(ethylenediamine) cobalt (III) complex (TECC) and, its subsequent characterization, is being performed to study its potential as a nitric oxide delivery agent in anticancer treatment. NO-TECC may be either a nonoate-like compound, or possibly NO may substitute for one of the ethylenediamine ligands. Evidence collected to date suggests that NO-TECC has been successfully synthesized in our lab from TECC suspended in CH_2Cl_2 and continuously pressurized with NO gas at room temperature. Infrared spectral analysis of the resultant solid reaction product shows stretching frequencies (1400 to 1900 cm^{-1}) consistent with possible NO attachment to nitrogen similar to a nonoate. Thin layer chromatography on silica gel resolves 2 compounds, TECC (Rf 0.45) and a potential NO-TECC (Rf

0.35). The TECC and NO-TECC also have distinctively different appearance and odor. Current work includes obtaining elemental analysis (C, H, N and O), obtaining proton and carbon NMR data and doing NO-release profiles as a function of pH. Sulforhodamine B (SRB) assays will also be done with normal and cancer cell lines to assess cancer cell toxicity potential.

Poster Board No. 68 - HUMAN CIC TRANSCRIPTIONAL REGULATOR: COMMON VARIANTS THAT CAUSE FUNCTIONAL CHANGES. Phil Dougherty, pdougher1@walsh.edu, Adam Underwood, aunderwood@walsh.edu, (Thomas Freeland, tfreeland@walsh.edu), Walsh University, Division of Math and Science, 2020 East Maple St., North Canton OH 44720.

The human Capicua protein (CIC) is a transcriptional regulator. Inactive versions of the CIC gene have been found in various cancers including oligodendrogliomas. It is also important in lung development and in liver function. The CIC protein contains the HMG box for DNA binding, along with another DNA binding domain called the C1 domain. Both of these are necessary for recognition of the target DNA sequence in promoters. The goal of the current work is to use homology modeling to determine the 3-dimensional structure of CIC protein in complex with its DNA target, to use a database of human SNPs and other genomic variants to identify common non-synonymous mutations, to map those mutations onto the 3D structure, and to use molecular dynamics to determine if any of the common human variants will change the structure or DNA binding properties of CIC protein. Evolutionary analysis will be used for identifying regions of high conservation in the protein, and in this way the list of human variants will be narrowed to those in the conserved regions. This is part of a larger project in collaboration with HudsonAlpha Institute for Biotechnology in Huntsville, Alabama, the goal of which is to provide a database of human variants that are likely to play a role in human health or disease, based on computer modeling of the variant proteins.

Poster Board No. 69 - GROWTH RATE EFFICIENCY OF *SINULARIA FLEXIBILIS* PROVIDED WITH NUTRIENT SUPPLEMENTS. Emily B. Breech, ebreech@bgsu.edu, Matthew L. Partin, partim@bgsu.edu, Bowling Green State University, Department of Biological Sciences, Bowling Green OH 43403.

The soft coral *Sinularia flexibilis* contains an aqueous alcohol extract that has shown antineoplastic activity against lymphocytic leukemia. It also has other biological properties that work as antimicrobials, anti-inflammatory agents, and cytotoxicity activities. There is much research on the effects of flow rate on growth and morphology and the effects of light-dependency on growth rate. The purpose of this study was to further study *S. flexibilis* and to analyze the effect of adding coral food and how it may enhance the growth rate. Two artificial coral trees with 7 polyp-bearing colonies of 5 cm to 6 m attached to aragonite coral plugs were placed in the same tank to keep light intensity, salinity, and flow the same for the two colonies. A large tube was crafted from Sibe Polymer and Marineland® Aquarium Sealant and placed over one of the coral trees Monday, Wednesday, and Friday for 5 weeks to separate it from the other tree in the tank. Inside the tube, the corals were fed and left to absorb the food, Corilific Delite™, for 10 minutes. When analyzed graphically, the colonies that were fed showed inconsistent growth rates compared to those that were used as the control. Since the food was dropped on the corals similar to how sediment is dropped on them from dredging, it is possible that the corals experienced stress similar to sedimentation in the ocean and grew inconsistently. Further testing is required to confirm these possible results.

Poster Board No. 70 - FOOD PREFERENCES OF CRESTED GECKOS, *CORRELOPHUS CILIATUS*. Melanie L. Heldman, mheldma@bgsu.edu, Amanda M. Paisley, apaisle@bgsu.edu, Haya N. Saadeh, hsaadeh@bgsu.edu, Madison P. Swihart, swiharm@bgsu.edu, (Eileen M. Underwood, eunderw@bgsu.edu), Bowling Green State University, Department of Biological Sciences, Bowling Green OH 43403.

Crested geckos, *Correlophus ciliatus*, are becoming more common as pets. In addition, more types of food for crested geckos are available in the pet market. Differences in food type were hypothesized to cause differences in the growth of the crested geckos. Two food types were examined: Pangea Fruit Mix™ Complete Watermelon & Mango Gecko Food and Pangea Fruit Mix™ Complete with Insects. A third group, mixing the two, was added to account for the prior taste effect of geckos who had previous experience with the Watermelon & Mango food. The geckos were split into 3 groups (n=15 per group) and they were offered fresh food 3 times a week. The geckos' growth was monitored through weight and length. They were weighed and photographed every 2 weeks. Length was calculated from photographs using "Snake Measure Tool" software. Initial observations, from the first 2 months, suggest that the geckos offered food containing insect protein showed greater growth than either of the other groups.

Poster Board No. 71 - EXPOSURE OF FUNGAL EXTRACT TO CANCER CELL LINES. Ching-Wen Lin, linc@findlay.edu, University of Findlay, Dept. of Biology, 1000 N. Main St., Findlay OH 45840.

Fungi have been used to produce food and traditional medicines throughout the world for thousands of years. Fungi contain a large number of organic molecules but their effects on human cells and their bioavailability remain unclear. Some fungi show cytotoxicity that can inhibit growth and kill cancer cells, thus making them of potential therapeutic value. In this research, a variety of fungal specimens were collected from various locations throughout Ohio and isolated in pure culture. Samples from each genus species were extracted using ethylacetate/water partitioning. HCT-116 cells derived from human colon cancer, SKMel a melanoma derived cell, and Hela cells derived from cervical cancer were counted and equal seeding density applied to tissue culture plates. After 2 days, diluted fungal extracts (1:2,000 and 1:5,000) were added to the plates. The cells were observed daily for colony size. After 7 days, the cells were stained with crystal violet and colonies were counted as a measure of viability. Of the multiple extracts tested, only #606 demonstrated statistically significant cytotoxicity, at the exposure conditions, with a p-value less than 0.05. The compound(s) in extract #606 responsible for cytotoxicity and its mechanism of action, however, remain unknown.

Poster Board No. 72 - EFFECTS OF CADMIUM CONTAMINATION IN SOIL ON POLLINATION SERVICES. Rachel E. McLaughlin[1,2], mclaughlin.384@osu.edu, (Frances S. Sivakoff[1], sivakoff.3@osu.edu), Mary M. Gardiner[1], gardiner.29@osu.edu, [1]The Ohio State University, Columbus OH, [2]3741 Ronda Ct., Springfield OH 45502.

Urban agriculture has grown in popularity across many cities throughout the world. Many of these cities have industrial pasts, resulting in soils contaminated with heavy metals such as lead (Pb), cadmium (Cd), and copper (Cu). Heavy metals are known to adversely affect human health, but their effects on the pollinators providing critical pollination services to urban agriculture are largely unknown. The objective of this study was to understand the effects of Cd contamination on bees' pollination services. Previous work has found Pb contamination in soil decreases the length of bee visits in sunflowers, but it is unknown whether similar results on pollinator behavior could be expected with Cd. Even if pollinator behavior is different, this may not translate into differences in seed production. Sunflow-

ers grown in Cd-contaminated soil are expected to receive fewer pollination services than those grown in control soil, resulting in lower seed set. Mature sunflowers grown in the greenhouse in 3 soil treatments (uncontaminated potting media, and media with either 10 ppm or 50 ppm Cd, (n=24) for each treatment), will be placed into the field and left open to pollination for 6 hours on 3 days. Additional flowers from each soil treatment will be either hand pollinated (n=24) or pollinators excluded (n=24) to compare seed set to those naturally pollinated. Flowers will be maintained in the greenhouse and their resulting seeds counted. Generalized linear models (GLMs) will be used to determine if heavy metal contamination influenced pollination services (sunflower seed count, sunflower seed weight).

Poster Board No. 73 - ODD GENE AND THE RELATIONSHIP OF PATTERNLESS SNOW AND BLIZZARD MORPHS IN THE CORN SNAKE *PANTHEROPHIS GUTTATUS*. Samantha L. Sanders, slsaman@bgsu.edu, Eileen M. Underwood, eunderw@bgsu.edu, Bowling Green State University, Department of Biological Sciences, Bowling Green OH 43403.

The BGSU Herpetarium has conducted genetic projects with corn snakes (*Pantherophis guttatus*) for many years, and in 2005 discovered a new pattern morph named *odd* for the unusual saddle thickness displayed. This study focused on the *odd* gene's relationship to blizzard and patternless snow morphs, two color morphs that make the individual appear all white with little to no pattern. Initially the patternless snow morph was attributed to an interaction between the *odd* gene and the snow morph. The hypothesis of this study was that original patternless snow individual carried blizzard in its genetic background, and the lack of pattern was not due to the *odd* gene. Genetic crosses were established and offspring morphs recorded. Pedigrees were generated to trace these morphs back to the original patternless snow individual carrying the *odd* gene to determine the genotype of the parents. It was determined from this that the individual did have blizzard in its background and thus the patternless snow morph was due to that instead of the *odd* gene. This study also reinforced past findings that the fertility rates of *odd* individuals tend to be low compared to individuals without the gene. The fertility of *odd* females was 13 to 20% (n=5), while that of *odd* males was 60 to 100% (n=11), comparable to the control crosses. Thus female fertility was reduced. An unexpected result was a change in the pattern of *odd* offspring, many of which displayed a spotted pattern as if the narrow saddles were missing the central region.

Poster Board No. 74 - COMPARISON OF TREE SPECIES COMPOSITION AND STRUCTURE OF TWO DIFFERENT FORESTS SURROUNDED BY RECLAIMED SURFACE-MINED LAND. Anna K. Sharier, asharier@muskingum.edu, (Danny Ingold, ingold@muskingum.edu), Muskingum University, Biology Dept., 163 Stormont St., New Concord OH 43762.

Surface mining operations in Appalachia frequently left behind small patches of unmined forests often separated from other forest patches by expansive reclaimed grasslands. Such habitat fragmentation could result in a decline in tree species diversity and abundance in such patches relative to forests in unmined areas. The objective of this study was to compare tree species composition and importance (based on species density, frequency and coverage measures) of 2 forest patches surrounded by surface-mined land that was reclaimed at different times (late 1960s vs. mid 1970s). During September and October 2017, twelve 100 m^2 rectangular plots were established on each of the two 20 to 25 hectare forest patches in Muskingum County, Ohio. Six plots over a 3 week period in September and 6 in October were inventoried at each location. In each plot the number of each tree species were quantified and the diameter at breast height of each tree was obtained. Using data from all 6 plots separately in September and October, importance values for each tree species were obtained. Initial results suggest that box elder (*Acer negundo*), slippery elm (*Ulmus rubra*) and shellbark hickory (*Carya laciniosa*) have the highest importance values on the northern plot (reclaimed in the 1960s), while sugar maples (*Acer saccharum*), red oak (*Quercus rubra*), and shellbark hickory ranked highest at the southern plot (reclaimed in the late 1960s). Our findings suggest that although the species diversity at the 2 sites varied, micro-climate factors are more likely to account for these differences (wetland vs. upland habitats) rather than the timing of surface mining and subsequent reclamation.

Poster Board No. 75 - ETHANOL RESPONSIVENESS OF AN AMBROSIA BEETLE SYMBIONT, *AMBROSIELLA GROSMANNIAE*. Gayathri U. Beligala[1], gbeliga@bgsu.edu, Satyaki Ghosh[1], satyakg@bgsu.edu, Christopher M. Ranger[2], christopher.ranger@ars.usda.gov, Vipaporn Phuntumart[1], vphuntu@bgsu.edu, [1]Bowling Green State University, Department of Biological Sciences, 217 Life Sciences, Bowling Green OH 43403, [2]US Department of Agriculture, Agricultural Research Service.

Several species of exotic ambrosia beetle cause severe damage to nursery plants across United States. This study focuses on *Xylosandrus germanus*, an ambrosia beetle that attacks physiologically-stressed trees that are apparently healthy. Stressed trees produce ethanol as a result of limited oxygen availability caused by stress factors such as flood, drought and freezing. Female *X. germanus* locates stressed tress by their emission of ethanol. They bore galleries in the trees and introduce a symbiotic fungus, *Ambrosiella grosmanniae,* which is later used as a food source for developing larvae. The major aim of this study was to determine the responsiveness of *A. grosmanniae* to ethanol that is inherently present in the galleries. Low concentration of ethanol was hypothesized to enhance the growth of *A. grosmanniae*. An agar-plate based assay was used to characterize the effect of ethanol on growth of *A. grosmanniae* using malt extract agar where ethanol was incorporated at 4 concentrations: 0% (control), 1%, 2.5% and 5% (n= 7 to 10 per ethanol concentration). After 6 days, the dry weight and the surface area of the mycelium was determined. The dry weight was significantly increased at 1% ethanol compared to 0% (control) and 5%. Dry weight at 2.5% ethanol was not significantly different from 0%. The surface area at 0% and 1% ethanol was similar followed by a gradual decrease thereafter. These findings indicate that ethanol which acts as an indicator of susceptible trees for ambrosia beetles also increases their survival inside the galleries by promoting the growth of its symbiont *A. grosmanniae*.

Poster Board No. 76 - TOO HOT OR TOO DRY? DIFFERENTIAL SENSITIVITY OF BEES TO CHANGES IN TEMPERATURE AND WATER BALANCE WITH URBANIZATION. Justin D. Burdine, jburdin@bgsu.edu, Melissa E. Seidel, mseidel@bgsu.edu, Dr. Kevin E. McCluney, kmcclun@bgsu.edu, Bowling Green State University, Department of Biological Sciences, 217 Life Sciences, Room 451B, Bowling Green OH 43403-0208.

Urban environments experience elevated temperatures and changes in soil water content with increasing impervious surface. A relationship between imperviousness and bee population demographics has been demonstrated, however little research has investigated the physiological responses of bees to urbanization. This study investigated the thermal and hygric limits and the field body temperature and hydration state for 3 bee genera across an urban environment: *Agapostemon* (sweat bees), *Apis* (honeybees), and *Bombus* (bumblebees). Thermal and hygric safety margins (difference between field condition and physiological limits) for each bee genera were calculated to identify differences across taxa and across varying imperviousness. A total of 195 bees were sampled from 3 urban and 3 rural sites in Toledo, Ohio. Critical thermal maximum (CTmax) and critical water content (CWC) for bee taxa, as well as percent impervious surface, were calculated at

these sites. Linear mixed-effects models and post-hoc multiple comparisons tests revealed significant differences in CTmax ($F_{2,82}=4.085$, $p= 0.02$) and CWC ($F_{2,82} = 62.80$, $p<0.001$) between taxa. For CTmax, *Bombus* had a higher thermal limit than *Apis*, but not *Agapostemon*. For CWC, *Agapostemon* had longer desiccation times and lower CWC than *Apis* and *Bombus*. Mixed-effects models were also used to investigate relationships between thermal and hygric safety margins, and percent imperviousness. Thermal safety margin was negatively associated with landscape imperviousness for *Bombus* and with local imperviousness for *Agapostemon*. Hygric safety margin was negatively associated with landscape imperviousness for *Apis*. These results show that bees exhibit variation in thermal and hygric limits across an urban environment. This study offers some of the first evidence on the impact urbanization has on bee physiological safety margins.

Poster Board No. 77 - EFFECTS OF NUTRIENTS ON INVASIVE FLOWERING RUSH (*BUTOMUS UMBELLATUS*) IN LAKE ERIE DIKED WETLANDS. Erica L. Forstater, eforsta@bgsu.edu, Helen J. Michaels, hmichae@bgsu.edu, Bowling Green State University, Department of Biological Sciences, 217 Life Sciences Building, Bowling Green OH 43403-0208.

Introduced to the Great Lakes Region from Europe before 1900, invasive Flowering Rush (*Butomus umbellatus*, FR) forms monotypic stands that crowd native species and cover open water systems. Factors contributing to invasion persistence and impacts on ecosystem function by this species are poorly understood. This study characterizes vegetation and environmental factors at the Ottawa National Wildlife Refuge, which borders Lake Erie, to understand how sediment nutrient levels in watersheds affect FR invasion. It was hypothesized that increased sediment nutrient levels are important drivers of the invasion success of FR. Sediment nutrient levels and vegetation were sampled within eighty-two 1 m^2 random plots throughout the marsh complex. Vegetation of FR and the 18 other species present were harvested or canopy characteristics were measured to estimate biomass. Flowering Rush was the most abundant of all identified emergent invasive species found, and was found at 55% of the surveyed plots. Average FR rhizome bud count per plot was 509, with a range of 0 to 2760. Flowering rush was found both with and without native species and other invasive species. Sediment nutrient analysis of phosphorus, nitrate-nitrite, and ammonia showed heterogeneity within and across management units, which may indicate the presence of nutrient hotspots across the landscape. Average water depth across all plots was 38.15 cm, whereas average water depth at locations with FR present was 31.58 cm. These data will inform future experiments testing FR and native species response to non-point-source nutrient additions, which will help to manage coastal wetland biodiversity and the ecosystem services provided by them.

Poster Board No. 78 - TOPOGRAPHICAL INFLUENCES ON MIGRATORY ORIENTATION ALONG THE SOUTHWEST COAST OF LAKE ERIE. David V. Gesicki[1], dgesick@bgsu.edu, Verner P. Bingman[2], vbingma@bgsu.edu, Bowling Green State University, Bowling Green OH 43402, [1]Department of Biological Sciences, [2]Department of Psychology.

Identifying migratory pathways is critical for understanding the risks affecting migratory birds. Large expanses of open water are a potential challenge during migration because of increased mortality and the energetic cost of flight "detours." Therefore, migratory birds face tradeoffs between the risk assumed by overwater flights and minimizing energy or time. However, it may favor a bird energetically to deviate their flight paths by following coastlines or, in many cases, there may be an optimum detour involving a shortcut across a smaller fraction of the obstacle. We investigated the patterns of nocturnal bird migration in spring at 3 coastal sites and 1 inland site on the southwest coast of Lake Erie by means of a passive infrared device. The directions of the coastlines differed by 35° at the 3 coastal sites, which were 16 km apart. Observations across 50 nights were made from civil sunset through civil sunrise when conditions permitted. Generally, mean track directions of birds observed along the coast differed from the prevailing broad front direction (NNE), suggesting a counterclockwise shift in orientation which may reduce the extent of an overwater flight. The mean track direction differed between sites, suggesting some local influence of the underlying topography on orientation behavior. The propensity of birds to deviate from the broad front direction was significantly higher at coastal sites where the orientation of the coastline has a more northerly component. The results suggest birds actively shifting their migratory orientation in an energetically meaningful way upon arrival to the Lake Erie coast.

Poster Board No. 79 - THE EFFECTS OF INCREASING PRECIPITATION LEVEL AND SHIFTING STORM DISTRIBUTION ON BIOSPHERIC NUTRIENT CYCLING IN AGRICULTURAL SOIL. Josie C. Lindsey-Robbins, lindsj@bgsu.edu, Shannon L. Pelini, spelini@bgsu.edu, Bowling Green State University, Dept. of Biological Sciences, Bowling Green OH 43403.

Management of nitrogen and phosphorus concentrations in soil is critical for maintaining functioning ecosystems across the planet. In this study, we aimed to investigate how varying precipitation regimes and land-use history affect plant growth and soil nutrient cycling. Using a common garden experiment, we tested the effects of increased precipitation levels and shifted precipitation distributions on nutrient cycles within analogous soil that differs in land-use (i.e., agricultural versus unmanaged forest) in northern Michigan. We measured soil and leachate concentrations of nitrate (NO_3^-), phosphate (PO_4^{3-}), and ammonium (NH_4^+), plant biomass, and carbon dioxide (CO_2) efflux. We found that land-use history impacts nutrient cycling dynamics and responses to altered precipitation regimes. More specifically, agricultural soils, which had over 6 times the PO_4^{3-} and 4 times the NO_3^- of forest soil, leached more of those nutrients over the experimental trial. Interestingly, our data show that current levels of precipitation produce 2 times the levels of NO_3^- in leachate from forest soils when compared to higher levels of precipitation, suggesting that higher soil moisture may retain NO_3^- within soil. In contrast, PO_4^{3-} leaching was most strongly affected by initial PO_4^{3-} concentrations rather than precipitation regime. We suggest that farmers use less N and P fertilizer and adjust the timing of fertilizer application to decrease nutrient saturation and subsequent nutrient leaching in field soils. Since we found no significant difference in plant biomass based on land-use or precipitation, we predict that these changes will have little effect on seedling biomass production in nutrient-saturated agricultural soil.

Poster Board No. 80 - SEED COAT PIGMENT VARIATION AND UV STRESS TOLERANCE IN *LUPINUS PERENNIS*. Haley M. Meek, hmeek@bgsu.edu, Helen J. Michaels, hmichae@bgsu.edu, Bowling Green State University, 331 Life Sciences Building, Bowling Green OH 43403.

Anthocyanin pigments, which provide seed coat pigments and have been associated with UV stress tolerance in plants, are present in the seed coats of legumes such as *Lupinus perennis* a perennial, herbaceous plant. Because Ohio populations of *L. perennis* are polymorphic for seed coat color, this study aims to classify seed coat phenotypes and assess their UV stress tolerances to test the hypothesis that phenotypes with darker color will have higher anthocyanin levels and UV stress tolerance than phenotypes with lighter seeds. Seeds collected by family from 20 wild plants were weighed and imaged under identical light conditions. Image analysis software and chemical analysis were used to determine seed color phenotypes. Seedlings grown from each seed phenotype were subjected to UV and control treatments to determine UV tolerance,

while leaf tissues were analyzed for anthocyanin pigments. Based on image and chemical analyses, 2 main phenotypes were determined to be prevalent in the sampled population: "white" seeds with 0 to 5% pigmentation and "dark" seeds with 40 to 80% pigmentation. It was observed that seed color did not influence seed weight, suggesting that any differences in seedling fitness between families was not a result of differential seed masses but likely due to varying anthocyanin levels. Additionally, differences in pigmentation were observed in seedlings, with UV-exposed plants having darker leaves than control plants, indicating that anthocyanin production was induced. These results suggest that distinct seed color phenotypes may persist in Ohio *L. perennis* populations due to the role of anthocyanins on seedling fitness and UV tolerance.

Poster Board No. 81 - HIGH STRENGTH CHITOSAN MICROPARTICLES INCORPORATED POROUS COMPOSITE SCAFFOLDS FOR BONE DEFECT REPAIR. Turki E. Alahmadi[1], Turki.alahmadi@rockets.utoledo.edu, Janitha M. Unagolla[1], Ambalangodage C. Jayasuriya[1,2], [1]University of Toledo, Department of Bioengineering, Toledo OH 43607, [2]University of Toledo, Department of Orthopedic Surgery.

Chitosan, the second most abundant natural polymer, is a linear polysaccharide frequently used in biomedical applications due to its biocompatibility and biodegradability. The objective of this research work was to synthesize scaffolds with higher mechanical properties that are used for craniofacial defects. Microparticles were made by adding 2% low molecular weight chitosan (w/v) solution in 2% acetic acid dropwise into 1% (w/v) tripolyphosphate (TPP) to cross-link. Scaffolds were prepared with various solutions of 0%, 10%, and 20% (w/w) of calcium phosphate (CaP), KCl at a constant 20% (w/w), and the remainder as microparticles. All solutions were mixed with 1 mL of 2% (w/v) carboxymethyl cellulose (CMC) and 1 mL of 2% (w/v) chitosan solution and 2% (w/v) $CaCl_2$. Mechanical testing for compressive strength was performed with the ADMIT testing machine. The 10% scaffolds in the dry state had the highest compressive strength at 26.86 MPa and the 20% scaffolds had the lowest compressive strength at 4.7 MPa. Wet scaffolds in phosphate-buffered saline (PBS) did not show any significant difference in compressive strength between the various CaP percentages. The scanning electron microscopy (SEM) micrographs showed a smooth surface of microparticles on the 0% scaffolds while the 10% scaffolds showed rough surface and even rougher on 20% scaffolds. SEM micrographs showed that KCl leached out and created pores at those sites. The live and dead cells assay showed that 10% CaP scaffolds had the most cell attachment. The results are promising and show great potential future projects in bone tissue engineering.

Poster Board No. 82 - INJECTABLE CHITOSAN-NANOHYDROXYAPATITE MICROPARTICLES ENCAPSULATED WITH BMP-2 FOR BONE REGENERATION APPLICATIONS. Okeke, IU[1], Izzyuo@gmail.com, Gaihre, B[1], Jayasuriya, AC[1,2], University of Toledo, Toledo OH 43614, [1]Department of Bioengineering, [2]Department of Orthopaedic Surgery.

Injectable porous spherical particles were fabricated using chitosan biopolymer (CS), sodium tripolyphosphate (TPP), and nano-hydroxyapatite (nHA). Using simple coacervation and lyophilization techniques, chitosan solutions with 0.5%, 1% and 2% (w/v) nHA concentrations were used to obtain lyophilized spherical scaffolds of 1.33 mm (n=25) mean diameter. Portions from each lyophilized scaffold group were soaked and dried to obtain Lyophilized Soaked and Dried (LSD) scaffolds of 0.93 mm (n=25) mean diameter; a promising property for injectability. Scanning electron microscopy images revealed scaffold porous surface morphology and interconnected pore structures < 10 µm and 2 µm, respectively. Ultimate compressive strength (UCS) of 8.59 MPa and 3.93 MPa were observed for 2% nHA/chitosan LSD and 2% nHA/chitosan lyophilized scaffolds. One-way ANOVA results showed significant increase ($p < 0.001$) in the UCS of 1% and 2% nHA/chitosan lyophilized scaffolds compared to that of 0% and 0.5%. Additionally, 2% nHA LSD scaffolds had significantly increased ($p<0.005$) their mean UCS by 120% compared to 2% nHA lyophilized scaffolds. The cumulative release data indicated that about 87% of total BMP-2 encapsulated within the particles was released by the third week of experimental period. Degradation study conducted at 37 °C also showed BMP-2 release from the 2% nHA/CS particles over the 3 weeks period was governed by simple diffusion rather than the degradation of particles.

Poster Board No. 83 - LEAF EXTRACTS OF *ACER SPP.* CAUSE DIFFERENT PATTERNS OF TOXICITY IN BIOASSAYS OF EQUINE ERYTHROCYTES. Amanda M. Drake, amanda.drake@otterbein.edu, Jeffrey S. Lehman, jlehman@otterbein.edu, Otterbein University, Department of Biology and Earth Science, 1 South Grove Street, Westerville OH 43081.

While red maple (*Acer rubrum*) is the most common maple reported to cause maple toxicosis (i.e., a debilitating condition that occurs in equines after the consumption of dried or wilted maple leaves), other maple species are also toxic. Previously reported is that extracts from *A. saccharinum* cause similar levels of damage to equine erythrocytes. While the toxic agent(s) is unknown, the development of hemolytic anemia and methemoglobinemia in equines suggests it is a strong oxidant. The objective of this research is to evaluate the toxicity of dried samples of 35 maple species. Leaves (n = 10 to 15) were collected, dried, and ground. The toxin(s) were extracted in buffer and incubated with erythrocytes. Toxicity, as measured by area under hemolytic curve (AUHC) and percentage methemoglobin (%M), was quantified based on the absorbencies of erythrocyte/extract suspensions at 560, 576, and 630 nm. Species were ranked for AUHC and %M. Levels of toxicity for *A. buergerianum* (AUHC = 56, %M = 82) and A. freemanii (AUHC = 53, %M = 64) were higher than levels for *A. rubrum* for both AUHC and %M (35 and 59, respectively), while levels for *A. campestre* (AUHC = 21, %M = 0) and *A. japonicum* (AUHC = 29, %M = 47) were lower for both. Levels of toxicity for *A. cappidociumand* and *A. pensylvanicum* were higher than *A. rubrum* for AUHC (51 and 58, respectively) but lower for %M (2 and 7, respectively) while the level of toxicity for *A. griseum x nikoense* showed the opposite trend (low AUHC = 24, high %M = 66). These four different patterns support the possibility of more than one toxic compound responsible for causing maple toxicosis.

Poster Board No. 84 - ECOLOGICAL CORRELATES WITH DIOECY IN THE FLORA OF A TROPICAL PREMONTANE WET FOREST IN COSTA RICA. Breanne L. Held, breeheld9517@gmail.com, Jeffrey S. Lehman, jlehman@otterbein.edu, Otterbein University, Department of Biology and Earth Science, 1 South Grove Street, Westerville OH 43081.

Historically, selection to enforce outcrossing has been the primary explanation for the evolution of dioecy. In contrast, many scientist argue that the selection of dioecy is driven by ecological traits that influence male/female fitness and seed dispersal. The objective of this study was to examine the association between plant sexual system with various ecological traits for the flora of a tropical wet forest in Costa Rica. This study included 313 angiosperm species in 216 genera and 83 families that were characterized for sexual system, growth form, flower size, fruit type, and seed number. Fisher's exact tests were conducted to determine the relationship between each of the ecological characteristics and sexual systems. The null hypothesis for all comparisons is that the proportionate representation of hermaphroditic, monoecious, or dioecious species in the various categories is not significantly different from the distribution of species for the entire flora. Of the total 313 species, 229 (73.2%) were hermaphroditic, 41 (13.1%) were monoecious, and 43 (13.7%) were dioecious. In analyses of species, dio-

ecy was associated with woody growth ($X^2 = 8.53$; $P = 0.03$); tiny flower size ($X^2 = 7.37$; $P = 0.04$), few seeds ($X^2 = 13.82$; $P < 0.001$), and fleshy fruit ($X^2 = 9.18$; $P = 0.003$). Results agree with those of other published works and suggest that dioecy is heavily driven by 1) woody growth (i.e., long-lived, perennial growth), 2) flower size (i.e., tiny, inconspicuous, flowers pollinated by generalized pollinators), 3) fruit and seed characteristics (i.e., fleshy, single-seeded fruits dispersed by specialized frugivores).

Poster Board No. 85 - CYTOTOXIC EFFECTS OF PHOSPHOCHOLINES IN HUMAN MONOCYTIC U937 CELLS. Matthew Buchfellner[1], buchfellnerm@findlay.edu, Kelly O'Connell[1], Ritesh Mittal[2], Benjamin Travis[2], PSS Rao[1], [1]The University of Findlay, Pharmaceutical Sciences, College of Pharmacy, 1000 N. Main Street, Findlay OH 45840, [2]Anatrace Inc., 434 W. Dussel Dr., Maumee Ohio 43537.

Cancer is a progressive and, often, lethal disease marked by the uncontrolled growth and spread of abnormal cells. As per the American Cancer Society, this year an estimated 62,000 new cases of leukemia will be reported in the United States. Amongst the various kinds of leukemia, acute myeloid leukemia (AML) is projected to be the most lethal type of leukemia in the United States. Given the lack of selectivity (cancer vs. non-cancer cells) amongst the available cytotoxic agents, our aim was to assess the efficacy and mechanism of action for novel phosphocholines. Development of a selective and potent chemotherapeutic agent is expected to improve the prognosis in AML patients. To test our hypothesis, human monocytic leukemia U937 cells were treated with 9 different phosphocholines (at 10 and 100 μM) for 24 h to determine the cytotoxic effects of these agents. The cytotoxic effects were determined using the XTT assay. Upon identifying the lead compound, C16, a dose-response curve for C16 was also established in U937 cells. To confirm apoptosis, the activation of caspase-8 and -9 upon C16 treatment was determined in U937 cells using the respective caspase activity kits. The cytotoxic effects of novel phosphocholine, C16, in U937 cells was found to be associated with a significant ($p < 0.05$), dose-dependent activation of caspase 8. Based on the promising results, future studies will focus on further delineating the mechanism of action of C16 phosphocholine and analyzing the selectivity of cytotoxic effects in U937 vs. health human monocytes.

Poster Board No. 86 - MECHANISMS OF DISRUPTION SIZE DEPENDENT MEMBRANE REPAIR IN MAMMALIAN CELLS. Andrew J. Fernandez, Fernandez.254@buckeyemail.osu.edu, Kevin McElhanon, Kevin.McElhanon@osumc.edu, (Noah Weisleder, noah.weisleder@osumc.edu), The Ohio State University, Department of Physiology and Cell Biology, Dorothy M. Davis Heart and Lung Research Institute, 473 W. 12th Ave., Columbus OH 43210.

Cellular membrane repair is a fundamental feature of eukaryotic cells that allow them to survive damage to the lipid bilayer that must be repaired or the cell will die. Therefore, a swift method of membrane repair must be available to the cell. This study will test the hypothesis that membrane disruptions of differing sizes will initiate different cellular mechanisms of membrane repair. Mouse C2C12 myoblast cells will be damaged using a biolistic gene gun with silica particles ranging from the nanometer to micrometer size range, propelled using helium gas at 1100 pounds per square inch. The injured cells will be tested for quantifiable amounts of damage, caused by the particles, with multiple assays. For example, Lactate dehydrogenase release is a colorimetric assay that measures the amount of exchange between the cytoplasm and extracellular fluid. Propidium iodide staining shows the amount of dead and viable cells in a cell population by staining them with a fluorescent dye. Similarly, the diolistic test transfers fluorescent dye into the cells to show the number of cells impacted by the particles. These tests can be used to create a protocol that can consistently create an equal amount of damage using differing particle sizes. Then, western blots can be used to measure the phosphorylation of the PI3 kinase (PI3K) signaling pathway, which has been shown to be one pathway regulating membrane repair. The absence of pathway activation will suggest the injury was repaired by another mechanism such as thermodynamic resealing.

Poster Board No. 87 - SYNTHESIS OF A SILSESQUIOXANE-BASED SUPRAMOLECULAR POLYMER. Rachel Bianculli, rbiancu@bgsu.edu, Alexis Ostrowski, (Joseph Furgal, Furgalj@bsgu.edu), Bowling Green State University, Overman Hall, 1001 E. Wooster St., Bowling Green OH 43402.

Research toward smart materials, specifically self-healing polymers, is an expanding topic within the materials science field. These materials rely heavily on dynamic cross-linking that is achieved by inducing different degrees of hydrogen bonding, van der Waals forces, etc. This work, demonstrated by research previously done within the Ostrowski research group, shows how coordination bonds of transition metals have been shown to create light activated, self-healing properties. Work done with these light-activated chromium (III) complexes with a poly(butylyene-co-ethylene) backbone have shown how metal—ligand coordination geometries can tune mechanical properties of the polymeric material. However, these materials suffer from being incredibly soft and gel like and lack mechanical strength needed for durable coatings. A collaboration with the Furgal lab aims to make the mechanical and thermal properties of the previously synthesized polymer more applicable through the addition of silsesquioxane and siloxane structures into the polymer matrix, which offer thermal stabilities greater than 300 °C and a tunable modulus. These silicon based compounds will be used as composites (through mixtures) and/or covalently attached to increase the cross-link density, inherent stability and spatial alignment of the previously synthesized metallosupramolecular polymer matrix. The final polymer-silsesquioxane product is hypothesized to have a more rigid and applicable structure for advanced coatings while maintaining or enhancing the optical properties of the polymer. Thus far, we have successfully made and characterized two siloxane-diethylene glycol monomers and made and began characterizing two co-polymers which will be composite additives to the metallosupramolecular polymer matrix.

Poster Board No. 88 - THE ROLE OF THE TGR5 RECEPTORS AND DEIODINASE II IN 3,4-METHYLENEDIOXYMETHAMPHETAMINE (MDMA, MOLLY)-INDUCED HYPERTHERMIA. Sara R. Bodnar, sbodnar@bgsu.edu, Emily A. Ridge, eridge@bgsu.edu, Jon E. Sprague, jesprag@bgsu.edu, Bowling Green State University, 325 Life Science Building, Bowling Green OH 43403.

Hyperthermia induced by 3,4-methylenedioxymethamphetamine (MDMA, Molly) is one of the most acute life-threatening toxicities associated with MDMA intoxication. Following MDMA exposure, heat is generated through the activation of uncoupling protein 3 (UCP3) while heat dissipation is lost through vasoconstriction, resulting in a thermogenic response that can lead to death. The bile acids receptor TGR5 has been suggested to play a role in cold-induced thermogenesis through its regulation of the thyroid protein catalyst deiodinase II (D2). Because D2 regulates the conversion of T4 to T3 and the subsequent expression of UCP3, the hypothesis tested was that TGR5 and D2 may play a role in the hyperthermia mediated by MDMA. This hypothesis was tested with the recently identified TGR5 receptor antagonist triamterene (TM) or the D2 inhibitor iopanoic acid (IOP). Male Sprague-Dawley rats were treated with TM (50 mg/kg, ip) 30 minutes before or with IOP (50 mg/kg, ip) for 7 days before MDMA (20 mg/kg, sc). MDMA-induced the greatest maximum temperature change (ΔTmax) of 3.7±0.5 °C and temperature area under the curve (TAUC). Both TM and IOP attenuated MD-

MA-induced hyperthermia with ΔTmax of 2.2±0.8 °C and 2.1±0.6 °C, respectively. Consistent with these ΔTmax values, TAUC was reduced with TM or IOP treatment before MDMA. Overall, the present study provides the first suggestion that bile acids may have a potential role in MDMA-induced hyperthermia through their regulation of the TGR5 receptor and D2 activity.

Poster Board No. 89 - ENANTOSELECTIVE FLUORESCENT SENSORS FOR CHIRAL CARBOXYLATES. Johnathon M. Durgala[1], jdurgal@bgsu.edu, Sara Sheykhi, sarshey@bgsu.edu, (Pavel Anzenbacher Jr., pavel@bgsu.edu), Bowling Green State University, Bowling Green OH, [1]707 E. Wooster St., Bowling Green OH 43403.

Due to different biological activities of enantiomers, there are strict guidelines for the quantification and use of chiral compounds by the US Food and Drug Administration (FDA). Thus, the ability to determine enantiomeric excess (ee) in chiral compounds is important for the development of new chiral drugs. Optical spectroscopy-based ee determination is of interest because of the superior sensitivity, short analysis time, and the circumventing of the expensive chromatographic separation. In our study, we used enantioselective Indicator Displacement Assays (eIDAs) for the determination of enantiomeric excess (ee) of carboxylic acids. In this eIDA, we utilize 2 chiral receptors $[(Cu^{II}(1R,2R)$-1,2-N, N'-bisquinolin-2-methyl-diphenyl-1,2-diamine)$]^{2+}$ and $[Cu^{II}(1S,2S)$-1,2-N, N'-bisquinolin-2-methyl-diphenyl-1,2-diamine$)]^{2+}$ in conjunction with Coumarin 343 as a fluorescent indicator. This chiral receptor-fluorophore sensing ensemble is shown to be useful in determination of enantiomeric excess of carboxylic acids including non-steroidal anti-inflammatory drugs (NSAIDs).

Poster Board No. 90 - IMPROVING GAS CHROMATOGRAPH-MASS SPECTROMETRY METHODS FOR THE SEPARATION OF SYNTHETIC CATHINONE DERIVATIVES. Noah M. Froelich[1], noahf@bgsu.edu, (Travis J. Worst, tworst@bgsu.edu, Jon E. Sprague, jesprag@bgsu.edu), Bowling Green State University, [1]715 Third St., Apt B, Bowling Green OH 43402.

The arrival of modern designer drugs brings the need for more accurate and reliable testing methods for these new drugs. These methods must be rapid and useful for more than just one specific drug. A gas chromatograph-mass spectrometer (GC-MS) can be used. This research attempts to shorten the time necessary to analyze 14 synthetic cathinones on a GC-MS while improving separation of isomers by designing creative temperature ramps. Synthetic cathinones were chosen for study because this class of drugs is rapidly growing in popularity and number of variants, faster than some crime labs and laws can keep up. As such, the need for fast and reliable testing is apparent. A common trend in synthetic cathinones that make their analysis difficult are isomers, because their properties are very similar. Taking that trend, and its analytical challenges, into account, this research includes testing with synthetic cathinone isomers that differ only in the position of a substituent on the phenyl ring. The research demonstrates that slowing temperature rate increases can increase the separation of cathinone isomers to an acceptable level for identification without increasing the necessary time for analysis.

Poster Board No. 91 - IRON(III)-POLYSACCHARIDE MATERIALS AS A CONTROLLED FERTILIZER SYSTEM. Zachery R. Hatten, hattenz@bgsu.edu, Bowling Green State University, 132 Overman Hall, Bowling Green OH 43403.

Agriculture relies on nutrient fertilizers for raising crop yield; however, care must be taken during application since rainfall washing of nutrient-rich fertilizers into watersheds has been shown to contribute to the growing prevalence of harmful algal blooms (HABs). Among the essential plant nutrients in conventional fertilizer, phosphate contributes most significantly to the incidence of HABs. This creates a need for phosphate encapsulation into a material that can then be used for targeted and controlled slow-release fertilizer delivery. Our results show that natural biopolymers coordinated to iron (III) provide a biodegradable encapsulation method for phosphate. The biopolymer-iron (III) hydrogels were soaked in phosphate solutions of varying pH. After soaking, the remaining solution was separated from the beads for analysis of phosphate concentration using a colorimetric ascorbic acid-molybdate complex. Introduction of phosphate to the molybdate reagent resulted in blue color measurable at 830 nm in a UV-visible spectrometer. When determining the phosphate uptake into the hydrogel material (milligrams phosphate per 1 gram of hydrogel beads), the phosphate solution pH showed no statistically significant influence on phosphate uptake. In contrast, iron (III) concentration variation was significantly different, where intermediate concentrations of iron (III) showed the most phosphate uptake.

Poster Board No. 92 - EVALUATION OF WASTEWATER TREATMENT TO REDUCE NUTRIENT TRANSPORT. Jenna C. Laib, jlaib@bgsu.edu, Autumn R. Kolk, autumnk@bgsu.edu, Benjamin T. Phillips, btphill@bgsu.edu, (Robert Midden, midden@bgsu.edu), Bowling Green State University, Dept. of Chemistry, Bowling Green OH 43403.

Excess amounts of phosphorus and nitrogen flowing into Lake Erie from agricultural fields in northwest Ohio has led to several harmful algal blooms (HABs). One potential source of those nutrients is manure applied to fields for fertilizer. Manure from confined animal feeding operations (CAFOs) is 95 to 98% water with only ~3% solids and nutrients, thus physical transportation is expensive relative to the value of the agricultural nutrients. Furthermore, once manure nutrients are applied to agricultural fields, they are relatively easily mobilized to waterways by precipitation. More than 700 lab-scale tests have been used to optimize the treatment of CAFO manure with cationic polymers and coagulant, which are commonly used in wastewater treatment plants, to sequester the nutrients as solids separated from water, thus reducing the weight by a factor of 20 and binding the nutrients in a form that greatly reduces its mobility in soils. A pilot test is underway on 8 small plots growing corn: 2 control, 3 with raw manure, and 3 with treated manure. As corn requires more nutrients than other crops, this would test the effectiveness of the treated manure as a fertilizer. Surface and subsurface runoff is collected from each plot separately after a rain event, using automated water samplers, and analyzed for nutrient concentrations of dissolved phosphate, nitrite+nitrite and ammonia and total phosphorous and nitrogen. Loads are calculated for all nutrients based on concentration measures in the runoff and total volume coming off the plots. Preliminary results are promising, showing that the runoff from the fields with the treated manure have significantly lower phosphate levels compared to plots with untreated manure. Work is still being done for improving the results of the other nutrients. Data collection is continuing to determine the ability of the treated manure to promote crop growth relative to untreated manure and to reduce nutrient migration to waterways over the entire growing season, which is the original goal of this research.

Poster Board No. 93 - GLYCATION REACTIONS AND THEIR APPLICATION TOWARDS ALS IDENTIFICATION AND TREATMENT. Kevin Lewis, lewisk1@findlay.edu, Dr. Nathan Tice, tice@findlay.edu, Dr. Darren L. Smith, University of Findlay, Chemistry Dept., 1000 N. Main St., Findlay OH 45840.

Amyotrophic Lateral Sclerosis (ALS) is a disease which affects about 1 out of every 300,000 people in the United States. This neurodegenerative disease removes motor function from the patient at an alarmingly fast rate, leaving a life expectancy of only 2 to 5 years. A true, universal

cause of ALS is still largely unknown given the attention that the disease has had in recent years. One potential cause of ALS is a glycation reaction which inhibits protein function within the body and promotes inflammation. A glycation reaction is one in which an amino acid or protein condenses with the carbonyl of a free carbohydrate to eventually form what is known as an advanced glycation end product (AGE). While AGEs have long been known as causal factors with respect to inflammatory response and chronic disease (e.g., arthritis, heart disease, neurodegenerative disorders), little is understood about chemistry behind AGE formation. The goal of this research was to study how simple amino acids react with common sugars to model the formation of AGEs in the body. Various combinations were tested by reacting the D-form of simple carbohydrates (fructose, galactose, glucose or mannose) and an aryl amine or amino acid (aspartic acid, tryptophan, aniline, phenylalanine, benzylamine). These glycation reactions were run under mild conditions (40 °C, 3 to 4 hours, with acetic acid). Products were isolated as air-stable white solids in reasonable yield (65 to 80%) and characterized by IR, NMR and Mass Spectrometry. NMR analysis did confirm the expected presence of both the alpha- and beta-anomer product.

Poster Board No. 94 - COUNTER-ION AND MECHANICAL PROPERTIES EFFECTS ON PHOTODYNAMICS OF CU(I) COMPLEXES IN SUPRAMOLECULAR POLYMERS. Ankit Dara, ankitd@bgsu.edu, Anton O. Razgoniaev, arazgon@bgsu.edu, Alexis D. Ostrowski, alexiso@bgsu.edu, Bowling Green State University, Center for Photochemical Sciences, Bowling Green OH 43402.

Sensing the viscosity of solutions through structural changes in inorganic fluorophores has been investigated; however, these systems have used ground state changes to sense this change and have focused on solution phase measurements. In contrast, we used changes in the excited state coordination geometry (tetrahedral to square planar) of copper phenanthroline complexes to probe the viscosities of different supramolecular polymer materials. We incorporated $[Cu(dmp)_2]PF_6$ complexes (dmp: dimethylphenanthroline) inside various supramolecular hydrogen bonding polyurethanes (with different viscosities) to sense changes in rotation. We observed that excited state lifetime of the Cu-phenanthroline complexes increases with viscosity of the polymer environment. A recent study also indicated that the counter-ions can also play a role in the dynamic mechanical response in metallopolymers. To further quantitatively explore this effect, we changed the counter-ion of the Cu-phenanthroline complex from PF_6^- to $B(Ph)_4^-$ (both non-coordinating) and performed the time-resolved emission and transient absorbance studies to further characterize the excited state dynamics. Our observations showed a slight increase (about 8 ns) in excited state lifetime for the sterically bulky $B(Ph)_4^-$ counter-ion compared to PF_6^-. However, more data-set is needed to confirm this difference. This effect of counter-ions on excited state lifetime is often overlooked and currently being explored in our lab. These results could be applied for mechanical stress sensing applications, where changes in polymer viscosity that occur when the polymer is stressed would show up as changes in emission lifetime.

Poster Board No. 95 - PHOTO-ISOMERIZATION IN VANADIUM-BASED COORDINATION GELS. Kalani D. Edirisinghe, Ediride@bgsu.edu, Alexis Dee Ostrowski, alexiso@bgsu.edu, Bowling Green State University, Department of Chemistry and Center for Photochemical Sciences, Bowling Green OH 43403.

Metal–coordination has been used in hydrogel materials to introduce new properties and reactivity. In this work we have created gels with different vanadium metal ions as crosslinks, specifically V^{3+} and VO^{2+}. Initial results have shown that gels made from different vandium species exhibit different physical properties such as loss and storage moduli and show some photoreactivity. We have also used simple hydroxy acids having similar functional groups to the polymer matrix. Due to an isomerization of a vanadyl-tartrate complex, the most significant photochemistry is shown with tartaric acid. Tartaric acid is known to be in three types as *d*, *l* and *dl* racemic. It can be assumed that upon irradiation at 365 nm wavelength, the *dd* or *ll* type of vanadyl tartrate (which is purple in color) is formed while upon dark the *dl* type of vanadyl tartrate (which is yellow-brown in color) is formed. The vanadyl tartrate complex incorporated hydrogels kept in dark show up in yellow-brown color whereas the irradiated hydrogels show up in purple. This has shown to be a reversible photoisomerization and these can be developed in the hydrogel matrix to make photoresponsive hydrogels.

Poster Board No. 96 - APPLICATION OF COPPER(II) BASED CATALYSTS INTO METALLO-SUPRAMOLECULAR MATERIALS. Sandeep K. Sahoo, sksahoo@bgsu.edu, Travis C. Green, greentc@bgsu.edu, Alexis D. Ostrowski, alexiso@bgsu.edu, Bowling Green State University, Department of Chemistry, Bowling Green OH 43403.

Transition metal based homogeneous catalysis has shown tremendous potential in synthetic chemistry and had been well studied over the years. Most rare earth metals have been used as sacrificial catalyst in various catalytic transformations due to difficulties in separating the metals out of the reaction mixture. Heterogeneous catalysts have the advantage that they can be separated from the initial reaction, thus increasing the desired non-metal contaminated product and reusability of the catalyst. One way of designing heterogeneous catalysts is by employing a polymer backbone onto a metal precatalyst. By introducing polymers to the catalyst can alter its solubility in catalytic condition depending on the type of polymer used and will act as a heterogeneous catalyst. The aim is to employ metal complexes into a polymer via a metallosupramolecular assembly, which can be catalytically active. Metallopolymers that contain catalytic active Cu (II) were successfully synthesized. These metallopolymers have been shown to be an active precatalyst for catechol oxidation reaction. Currently, there is work being completed on the synthesis and catalytic activities of different Cu(II) based metallopolymer catalysts having different polymer (hydrophobic/hydrophilic) backbone. It is found that the catalyst having more hydrophobic polymer backbone is more catalytic active. Studies suggest that the higher activity might be due to the formation of more stable radical intermediates during the catalytic cycle. Finally, heterogeneity and efficiency of these catalysts will be checked by performing the catalysis solvents in which the catalyst will be insoluble. Hence the catalyst can be recovered from the reaction mixture and can be reused.

Poster Board No. 97 - THE ROLE OF ADIPOSE TRIGLYCERIDE LIPASE IN THE HYPERTHERMIC RESPONSE MEDIATED BY 3,4-METHYLENEDIOXYMETHAMPHETAMINE (MDMA, MOLLY). Jon E. Sprague, jesprag@bgsu.edu, Paul Lungu, p.lungu@vikes.csuohio.edu, Bowling Green State University, 325 Life Science Building, Bowling Green OH 43403.

3,4-methylenedioxymethamphetamine (MDMA) can induce an acute life-threatening hyperthermia. This hyperthermia has been ostensibly linked to free fatty acid (FFA) mediated uncoupling of oxidative phosphorylation in brown adipose tissue and skeletal muscle. The liberation of FFA from white adipose tissue is associated with heat generation in skeletal muscle. Adipose triglyceride lipase (ATGL) is the rate-limiting enzyme for the conversion of triglycerides to FFA in white adipose tissue. The role of ATGL in the hyperthermia mediated by MDMA was examined. The selective ATGL inhibitor, atglistatin (200 µg/kg ip.) was administered 30 minutes prior to MDMA (20 mg/kg sc.). MDMA-induced a hyperthermic response 60 and 90 minutes post treatment. Pretreatment with

atglistatin significantly attenuated this hyperthermic response. MDMA induced a maximum temperature change of 1.68 °C compared to a maximum temperature change of 1.10 °C in the atglistatin/MDMA treatment group. These findings demonstrate that ATGL contributes to the hyperthermia mediated by MDMA.

Poster Board No. 98 - A MATLAB TOOL FOR CLUSTERING CAST ALUMINUM MICRO-PORES. Nathan Rayens[1], rayensnt@miamioh.edu, Tongguang Zhai[2], Pei Cai[2], [1]Miami University, Oxford OH 45056, [2]University of Kentucky, Lexington KY.

This project focused on the development of MATLAB code which was designed to process images of aluminum castings for micro-pores that occurred during solidification. Defining micro-pore clusters and comparing them to macroscopic crack properties could help optimize cast materials in the future. Initially, the code was created to identify the pores in the images by selecting areas that were darker than their surroundings; pore identification was signified in MATLAB with a ring around the fault. This program was then refined so that the code was able to identify faults while ignoring dark bands at the edges of the images. Additional refinements allowed for the grouping of faults that were located within a certain distance of each other. Clusters of pores were then identified with rings of the same color around their constituent pores so that each cluster could be differentiated from the others. Finally, the code was further refined to prevent large, clearly-individual pores from being added to clusters, and to limit the chaining of pores to a specified radius from the central-most pore so they couldn't aggregate into one large cluster across the whole image. Ultimately, the code was able to characterize pore clusters in terms of their sizes, numbers of pores and average distances, in order to identify those clusters at which fatigue cracks were nucleated in the cast aluminum alloys; a critical step towards accurate life prediction of the alloy in engineering applications. While micro-pore clusters have been recognized as the preferred fatigue crack nucleation sites, the quantitative relationship between these pore clusters and crack nucleation could not be established previously.

Poster Board No. 99 - COMPARATIVE STUDY OF CHIP MORPHOLOGY IN DRY, FLOOD COOLANT AND MQL MACHINING OF TI-6AL-4V. Ashutosh Khatri, khatriam@miamioh.edu, Muhammad P. Jahan, jahanmp@miamiOH.edu, Miami University, Department of Mechanical and Manufacturing Engineering, Oxford OH 45056.

The objective of this study is to investigate the patterns of chip morphology for machining titanium alloy Ti-6Al-4V with different machining conditions, such as dry, flood coolant and minimum quantity lubrication (MQL). A series of experiments were carried out using end-milling operation with uncoated and titanium aluminum nitride (TiAlN) coated carbide tools. The cutting feed rate and depth of cut were varied while keeping the cutting speed constant at a comparative higher setting of cutting speed. It was observed that for all 3 machining conditions, dry, flood coolant, and MQL, serrated chips were formed with the chip length varying from 1 mm to 2 mm. The shear bands resulting from dry machining conditions were in greater quantity and more visible than those deriving from MQL and flood coolant machining processes. Another noticeable feature about the chips was that the chips generated in dry and flood machining conditions had burrs on the edges, indicating the possibilities of burr formation on the workpiece during the machining process. These burrs on the edges of the chips were not observed in the MQL conditions, which means there were very few or no burrs formed on the workpiece with MQL conditions. Also, the chips in dry and flood coolant machining with TiAlN coated tools were found to have irregularities towards the tips, indicating built up edge formation on the tool, which is not desired for better surface finish. These irregularities were observed to be fewer in MQL machining conditions. The microstructural analysis of the chips shows that there was severe deformation of the beta (β) phase and a transformation to alpha (α) phase was observed. To conclude, the MQL condition provided better chip morphology, indicating better machining performance, compared to dry and flood coolant conditions for machining of titanium alloy Ti-6Al-4V.

Poster Board No. 100 - IMPROVED DATA FIDELITY IN COORDINATION OF MULTIPLE KINECT™ CAMERAS: SVD, INTERPOLATION, AND JITTER. Pushkar Sathe, pss32@zips.uakron.edu, Shivakumar Sastry, ssastry@uakron.edu, Sriharsha Vankamamidi, Nghi H. Tran, nghi.tran@uakron.edu, University of Akron, Department of Electrical and Computer Engineering, 302 Buchtel Commons, Akron OH 44325-3904.

The Kinect™ camera is a versatile tool that has been used for various applications such as human motion capture, gaming, etc. The skeletal tracking algorithm implementation for this device allows us to efficiently gather 3D joint location data for landmark joints, to track and monitor human motion and activity. Several activities involve complex sequences of motion and a single camera cannot track all the joints due to occlusions. One approach to address this problem is to utilize multiple cameras. This approach implements Singular Value Decomposition (SVD) to infer the rotation and translation matrices for fusing data. When trying to coordinate multiple Kinect™ cameras, some challenges arise such as interpolation and jitter. This study demonstrates the effectiveness of using Singular Value Decomposition in transforming the reference coordinates of the 2 cameras and achieving view invariance as well as a solution to synchronize the data collection in multiple cameras.

Poster Board No. 101 - EXERCISE DISCRIMINATION USING CANONICAL CORRELATION ANALYSIS. Bach Tran, bxt1@zips.uakron.edu, Pushkar Sathe, pss32@zips.uakron.edu, Mohammad Ranjbar, mr130@zips.uakron.edu, Shivakumar Sastry, ssastry@uakron.edu, University of Akron, Department of Electrical and Computer Engineering, 302 Buchtel Commons, Akron OH 44325-3904.

The ability to accurately identify human activities is essential for developing automated rehabilitation and sports training systems. This paper proposes a motion classification approach based on Canonical Correlation Analysis (CCA) that can evaluate the relationship between different groups of body joints and identify the unique movement pattern of each group to achieve this correlation. Assuming the dependence between joints in each data set, CCA is the most appropriate tool to study the interrelationships among all the data sets. In comparison, other multivariate techniques are more specific in terms of restrictions imposed on dependence and independence of variables. In this paper, large-scale exercise motion data, consisting of location measurements of 25 body joints, are organized into multivariate data sets. The canonical correlation coefficients are calculated between all possible pairs of data sets for each exercise to study the correlation patterns. The result shows that the patterns are recognizable and the canonical coefficients are unique for any joint group in each exercise. A classification algorithm is introduced based on this result. This can be used to identify and differentiate exercise types. We aim to use the canonical variables for diagnosing faults in exercises.

Poster Board No. 102 - EFFECT OF LIGHT INTENSITY ON PRODUCTIVITY OF IRISH CONNERS AND ROYAL BURGUNDY BUSH BEANS IN AQUAPONIC CULTURE. Miranda E. Gessner, gessneme@mountunion.edu, (Charles Mcclaugherty, mcclauca@mountunion.edu), University of Mount Union, 1972 Clark Ave., Alliance OH 44601.

Aquaponic culture has potential for food production outside of the growing season or in regions where it is difficult to grow crops. Aquaponics provide a controlled environment for growing plants and fish without requiring pesticides and minimizing the potential for environmental and insect damage. A challenge facing aquaponic systems is providing adequate quantity and quality of light in an indoor environment. This experiment examined the impact of unequal amounts of sunlight exposure on bean plants in a greenhouse aquaponic system. The greenhouse had only south facing windows, creating a light intensity gradient across the grow beds. The system consisted of 3 separate 150-gallon grow beds (filled with expanded clay pellets) connected to a 250-gallon fish tank containing goldfish and cichlids, a filter, and a 200-gallon sump. Photosynthetic performance was assessed using a LI-COR® Photosynthesis System by measuring gas exchange in leaves receiving light intensities ranging from 0 to 2000 µmol m^{-2} s^{-2}. Light response curves constructed using this data showed maximum CO_2 assimilation rates (A_{max}) differed notably between plants receiving different intensities of light. Leaves exposed to more sunlight had A_{max} consistently above 20 µmol m^{-2} s^{-2} whereas leaves on the side of the grow bed exposed to less sunlight had A_{max} between 15 and 18 µmol m^{-2} s^{-2}. Generally, out of about 75 plants, the bean plants exposed to lower light intensities were smaller, had lower fruit production, and had lighter colored leaves in comparison to plants receiving more sunlight, demonstrating the importance of the light environment on plant productivity in aquaponic systems.

Poster Board No. 103 - DEPTH DISTRIBUTION OF PHYTOPLANKTON IN WESTERN LAKE ERIE: CORRELATIONS BETWEEN BUOY AND FLUOROPROBE-DERIVED DATA. Alex J. Johnson[1,2], a.j.johnson32@vikes.csuohio.edu, Douglas D. Kane[2,3], dkane@defiance.edu, Justin D. Chaffin[2], chaffin.46@osu.edu, [1]Cleveland State University, 2121 Euclid Ave., Cleveland OH 44115, [2]The Ohio State University, Franz Theodore Stone Laboratory, [3]Defiance College.

Cyanobacterial harmful algal blooms (cHABs) are a recurring problem in Lake Erie as it is shallow, warming, and prone to nutrient runoff. Since the Toledo "do-not-drink" advisory in 2014, data buoys have been deployed to monitor water-quality parameters in real time to warn against future toxic blooms. Data buoys are located 0.7 meters below the surface while water-intakes draw water at lower depths. For this research, water was sampled at meter intervals, from 0 to 5 meters, next to 3 buoys located in western Lake Erie. A FluoroProbe was used to determine the distribution of cyanobacteria throughout the water column. The purpose of this research was to evaluate any correlations between buoy-derived data and FluoroProbe-derived data to see if buoys were accurately measuring cyanobacteria and potentially serving as an early warning system for cHABs. Based on the results of linear regressions, the buoy data and FluoroProbe were highly correlated for total chlorophyll *a* (chla) ($P<0.001$, $R^2=0.997$) and cyanobacteria-chla ($P<0.01$, $R^2=0.647$) for the water column average and specifically at 1 meter depth (chla: $P<0.001$, $R^2=0.9927$; cyanobacteria-chla: $P<0.01$, $R^2=0.673$). In previous buoy studies, buoys had a more significant correlation with cyanobacteria-chla than chlorophyll *a*. Overall, there does not seem to be great differences between buoy data and FluoroProbe derived data. Based on the distribution of cyanobacteria in the water column relative to buoy depth, data buoys can accurately measure, and be used for, cHAB and associated predictions.

Poster Board No. 104 - COMPARISON OF SOIL PROPERTIES BETWEEN A MANAGED POWERLINE RIGHT-OF-WAY AND AN ADJACENT MATURE FOREST. Darren J. Krolikowski, krolikdj@mountunion.edu, Charles A. McClaugherty, mcclauca@mountunion.edu, University of Mount Union, Dept. of Biology, 1972 Clark Ave., Alliance OH 44601.

Powerlines and other utility right-of-ways (ROW) pass through a variety of ecosystems. Management of these ROWs often involves suppression of woody vegetation by repetitive physical removal and herbicides. Recent research is examining ways to manage these areas in ways that promote plant and wildlife diversity while minimizing chemical use and labor costs. One key to the management of these areas is an understanding of how soil properties of the managed areas have been modified. This study compared soil properties along a topographically diverse ROW with soils in a parallel transect in an adjacent mature hardwood forest at the Huston-Brumbaugh Nature Center in Stark County, Ohio. Soil characteristics examined were texture, pH, moisture, and organic matter. Four samples of the A-horizon were taken from each of the 5 plots along the 2 parallel transects for a total of 40 samples. Nine out of the 20 power line plots had a higher pH value compared with undisturbed land. Data showed that the ROW plots had an average of 5.3, while forest plots average 4.7. Soil moisture showed no statistically significant differences between managed and forested sites, but was higher on both transects at the lowest elevation plot. These 8 plots showed an average 10% difference. Soil organic matter was consistently higher in the forested plots with a 7% average. Organic matter in the soil may be a result of greater litter inputs within the forested area. Despite the ROW plots having a lower organic matter content, the other parameters proved to be lower than expected. Due to these findings, slope and aspect have little effect on the vegetation of the ROW plots.

Poster Board No. 105 - ECOLOGICAL IMPLICATIONS OF EMERALD ASH BORER DAMAGE AT THE JOHN HUSTON NATURE CENTER. Jacob A. Stallman, stallmja@mountunion.edu, (Charles A. McClaughty, mcclsuca@mountunion.edu), University of Mount Union, Dept. of Biology, 1972 Clark Ave., Alliance OH 44601.

The emerald ash borer (EAB) (*Agrilus planipennis* Fairmaire) is affecting the American ash tree in most of the mid-western states. The effects of EAB are apparent in southeast Stark County, Ohio. This project examines the implication of EAB damage on forest success which has management implications. During the fall of 2017, all 240 ash (*Fraxinus americana* L) trees were dead or dying in a 2.16-hectare plot in the northwest quadrant of the nature center; they were tagged, surveyed and mapped using GPS. The percentage canopy cover was measured using a spherical densitometer at 20 points along transects through the plot. All the trees that were tagged were infested with the emerald ash borer. The only healthy trees were 5 saplings. The mean diameter at breast height (DBH) of infected trees was 31.3 cm and DBH values ranged from 10.9 to 71.4 cm. The percentage of canopy cover ranged from 51% to 80%. The mean canopy cover in adjacent intact plots was 80%. Multiflora rose (*Rosa multiflora*) was present in 63% of this area and was more common in the areas beneath the affected trees. The nearly simultaneous death of these ash trees has caused the succession of the forest to be disrupted. The most common saplings entering the voids caused by the diseased ash trees are sugar maple (*Acer saccharum* Marshall) and Tuliptree (*Liriodendrin tulipifera* L.). Management of the area should focus on favoring these species, because these species are native in this area and will help the succession of the forest.

Poster Board No. 106 - ASSESSING THE EFFECTS OF ROAD SALT RUNOFF ON GREAT POND SNAILS. Allison E. Zahorec, alizahorec@hotmail.com, Kent State University, 8019 Oak Tree Drive North, Lorain OH 44053.

Road deicing salts are commonly applied during the winter months to prevent roads and sidewalks from freezing and to increase traction. Once dissolved in runoff, these salts can rapidly enter freshwater ecosystems and elevate salinity. Increased freshwater salinity threatens aquatic ecosystems by impairing sensitive macroinvertebrate communities. However, studies have shown that the macroinvertebrate responses to road salts are variable. A two-part study was conducted to investigate the effects of road salts on the growth and survival of great pond snails (*Lymnaea stagnalis*). Chronic toxicity tests were first conducted by exposing newborn snails to water samples collected from 5 salt-impacted freshwater ecosystems. Water sample salinity was assessed by measuring conductivity and ionic content. A second investigation was then conducted with chronic toxicity tests exposing week-old snails to reconstituted stormwater samples of increasing conductivities. Two common road salts, rock salt and calcium magnesium acetate (CMA), were used to raise these samples to the target conductivity levels. The results of the initial study showed that pond snails exposed to highly saline water grew significantly larger than snails exposed to lower salinity levels. These results were confirmed by the second investigation with snails exposed to rock salt, though snails exposed to CMA suffered decreased growth and high mortality. Additionally, snail mortality was highest during the first week of exposure, indicating increased sensitivity in young snails. This work provides evidence that *Lymnaea stagnalis* can tolerate elevated freshwater salinity, but this tolerance may depend on the type of road salts impacting their habitats.

Poster Board No. 107 - STATE-WIDE SURVEY OF BUMBLE BEE DISTRIBUTON AND HABITAT USE. Paige Reeher[2], paige.reeher@gmail.com, Jessie Lanterman[1], Lanterman.2@osu.edu, Megan Varvaro[1], varvaro.2@osu.edu, Andrew Lybbert[1], lybbert.3@osu.edu, Randy Mitchell[2], rjm2@uakron.edu, Karen Goodell[1], goodell.18@osu.edu, [1]The Ohio State University, [2]The University of Akron, Department of Biology, ASEC E513, Akron OH 44325-3908.

Bumble bees contribute to Ohio's economic success and natural resources as pollinators of crops and wildflowers. In recent years several bumble bee species have declined dramatically, including the rusty patched bumble bee (*Bombus affinis*), which was placed on the federal endangered species list in 2017. The primary goal of this study was to determine the distribution of *B. affinis* and another species of concern, *B. terricola*, in Ohio and to document their habitat use and food plants. Secondarily, the impact of the amount, quality, and distribution of foraging habitat across the landscape affects bumble bee species diversity and abundance. This information will be used to recommend management practices that will help prevent the decline of species that are currently widespread and abundant. In summer 2017, bees in 130 wildflower meadows in 46 Ohio counties were surveyed. At each site, a team of trained observers recorded bee visits to flowers for 1.5 hours and counted all open flowers in a 100 m^2 area. A total of 28,949 bees were observed. Of those, 10,078 were bumble bees (visiting 132 species of flowers), 13,729 were honey bees (on 110 flower species), and 5,121 were "other" bees (including >20 genera of wild bees) on 143 flowers species. Neither *B. affinis* nor *B. terricola* was observed, even though several of their preferred food plants (according to historical records) were found growing abundantly and were frequently visited by other bee species. Through statistical analysis it was observed that bumble bees differed by species, and from honey bees, in their preferred food plants. In 2018 additional sites will be monitored in areas that were under-sampled in 2017, and high-quality sites will be sampled repeatedly to account for changes in flower resources and in bee activity throughout the summer. In addition, queen surveys will be conducted in the spring (April to May) and fall (September).

Poster Board No. 108 - DEVELOPMENT OF GENETIC LOCI TO ASSIST CONSERVATION OF TONGUETIED MINNOW (*EXOGLOSSUM LAURAE*) OF WESTERN OHIO. Maddison O. Guthrie, mguthrie.2@onu.edu, (Kenneth J. Oswald, k-oswald@onu.edu), Ohio Northern University, Department of Biological and Allied Health Sciences, Ada OH 45810.

Tonguetied minnow (*Exoglossum laurae*) maintains a highly restricted distribution in Ohio, occurring only in the upper Mad River of Logan and Champaign counties. Assessment of genetic diversity within this small population aims to assist in its conservation. Polymerase chain reaction (PCR) primers for multiple mitochondrial DNA (mtDNA) and single-copy nuclear DNA (scnDNA) loci were tested on genomic DNA extracted from several individuals (n=5) collected from the upper Mad River. Success of all PCR products was assessed by visualizing electrophoresed agarose gels under ultraviolet light. A total of 4 loci using 4 PCR primer sets have been developed to date, inclusive of both mtDNA and scnDNA loci. Development of additional mtDNA and scnDNA loci is planned. All successful PCR products will be DNA sequenced to estimate intraspecific variation within the upper Mad River population of tonguetied minnow.

Poster Board No. 109 - CHARACTERIZING THE EFFECTS OF THE DELTA32 MUTATION FOUND FROM *YERSINIA PESTIS* SURVIVOR DESCENDANTS ON CCR5 EXPRESSION AND HIV INFECTABILITY. Hannah N. Newsome[1], h.newsome1@mail.lorainccc.edu, (Harry Kestler, hkestler@lorainccc.edu), Brielle P. McCarthy[1] , b.mccarthy4@mail.lorainccc.edu, Raquel M. Dauch[2], r.dauch1@mail.lorainccc.edu, Gary R. Dodson[2], g.dodson1@mail.lorainccc.edu, Kyle A. Jones[2], k.jones52@mail.lorainccc.edu, [1]Lorain County Community College, Department of Biology, 1005 N. Abbe Rd., Elyria OH 44035, [2]Lorain County Early College High School, Elyria OH.

Human Immunodeficiency Virus (HIV) is a virus that can cripple the patient's immune system, rendering the immune system unable to fight the HIV or other infections. HIV must first bind to a primary receptor on the human T-cell, CD4, and 1 of 2 secondary receptors, CCR5 or CXCR4, to infect an individual cell. There is a mutation known to affect HIV infectivity. *ccr5 delta32* is a deletion mutation of 32 base pairs of the *ccr5* human gene sequence. It is thought that this mutation truncates the CCR5 receptor, rendering it incapable of reaching the surface of the human T-Cell. When the individual is homozygous for *delta32*, the mutation will confer resistance to HIV infectivity, as well as *Yersinia pestis*, more commonly known as the Black Plague. Twenty percent of European Caucasians are heterozygous for *ccr5* while only one percent of the same population is homozygous for *delta32*. We have identified an individual, subject EN2, who is a descendant of plague survivors, and is heterozygous for *ccr5 delta32* alleles. A PCR was performed using primers that circumscribe the *ccr5* gene. We were able to obtain both wild type and *delta32* allele from this individual. This product was then cloned into pCR4-TOPO vector and will then be excised and cloned into pLXSN retroviral expression vector. This vector will then be transfected into PT67, a retroviral packaging cell line. The retroviral products will then be used to create stable and transient transductants into H9 Lymphoid cells and will be tested for HIV infectability and CCR5 expression.

Poster Board No. 110 - DIFFERENTIAL SEXUAL VIABILITY DUE TO MUTATION ACCUMULATION IN DIPLOID AND HAPLOID X-CHROMOSOMES. Michael A. Balinski, mbalins@bgsu.edu, Ronny C. Woodruff, rwoodru@bgsu.edu, Bowling Green State University, 417 Life Science Building, Bowling Green OH 43403.

Much disagreement exists regarding the superiority of haploid organisms vs. diploid organisms in evolution; studies have shown that diploids evolve faster (have a higher rate of adaptive evolution) than haploids and vice versa. To elucidate the success of one ploidy strategy over another, and to clarify previous results, the viability of male haplo-X and female diplo-X *Drosophila melanogaster* was examined using an inbred cross (lacking X-chromosome recombination) to accumulate new X-chromosome mutations. Thirty crosses were performed using a single sibling male and female to establish each line. Males, possessing a single X-chromosome, were predicted to express more mildly deleterious mutations over time than diplo-X females, with attached-X chromosomes. This would result in a decrease in male viability, evaluated using the male sex ratio (# of male progeny/total # of progeny). As of 8 generations of X-chromosome mutation accumulation, haplo-X male sex ratios showed a shift from zero ($P<0.05$) with a positive average slope of about 0.007 per generation, indicating an increase in male fitness. Evaluations of the average sex ratio slope across generations as well as changes in population viability are currently underway. These results suggest that the rate of advantageous recessive mutations are more common that previously assumed, or that heterozygous deleterious mutations accumulate and are expressed faster in diploid females, providing evidence that at least some of the differences in viability seen between male and female organisms have their origins in sex-chromosome ploidy.

Poster Board No. 111 - EVALUATION OF CHERTS IN OHIO-SOURCED AGGREGATES FOR USE IN CONCRETE. Alexander C. Kern, kerna@bgsu.edu, (John Farver, jfarver@bgsu.edu), Bowling Green State University, Dept. of Geology, Bowling Green OH 43403.

Alkali-silica reactions (ASR) involve reaction of silica (SiO_2) minerals with highly alkaline ($pH>12$) pore fluids in concrete made with Portland cement and the subsequent formation of an expansive gel. ASR gel formation can cause a 96.8% volume increase by hydration in the presence of moisture inside the rigid framework of surrounding cement and aggregate and can cause severe cracking in the concrete. Current standards employed by the Ohio Department of Transportation (ODOT) are based solely on the amount of silica minerals present in the aggregate with no more than 0.5 wt% of opal, and no more than 3 wt% of chert or chalcedony. The objective of this study is to employ modern analytical instrumentation and methods to characterize the reactivity of different silica minerals with respect to alkali-silica reactions in concrete. Specifically, the study focuses on developing an appropriate test method to distinguish chert samples that are susceptible to ASR. Chert samples are characterized using polarized light microscopy (PLM) of thin sections to determine grain size, porosity, and other textural features. The degree of crystallinity and purity are evaluated using x-ray diffraction (XRD), and higher resolution analysis of the textures and presence of impurities by scanning electron microscopy with energy dispersive x-ray spectroscopy (SEM-EDS). Silica solubility of the chert samples are evaluated by reacting samples in aqueous solutions that mimic the composition (pH) of pore fluids found in concrete produced using Portland cements, followed by analysis for Si concentration using inductively coupled plasma optical emission spectrometry (ICP-OES).

Poster Board No. 112 - LEAD CONTAMINATION IN TOLEDO COMMUNITY GARDENS. Natalie I. Miller, milinat@bgsu.edu, (John Farver, jfarver@bgsu.edu), Bowling Green State University, Dept. of Geology, Bowling Green OH 43403.

The primary objective of this study is to determine the levels of lead and other persistent toxic heavy metals (As, Cd, Cr, etc.) present in Toledo, Ohio, area community gardens and to advise community gardeners on associated potential health issues. In 2014, in several census tracts in Toledo, Ohio, over 5% of children under age 6 years had confirmed elevated blood lead levels (BLL) of >5 µg/dL. The primary path for elevated BLL in young children is hand-to-mouth ingestion of soil and dust. Residential soils in Toledo can have lead concentrations well above the EPA action level of 400 mg/kg, as such, soils in community gardens should also be tested. For this study, samples of garden soils were collected at the surface where wind-blown dust from adjacent lead contaminated soils could accumulate, at root depths for plants in the beds, from underlying soils beneath unlined raised beds, and bare soils between beds. The sample digestion follows USEPA Method 3051A and sample analysis follows Method 6010C for inductively coupled plasma-optical emissions spectrometry. To date, 28 soil samples were collected from an urban community farm in Toledo, and are composed of samples from raised beds, bare soils, the on-site chicken run, and from areas lining the perimeter, close to major roads. The results of this study will be used to create educational outreach programs for Toledo community gardeners and local school children, to educate them on the potential dangers of lead and other heavy metals, as well as on best practices for preventing further contamination.

Poster Board No. 113 - COMPARISON BETWEEN SENTINEL 2 AND LANDSAT 8 IMAGERY IN MONITORING CHLOROPHYLL-A IN THE WESTERN BASIN OF LAKE ERIE. Tharindu H. Abeysinghe, tharina@bgsu.edu, Anita Simic Milas, asimic@bgsu.edu, Yahampath A. Marambe, ymaramb@bgsu.edu, Patrick A. Reil, preil@bgsu.edu, Nicole K. Light, lightn@bgsu.edu, Nicholas J. Faust, nfaust@bgsu.edu, Bowling Green State University, School of Earth, Environment and Society, Department of Geology, 190 Overman Hall, Bowling Green OH 43403.

Algal blooms in the Western Basin of Lake Erie, as a result of excess nutrients, have impacts on ecology, economy and human health in the surrounding regions. A 3 day ban of drinking water in Toledo, Ohio, in 2014 highlighted the importance of real-time monitoring of the algal bloom phenomenon. Conventional monitoring methods can be expensive, time consuming and not practical on a large scale. With the frequent availability of free satellite imagery, remote sensing is widely used to monitor algal bloom in near real time. The aim of the study is to compare the potential of Landsat 8 and Sentinel 2A satellites in identifying chlorophyll-a dispersion in the Western Basin of Lake Erie. The field data collected by the Ohio Environmental Protection Agency (OEPA) on July 18 and August 9, 2016, and data from cloud-free satellite images were used to create several empirical algorithms. Sentinel 2A resulted the highest coefficient of determination ($R^2=0.91$) with band ratio B8/B5 (with spectral range B8=694 to 713 nm and B8=762 to 907 nm) for August 2016. Landsat 8 reached $R^2=0.63$ with band ratio (B3+B4)/B2 (spectral range for B3=525 to 600 nm, B4=630 to 680 nm and B2=450 to 515 nm) while Sentinel 2A reaches $R^2=0.81$ for the same band ratio with same spectral ranges. In conclusion, Sentinel 2A data could be used as a useful proxy for remote measurements of chlorophyll-a dispersion for future algal blooms. Further study is to be completed with Sentinel 2A and Landsat 8 images for 2017 data.

Poster Board No. 114 - CONSTRUCTING CONTINENTAL CRUST: TRACKING PETROGENESIS OF GRANITIC BATHOLITHS IN THE OSLO RIFT, NORWAY. Maureen Y. Haley, haleymy@miamioh.edu, Miami University, Department of Geology and Environmental Earth Science, 029 Shideler Hall, 250 South Patterson Avenue, Oxford OH 45056, Claire L. McLeod, mcleodcl@miamioh.edu, Richard J. Brydon, brydonrj@miamioh.edu, Amy L. Wolfe, wolfeal4@miamioh.edu, Barry J. Shaulis, bshaulis@uark.edu, University of Arkansas, Reidar G. Trønnes, r.g.tronnes@geo.uio.no, University of Oslo.

Granitoid rocks compose ~86% of the Earth's upper crust; by evaluating their mineralogical and chemical properties, the processes through which granitoids contribute to crust production can be investigated. The Oslo Rift (OR), Norway, formed during the break-up of Earth's last supercontinent, and contains 2 granitoid outcrops (batholiths): the Drammen (1811 km^3) and the Finnemarka (336 km^3). To assess the crystallization history and melt source of these batholiths (melting of pre-existing crust or mantle partial melting), unaltered individual crystals were investigated via electron microprobe (EMP: 10 nA electron beam accelerated to 15 kV, 2% instrument error). Crystals range from K-rich, to Na-rich, and Ca-rich varieties (n=1974: orthoclase, anorthoclase, and labradorite) indicating that multiple crystal populations are present within these batholiths. Titanite crystals reveal a strong crustal-derived signature (n=155) with $Ti^{4+}/(Al+Fe^{3+})$ <9 and a less prominent mantle-derived signature $Ti^{4+}/(Al+Fe^{3+})$ >9 (n=12). From biotite crystals (n=362), wt.% FeO and MgO abundances are consistent with a mantle-derived signature (n=307) at wt.% MgO >13, with fewer mixed mantle-crust derived signatures at 3 < wt.% MgO < 13, (n=42), and a minor crust-derived component at wt.% MgO <3 (n=13). From amphibole crystals (n=240), wt.% TiO_2 and Al_2O_3 are consistent with a crustal-derived source (Al_2O_3 <11, n=206) and display a lack of a mantle-derived component (Al_2O_3 >11, n=34). From the multiple crystal populations, crustal production through granitoid magmatism shows the involvement of both crust and mantle-derived melt sources. Implying that compositionally distinct melts contribute to batholith formation and Earth's upper crustal growth.

Poster Board No. 115 - EFFECT OF LAND COVER/LAND USE CHANGE ON EVAPOTRANSPIRATION RATE IN LOWER MAUMEE WATERSHED, OHIO. Yahampath A. Marambe, ymaramb@bgsu.edu, Anita Simic Milas, asimic@bgsu.edu, Tharindu Hasantha Abeysinghe, tharina@bgsu.edu, Patrick Anthony Reil, Preil@bgsu.edu, Bowling Green State University, School of Earth, Environment and Society, Department of Geology, 190 Overman Hall, Bowling Green OH 43403.

Evapotranspiration (ET) is an important eco-agro process, especially when soil and irrigation management practices are considered. Thus, it is an essential component of ecosystem models. Land cover/land use (LULC) changes impact the biophysical and biochemical properties of crops, which alter ET. The purpose of the present study is to examine the effect of LULC change on ET, particularly due to crop rotation and increased corn production. This study uses a modified Boreal Ecosystem Productivity Simulator (BEPS) physical model, adapted to crop cover, to generate daily, monthly and annual ET images using satellite (Landsat 8 and Sentinel-2), and meteorological data (precipitation, solar radiation, temperature and relative humidity) data for 2016. Leaf area index (LAI) for the model was produced using enhanced vegetation index (EVI). The study area is a vegetated region within the Maumee River watershed where crops are the predominant land cover. ET images were produced at 2 scales using Landsat 8 (30 m) and Sentinel-2 (10 m) for the growing season of 2016. Relationship of ET rates for these 2 sensors was examined. ET rate at mid-growing season was always higher in Sentinel-2 data. However, the end season ET rates were similar for both sensors. The ET rates for different agricultural plots (e.g., corn, soybean, wheat, and alfalfa) are more distinctive in Sentinel-2 derived ET images compared to the Landsat 8 derived ET.

Poster Board No. 116 - THE CHANGING HYDROLOGY OF A WET PRAIRIE IN NORTHWEST OHIO: A TIME SERIES ANALYSIS USING MACHINE LEARNING. Priyanka R. More, pmore@bgsu.edu, Enrique Gomezdelcampo, egomezd@bgsu.edu, Sheila J. Roberts, sjrober@bgsu.edu, Bowling Green State University, Department of Geology, Bowling Green OH 43403.

The Oak Openings Region (OOR) of northwest Ohio is well known for rare plant and animal species. It contains the few remaining wet prairie ecosystems in the area. Wet prairie ecosystems are highly sensitive to precipitation patterns and therefore to changing climate, as the shallow groundwater is greatly influenced by precipitation and temperature. A study at a small watershed in the Oak Openings was conducted to determine the correlation between shallow groundwater levels and precipitation and temperature, with the intention of predicting changes to the wet prairie hydrology according to expected climate change in the midwest. Hourly groundwater level data were collected using data loggers installed at 4 different piezometers within the study area from May 2015 to November 2017. Hourly precipitation and temperature data were obtained from the Toledo Express Airport weather station (TOL) located within 3 kilometers of the site. Artificial neural networks (ANN), a form of machine learning, was used to determine the correlation between the changing weather parameters and the groundwater levels due to the large amount of data available and the complexity of modeling a wet prairie ecosystem that is not well understood physically, and has been intensely managed with ditches. Using a multilayer feed-forward neural network, a good prediction was obtained between precipitation, temperature, and shallow groundwater levels as determined by an R value of 0.70. The next step involves using this neural network model with the expected changes in precipitation and temperature to determine the fate of wet prairies in the OOR due to climate change.

Poster Board No. 117 - ESTIMATION OF TEMPORAL AND SPATIAL REASONING ABILITY OF HIGH SCHOOL STUDENTS IN EARTH SCIENCE. Christina E. O'Malley, omalley.47@osu.edu, Carroll High School, 4524 Linden Ave., Dayton OH 45432.

The purpose of this research is to develop a method for teachers to be able to estimate a student's ability to reason "temporally and spatially" based on qualitative and quantitative data in the student's record. This study investigates the potential relationships between spatial reasoning skills, highest math course, career tech field, and OGT scores. High school students in their 11th or 12th grade year completed a 3-part assessment to measure skills in spatial reasoning using parts of the Purdue Spatial Visualization Test: Rotations (PSVT:R); skills in proportional reasoning were determined by using selected portions of the Lawson's Classroom Test of Scientific Reasoning (LCTSR), and students' ability to solve structural geologic problems were assessed by Ormand's Geologic Block Test (OGBT). Data (scores) from this 3-part survey was analyzed by ANOVA to understand relationships between spatial reasoning and other markers of academic performance, including highest math course and Ohio Graduation Test (OGT) scores and students' career tech field. Students (n=86) in career tech fields that require spatial and proportional reasoning (such as game programming) scored highest on the PSVT:R (an average of 24 points out of 28 possible on the combined surveys). Students who are enrolled in calculus performed best on the survey (M=22 of 28 items on the 3 combined surveys). There was a strong correlation between GPA and performance on OGBT ($r(86)=0.50$; $p<0.05$).

There is a weak correlation between OGT Science Score and performance on the OGBT ($r(86)=0.254$; $p<0.05$), a week correlation between GPA and PSVT:R ($r(86)=0.171$; $p<0.05$), and weak correlation between GPA and performance on the LCTSR ($r(86)=0.164$; $p<0.05$). There is no correlation between math course and spatial and proportional reasoning ability, or performance on the OGBT.

Poster Board No. 118 - PROTECTIVE EFFECT OF EPIGALLOCATECHIN-3-GALLATE (EGCG) ON BLEOMYCIN INDUCED DNA DAMAGE IN HUMAN LYMPHOCYTES. Paige Hoffman, hoffmanp@findlay.edu, Alexander Vaglenov, vaglenov@findlay.edu, University of Findlay, College of Pharmacy, Findlay OH 45840.

Epigallocatechin-3-gallate (EGCG; CAS 989-51-5) is the main polyphenol present in green tea (*Camellia sinensis*). It has been reported that EGCG has antibacterial, antiviral, antioxidative, antimutagenic and anticarcinogenic effects. In consideration of the above reports on different effects of EGCG, there was a need to extend the study of the comparative antigenotoxic effects as measured by Cytokinesis-block micronucleus assays in human lymphocytes against known classical mutagen and genotoxican. EGCG ability was tested to reduce bleomycin's initial genotoxic effect. Peripheral human lymphocytes were obtained from 4 human donors through blood draws and were then plated and treated with different concentrations of bleomycin as follows: 2, 4, and 8 µg/mL and then incubated for 72 hours before scoring. A comparison of micronuclei, nuclear bridges, nuclear buds, and the number of apoptotic and necrotic cells in bi-nucleated lymphocytes with bleomycin plus 5, 10, 20, and 40 µg/mL EGCG was conducted. The results in this research indicates that the EGCG presented *in vitro* decreased the micronuclei and BNMN cell yields over the investigated dose-range showing a statistically significant ($p<0.001$) protective effect from bleomycin-induced DNA damage with little toxic effect. The higher dose of 40 µg/mL EGCG together with bleomycin revealed protective but also showed a level of toxicity in the lymphocytes.

Poster Board No. 119 - DETERMINING THE EFFECTS OF SUBOXONE® TREATMENT ON POST MORTEM HEROIN DETECTION USING VITREOUS HUMOR BY GC-MS ANALYSIS. Toni-Ann T. Ledgister, tledgister001@defiance.edu, (Somnath Dutta, sdutta@defiance.edu), Defiance College, 701 N. Clinton Street, Defiance OH 43512.

Vitreous humor (VH) is the greatly hydrated, transparent gel, which sits between the lens and the retina, in the posterior portion of the eyes. VH has been the subject of a large number of studies for chemical analyses postmortem. VH is a suitable alternative matrix for forensic toxicology, considering most xenobiotics existing in the circulatory system can be detected in the VH, after crossing the blood-retina barrier. SUBOXONE®, a semi-synthetic opioid, with a structure similar to that of morphine. Previous studies have shown that SUBOXONE® is an antagonist for the receptors of heroin. The study to be performed will evaluate the detection levels of heroin from an analysis of vitreous humor after the administration of SUBOXONE®. Three samples, each of 9 mice, will be randomly selected and 3 mg of heroin per kilogram of body mass will be administered to each. Each group of mice will receive different doses of SUBOXONE®; group one will receive 1 strip of SUBOXONE®, group two will receive 2 strips, and the third group will receive 3 strips of SUBOXONE®. VH will be obtained postmortem using lens and retina evisceration, followed by filtered centrifugation, and will be analyzed using gas chromatography-mass spectrometry (GC-MS).

Poster Board No. 120 - IN VITRO MUTAGENIC AND GENOTOXIC POTENTIAL OF ARTEMISININ, ARTEMETHER AND ARTESUNATE. David M. Comshaw, comshawarnoldd@findlay.edu, Mathew Goodman, goodmanm@findlay.edu, Vadim Kutsar, kutsarv@findlay.edu, Jordan Wanner, wannerj@findlay.edu, Richard Dudley, dudley@findlay.edu, Alexander Vaglenov, vaglenov@findlay.edu, University of Findlay, College of Pharmacy, 1000 North Main St., Findlay OH 45840.

Artemisinin (CAS #63968-64-9) is an antimalarial drug isolated from the plant *Artemisia annua*. Artesunate (CAS #88495-63-0) and Artemether (CAS #71963-77-4) are semisynthetic derivatives of artemisinin. Several *in vitro* studies have shown that these drugs have strong anticarcinogenic effect. However, reports on mutagenic and genotoxic effects for all 3 drugs are scarce. The aim of this study is to evaluate, *in vitro*, the comparative mutagenic and genotoxic effect of artemisinin, artesunate, and artemether through Ames test, cytokinesis-block micronucleus cytome assay (CBMN) and comet assay. Results indicated a strong genotoxic effect on human lymphocytes detected by the CBMN and comet assays for all 3 drugs, yet negative mutagenic response when evaluated by the Ames test. All endpoints of CBMN cytome assay including micronuclei, nuclear buds, nuclear plasmic bridges, apoptotic, and necrotic cells showed statistical dose dependent differences with controls. The scale of in vitro genotoxicity for these drugs is as follows: artemisinin = artemether < artesunate. These findings suggest the necessity of further *in vitro* research on genotoxic and mutagenic effects of all 3 antimalarials with respect to their current antimalarial and future use as anticancer drugs.

Poster Board No. 121 - IMMUNOLOCALIZATION AND EXPRESSION OF HER2, HER3, HER4, EGFR AND P53 IN A PATIENT WITH SYNCHRONOUS PRIMARY ENDOMETRIAL ADENOCARCINOMA AND CLEAR CELL RENAL CARCINOMA: A CASE REPORT. Fabiano C. Araujo[1], fabiano.araujo@faminasbh.edu.br, Enio Ferreira[2], eniofvet@hotmail.com, Izabella Cristina Alves de Souza[3], izabellacristinabio@gmail.com, Priscila Fernanda da Silva Martins[3], priscilafernandasmartins@gmail.com, Emerson S. Veloso[2], emerson.esv@hotmail.com, Tatiany L. Silveira[2], taty.silveira@gmail.com, Ivy N. N. Gonçalves[2], ivynayra489@gmail.com, Adam Underwood[4], aunderwood@walsh.edu, Amy Milsted[4], milstedamy@gmail.com, Helen L. Del Puerto[2], helendelpuerto@hotmail.com, [1]Faminas-BH, Medical School, Rua Conceicao do Mato Dentro, 250, Belo Horizonte MG 31310-240, Brazil, [2]Universidade Federal de Minas Gerais, [3]Centro Universitário UNA, [4]Walsh University, North Canton OH.

Endometrial adenocarcinoma accounts for 85% of the endometrial carcinomas and renal cancer accounts for around 3% of all adult malignancies. When patients present with more than one tumor in the same or different organs/tissues, multiple primary tumors may be present. A major challenge is to find an anticancer therapy for multiple cancer types without increasing toxicity, pharmacological interactions, and without negative impact of overall outcome. It is hypothesized that immunolocalization and gene expression may be used to help identify patients that may present with multiple site tumors. To illustrate this possibility, the case report of a 69 year-old, non-obese, post-menopausal woman diagnosed with synchronous endometrial adenocarcinoma and renal cell carcinoma is presented. The 2 primary cancers may indicate genetic susceptibility to develop multiple site tumors. Immunolocalization of the EGFR, HER2, HER3, HER4 and p53 proteins by immunohistochemistry (IHC) was performed to investigate synchronous expression of these biomarkers. The endometrial adenocarcinoma was a well-differentiated tumor, with discernable glandular structure with moderate mitotic index. IHC revealed weak HER2, HER3 and HER4 staining of cell membranes in well-differentiated areas, and intense HER2 and p53 staining

in tumor areas showing histological aggressiveness characteristic. EGFR was found only in the stromal area. The renal cell carcinoma showed clear cell type, solid tumor, Fuhrman nuclear grade 2, presence of necrosis and hemorrhage. IHC revealed intense HER2 and HER4 staining of tumor cell membranes, but no HER3, EGFR and p53 staining. In summary, overexpression of HER2 and HER4 proteins was found in both primary tumors, suggesting that these proteins should be investigated in family history. The results show the potential of using immunolocalization and gene expression to evaluate patients that may be prone to multiple primary tumor development.

Poster Board No. 122 - SOX2 AND SOX3 EXPRESSION IN TWO COLORECTAL CELL LINES: HCT-116 AND HT-29. Felipe H. S. Silva[1], felipehssilva@gmail.com, Adam Underwood[2], Almir S. Martins[1], Isabella T. Borges[1], Elaine M. Souza-Fagundes[1], Jeremy Prokop[3], Jonas P. Ramos[1], Camila Almeida[1], Pedro G. Baeta[1], Isabella T. Borges[1], Luana P. Sousa[1], Fernando Galligani[1], Deborah K. M. Ribeiro[1], Fabiano C. Araujo[4], Amy Milsted[2], Helen L. Del Puerto[1], helendelpuerto@hotmail.com, [1]Universidade Federal de Minas Gerais, Av. Pres. Antonio Carlos, 6627, Instituto de Ciências Biológicas, Departamento de Patologia Geral F3 312, Belo Horizonte, MG 31270-901, Brazil, [2]Walsh University, North Canton OH, [3]Hudsonalpha Institute for Biotechnology, [4]Faminas-BH.

Colorectal cancer (CRC) has one of the highest incidence and mortality rates among cancers, yet differential diagnostics are still needed. Several intestinal stem cell markers have been found to be associated with CRC and might have a prognostic and predictive significance. SOX2 and SOX3 are members of the SOX (SRY-related HMG-box) family of transcription factors involved in regulation of embryonic development and cell fate. The objective of this study was to evaluate gene expression of SOX2 and SOX3 in 2 distinct colorectal carcinoma cell lines: HCT-116 and HT-29. HCT-116 is a cell line from adult male colorectal carcinoma, and HT-29 is a cell line from a 44 year-old female colorectal adenocarcinoma. HCT-116 and HT-29 cells, and the control cell line HEK (embryonic kidney), were seeded into 12-well plates (50,000 cells per well) and maintained in standard growth medium. After cells reached 80 to 90% confluency, cells were washed with sterile PBS and total mRNA isolated using Trizol® reagent. Total mRNA was DNAse treated, and RT-qRT-PCR was performed to quantify SOX2 and SOX3 mRNA expression, using S26 mRNA expression as normalizer. Results demonstrated SOX3 higher expression in HCT cells compared with HEK cells (3.16 fold change), and no detectable expression of SOX3 in HT-29. In addition, SOX2 mRNA expression was higher in HCT-116 cells when compared with HEK cells (4.55 fold change), and with HT-29 cells (6.45 fold change). Results support the hypothesis that SOX2 and SOX3 may have prognostic and predictive significance in CRC tissue samples.

Poster Board No. 123 - SOX3 EXPRESSION INDUCES APOPTOSIS IN HUMAN BREAST ADENOCARCINOMA CELL LINE (MDA-MB-231). Felipe H. S. Silva[1], felipehssilva@gmail.com, Adam Underwood[2], Almir S. Martins[1], Jeremy Prokop[3], Elaine M. Souza-Fagundes[1], Pedro G. Baeta[1], Jonas P. Ramos[1], Camila Almeida[1], Deborah R. Nascimento[1], Fabiano C. Araujo[4], Amy Milsted[2], Helen L. Del Puerto[1], helendelpuerto@hotmail.com, [1]Universidade Federal de Minas Gerais, Av. Pres. Antônio Carlos, 6627, Instituto de Ciências Biológicas, Departamento de Patologia Geral F3 312, Belo Horizonte - MG, 31270-901, Brazil, [2]Walsh University, North Canton OH, [3]Hudsonalpha Institute for Biotechnology, [4]Faminas-BH.

SOX3 protein acts as a transcription factor and has an important role in regulation of differentiation and cellular growth. In carcinogenesis, cells with critical lesions in DNA exhibit loss of tumor suppressor gene function and gain of oncogene function, resulting in loss of cell differentiation, resistance to apoptosis, and increased cell proliferation. The MDA-MB-231 cell line (breast ductal adenocarcinoma) is resistant to apoptosis and does not express SOX3. The objective of this work was to investigate participation of SOX3 protein in regulation of apoptosis and its pathways. The region encoding human SOX3 protein was subcloned into pEF1 expression vector using a SOX3 sequence amplified from human DNA. MDA-MB-231 cells were seeded into 24-well plates (25,000 cells per well). After 24 hours, cells were transfected with the SOX3 protein expression vector, pEF-1-SOX3. Control MDA-MB-231 cells were transfected with a pEF-1 vector lacking SOX3 sequences. After 24 hours, the percentage of cells in apoptosis was determined by flow cytometry, and caspase-3 and SOX3 mRNA expression was evaluated by real-time PCR. Results demonstrated higher expression of caspase-3 mRNA (2.5 fold change) compared to control, and SOX3 mRNA detection in cells transfected with pEF-1-SOX3 vector compared to no SOX3 mRNA detection in control cells; higher apoptotic cells percentage by flow cytometry (54.9%), compared to control (27.7%); and lower confluence of the cells (60%), when compared to control (100%). Results support the hypothesis that SOX3 may regulate apoptosis in the MDA cell line, acting as a tumor suppressor protein.

Poster Board No. 124 - QUANTITATIVELY ANALYZING MICROBIAL COMMUNAL SHIFTS BEFORE A HARMFUL ALGAE BLOOM. Adam R. Coger, acoger@bgsu.edu, (Zhaohui Xu, zxu@bgsu.edu), Bowling Green State University, 820 Maple Lane, Waterville OH 43566.

Overgrowth of toxic cyanobacteria causes harmful algae blooms (HABs) which have severe impacts on human health, ecosystems, and the economy. It takes several months from the point of nutrient overloading to the point of a rising HAB. Knowing when HABs will strike will potentially help mitigate the impact of HABs. There is currently no reliable method to make such a prediction. A study to predict the rise of HABs based on the relative abundance of microbial species in Lake Erie is being initiated. This study will search for quantitative patterns in microbial species linked to imminent HABs. Genomic signature sequences will be used to identify and quantify reporter species. K-mer is a DNA sequencing term that defines a pattern of nucleotides k terms long within a sample and counts how many times it occurs. Genomes of the relevant microbial species will be compared against each other to identify k-mers that are most unique to each species in relation to its community. The dominance of toxic cyanobacteria is precluded by a series of changes in the composition of the microbial community, which can be characterized by the shift of relative abundances of a set of reporter species. To emphasize this, the relative abundance of the reporter species will be estimated based on the occurrence of the unique k-mers in a metagenome. Metagenomes at various time points can be analyzed to identify correlations between HABs and quantitative patterns of reporter species. The correlation relationship will help to forecast the initiation of a HAB.

Poster Board No. 125 - SOYBEAN PHYTOBIOMES AND THEIR ROLES IN DISEASE RESISTANCE AGAINST *PHYTOPHTHORA SOJAE*, A ROOT ROT PATHOGEN. Renee E. Dollard, rdollar@bgsu.edu, Gayathri Beligala, gbeliga@bgsu.edu, Vipaporn Phuntumart, vphuntu@bgsu.edu, Bowling Green State University, Department of Biological Sciences, 217 Life Science Building, Bowling Green OH 43403.

Economic losses caused by the oomycete pathogen, *Phytophthora sojae*, in soybean production is estimated to be $1 to 2 billion worldwide. Utilization of resistance genes is an effective method to breed *Phytophthora*-resistant soybean cultivars. Disease resistance can also be conferred by incorporation of beneficial microorganisms. The goal

of this study is to explore the protection of soybean from *Phytophthora* infection using a microbiome approach. The initial step is to identify the bacteria associated with susceptible and resistant soybean varieties. To isolate soybean-associated root microbes, soil from 5 different soybean fields located within Wood County, Ohio, were collected and used to grow susceptible (Williams) and resistant (Williams82) soybean varieties under greenhouse conditions. Soybean seedlings were allowed to grow for 4 to 7 days, and rhizosphere and endophytic microorganisms were extracted from the soil surrounding soybean roots of both varieties. These microbial suspensions were coated onto susceptible soybean seedlings followed by inoculation with *P. sojae*. Microbial extract from Williams82 plants grown in the soils of location D (GPS coordinates; 41.40824, -83.702) showed enhanced resistance against *P. sojae* infection in Williams, indicating microbial mechanisms might be involved in disease suppression. Culturable rhizosphere and endophytic bacteria were isolated from the microbial suspensions of location D, which were then identified by 16S rDNA analysis followed by BLASTN and phylogenetic analysis (Mega 7). Identification of 8 representative colonies showed that they are bacteria in the genera *Pseudomonas*, *Bacillus*, *Agrobacterium*, *Rhizobium* and *Sphingobacterium*. Williams and William82 both contain *Pseudomonas* and *Bacillus* while *Agrobacterium*, *Rhizobium* and *Sphingobacterium* species are found to associate with only Williams82.

Poster Board No. 126 - DETERMINING HIV INFECTIVITY BY OVEREXPRESSING CXCR4 AND CCR5 PROTEINS. **Riley K. Figueroa[1,2],ryekincade@gmail.com,(H.W.Kestler[1],Hkestler@loraincccc.edu), 225 Kansas Ave., Lorain OH 44052, Virginia E. Ford[1], virford16@gmail.com, Leéna S. Boone[1,2],leenaboone@gmail.com, Jennifer M. Ortega[1,2], jenniferortega73@gmail.com, Kyle E. Patton[1,2], kylepatton83@gmail.com, [1]Lorain County Community College, Department of Biology, Elyria OH, [2]Lorain County Early College High School, Elyria OH.**

The human immunodeficiency virus (HIV) later progresses to acquired immunodeficiency syndrome (AIDS). To infect a cell, HIV needs to interact with 2 receptors on a human T-cell; a primary receptor (CD4) and 1 of 2 co-receptors (CCR5 or CXCR4). It has been hypothesized that CCR5-delta32 may affect CXCR4 expression due to its effect on CCR5. A study was initiated to investigate how the CCR5-delta32 mutation effects CXCR4, and how the mutation prevents HIV from infecting the human T-cell, even when the *cxcr4* is intact. The human *cxcr4* was PCR amplified using primers that isolate the gene. The *cxcr4* product was ligated into pLNCX2. With a successful pLNCX2-CXCR4, a bacterial transformation was performed and grown into competent *E. coli* cells. The cells are grown on different antibiotics, kanamycin and ampicillin, to ensure success. Successful clones were used to infect packaging cell line PT67. These cells then produce retroviral particles containing *cxcr4*. The retroviral particles, along with the CCR5-delta32 mutation or wild type, then infect tumor cells such as CEMX174 and H9. To determine the effect of overexpressing CXCR4 with the addition of the mutation, these cells are then infected with HIV. If the cells are infected with HIV, we can conjecture that the mutation does not affect the cells in the predetermined manner; however, if the cells are not infected with HIV, we will then conjecture that the CCR5-delta32 mutation down modulates CXCR4 along with CCR5.

Poster Board No. 127 - THE ROLE OF CYANOPHYCIN SYNTHETASE AND CYANOPHYCINASE WITH RESPECT TO NITROGEN AVAILABILITY IN *PLANKTOTHRIX AGARDHII*. **Nicole M. Kern[1,2], n.kern2@mail.loraincccc.edu, (Kathryn A. Durham[2], kdurham@loraincccc.edu), Jessica Cairns[2], Dulce Cintron[3], Eleana Cintron[3], Arianna Diaz[3], Mia Diaz[3], Sijoon Jeon[2], Deanna A. Leatherwood[3], Alexa Plantado[1,2], Taylor Webber[1,2], Jacob R. Wyatt[1,2], Sunny S. Dickerson[1,2], sdickerson1@loraincccc.edu, Michelle J. Neudeck[1,2], mneudeck@loraincccc.edu, George S. Bullerjahn[1], bullerj@bgsu.edu, R. Michael McKay, PhD[1], rmmckay@bgsu.edu, [1]Bowling Green State University, Bowling Green OH, [2]Lorain County Community College, Science and Mathematics Department, 1005 N. Abbe Road, Elyria OH 44035, [3]Lorain County Early College High School, Elyria OH.**

Unlike the phosphorus dependent algal blooms of western Lake Erie, Sandusky Bay's cyanobacterium *Planktothrix agardhii* blooms are often dependent on nitrogen inputs. Nitrogen levels of the bay drop significantly by midsummer, but the blooms persist, despite the fact that *P. agardhii* is a nondiazatrophic organism. Certain strains of cyanobacteria house 2 genes that are responsible for nitrogen storage and utilization. *cphA* encodes the enzyme cyanophycin synthetase that synthesizes a nitrogen storage polymer of arginine and aspartic acid called cyanophycin. *cphB* encodes the enzyme cyanophycinase that breaks down cyanophycin. The presence of these 2 genes in Sandusky Bay *Pa* strain was demonstrated through PCR. It is expected that *cphA* should be expressed when nitrogen is replete and that *cphB* should be expressed during nitrogen depletion. In this experiment, 2 cultures of *P. agardhii* were grown in BG-11 media. The culture was divided, centrifuged and resuspended: one in BG-11 and one in nitrogen-free BG-11. Every 3 days a portion of each culture was filtered for chlorophyll *a* and RNA was extracted. Furthermore, the color of the cultures was observed daily for signs of nutrient stress. The experiment continued until the nitrogen free culture showed significant signs of chlorosis. The levels of chlorophyll *a* were determined using a fluorometer to measure any difference between the 2 cultures. RT-PCR was performed on the RNA extracted from the cultures using primers for *cphA* and *cphB* to monitor the expression of those genes.

Poster Board No. 128 - DAY-LIGHT INTENSITY DOES NOT ALTER MELATONIN PRODUCTION OR THE GUT-ASSOCIATED BACTERIAL MICROBIOME OF ZOO-HOUSED POTTOS (*PERODICTICUS POTTO*). **Olivia Keserich[1], o-keserich@onu.edu, Tyler Tanto[1], t-tanto@onu.edu, Ellen L. Kuerbitz[2], kuerbitz.2@osu.edu, Patricia M. Dennis[2,3], pmd@clevelandmetroparks.com, (Katherine L. Krynak[1], k-krynak@onu.edu), [1]Ohio Northern University, Department of Biological and Allied Health Sciences, Ada OH 45810, [2]The Ohio State University, College of Veterinary Medicine, [3]Cleveland Metroparks Zoo, Conservation and Science Department.**

Melatonin, a hormone associated with sleep, follows a daily secretion circadian rhythm with peak levels occurring at night. Nocturnal animals in zoos are often housed on a reversed light cycle so visitors can see active animals, housed in darkness, during daytime visiting hours. This study examines the effect of daytime lighting brightness on behavior and health of the nocturnal potto (*Perodicticus potto*). Recent discovery has shown an association between melatonin levels and gut-microbiomes. It was hypothesized that increasing the daytime light intensity would result in a change in activity, melatonin levels and gut microbiome. The effect of a change in daylight intensity (3.3 to 13.5 lum/ft^2) in 2 communally housed pottos at the Cleveland Metroparks Zoo was investigated. Salivary samples were collected to measure melatonin levels associated with this change in daylight intensity. Behavioral data were collected using continuous behavioral sampling. Gut-associated bacterial communities were assessed by sequencing the 16S rRNA gene region of bacterial DNA (V4 target) using Illumina MiSeq platform. Sequence samples were processed using MOTHUR and statistical analyses performed in R. Time spent active increased for 1 animal in the increased lighting intensity period. Salivary melatonin levels were found to be too low for detection and preliminary microbiome analyses indicate no relationship between daylight light intensity and the gut-associated microbiome (PERMANOVA $F_{(2,39)} = 1.42$, $p = 0.16$). Future studies are planned to examine if a greater increase in

artificial light intensity, more closely mimicking natural daylight, would result in a change of the gut-associated microbiome and melatonin levels in these animals.

Poster Board No. 129 - THE GUT MICROBIOME AND THE HEART. Elizabeth Naugle, e-naugle@onu.edu, Holly Dyer, Alyssa Griffith, Katherine Krynak, Elena Less, Kristen Lukas, Patricia Dennis, Ohio Northern University, 402 W. College Ave., Ada OH 45810.

Cardiac disease is the leading cause of mortality in zoo-housed gorillas. A recent study has linked cardiac disease and the gut microbiome of western lowland gorillas (*Gorilla gorilla gorilla*), an association also seen in humans. It was hypothesized that the diet of the zoo-housed gorillas could be altered to influence the gut microbiome, perhaps to more closely resemble that of unaffected animals. To assess the relationship between diet and gut microbiome composition, the gut microbiome of 2 communally-housed male western lowland gorillas, previously diagnosed with cardiac disease, was evaluated during a prescribed dietary change. The diet was changed from a processed nutritional biscuit diet to a high fiber/low starch diet consisting primarily of leafy greens. The new diet was designed to mimic the diet of gorillas in their native habitat. Fecal samples were used to assess the gut microbiome before and after this diet change (n=16). DNA was extracted using a phenol chloroform extraction methodology and samples were sequenced amplifying the 16S rRNA gene region of bacterial DNA using Illumina MiSeq sequencing technology. Sequences were processed using MOTHUR and statistical analyses (PERMANOVA and NMDS) were performed in R (V 3.4.2) to assess beta diversity of the gut bacterial community. The dietary change resulted in shift in the gut microbiome composition (PERMANOVA $F_{(1,15)}=10.703$, $P<0.001$). The use of next-generation sequencing technology will allow for the comparisons of gut-microbiomes between heart-healthy individuals from a related study and the microbiome of these heart-diseased animals after their diet alteration.

Poster Board No. 130 - SOIL AGGREGATION BY *STREPTOMYCES* BACTERIA. Daniel J. Sedlacek, sedlacekd@xavier.edu, Ashley Reinert, reinerta@xavier.edu, Kathryn Morris, morrisk10@xavier.edu, Xavier University, 3800 Victory Parkway, Cincinnati OH 45207.

Experiments were conducted to assess the potential for *Streptomyces* bacteria to aggregate soil. Soil microbes known to stabilize soils are abundant and have filamentous growth habits that allow for enmeshing soil particles. *Streptomyces* exhibit both characteristics. Soil aggregation is an important ecosystem function provided by some soil microbes. Well aggregated soils hold more air and water, resist erosion, and sequester large amounts of carbon. The purpose of this study was to observe and quantify the ability of 4 *Streptomyces* strains to create soil aggregates from unstructured soil. Soil was crushed to 500 µm particles and half was sterilized before being mixed with an equal mass of unsterilized crushed soil, and then inoculated with *Streptomyces*. Controls were treated with sterile growth medium, and 5 replicates were set up for each treatment. After inoculation and incubation, the samples were dried and measured for aggregation. This was done by placing the samples in a set of 4 sieves of decreasing mesh size which were submerged in a pail of water. The sieves were agitated, and the soil particles settled until trapped in a given sieve. The total mass of aggregates on each sieve was used to calculate the amount of aggregation compared to the controls to determine the effectiveness of each strain. The data were analyzed using an ANOVA with treatment as the factor. Half of the isolates examined significantly increased the size of the aggregates produced over 4 weeks ($F_{9,56}=8.5$, $p<0.0001$). This research has important implications for soil conservation, nutrient retention and carbon sequestration.

Poster Board No. 131 - 3,4 METHELYNE-DIOXYMETAMPHETAMINE (MDMA) TREATMENT IN RAT ALTERS THE GUT MICROBIOTA POPULATION. Sayantan Roy Choudhury, srchoud@bgsu.edu, Emily Ann Ridge, eridge@bgsu.edu, Jon Eric Sprague, jesprag@bgsu.edu, Raymond Anthony Larsen, larsera@bgsu.edu, Vipaporn Phuntumart, vphuntu@bgsu.edu, Bowling Green State University, Department of Biological Sciences, Bowling Green OH 43403.

The gut microbiome is inhabited by at least a hundred trillion microorganisms which play a fundamental role in health, diseases and immune responses in humans. Previous studies have highlighted the ability of gut micro-organisms to communicate with the brain and modulate behavioral responses in diseases such as diabetes, inflammatory bowel syndrome, Parkinson's disease and other neurological disorders. The aim of this study was to investigate the alteration of the microbial population in the gut of rats in response to 3,4 methelyne-dioxymetamphetamine (MDMA) administration. To obtain the gut microbiome, fecal samples from animals before treatment and cecal contents from the animals at 90 minutes post-MDMA and saline treatment were collected and suspended in sterile phosphate buffered saline. Serial dilutions of samples were then carried out by plating on Leuria-Bertini (LB) agar plates. The plates were incubated overnight at 37 °C. The results showed no significant difference in numbers of bacterial colonies among animals after MDMA treatment as opposed to control animals treated with saline. Intriguingly, swarming colonies of bacteria were observed in the plates derived from cecal contents of rats treated with MDMA indicating changing behaviors of some bacteria in response to MDMA. A combination of biochemical tests, selective media and molecular identification of 16S rRNA gene revealed these bacterial swarmers were in the genus *Proteus*. This study indicates administration of MDMA changes the gut microbial composition, but the impact of this change is unknown.

Poster Board No. 132 - PERACETIC ACID—A SOLUTION TO CONTROL THE FISH PATHOGEN, *SAPROLEGNIA* SP. Satyaki Ghosh[1], satyakg@bgsu.edu, Sudhan Pachhain[1], sudhanp@bgsu.edu, Joseph S. Toguchi[1], jtoguch@bgsu.edu, David L. Straus[2], dave.straus@ars.usda.gov, Vipaporn Phuntumart[1], vphuntu@bgsu.edu, [1]Bowling Green State University, Department of Biological Sciences, Bowling Green OH 43403, [2]Harry K. Dupree Stuttgart National Aquaculture Research Centre, Stuttgart AR.

Saprolegniasis is a serious emergent disease of fish in both natural and commercial systems, causing losses approximately $40 million annually in the USA. It is caused by *Saprolegnia*, an oomycete pathogen, which can infect all life stages of fish. Peracetic acid (PAA) is being proposed as a control agent against Saprolegniasis, because it degrades readily in the environment, and leaves behind no toxic residues. The effect of PAA on *Saprolegnia sp.* growth was analyzed *in vitro*, by agar plate assays. Prior to subculture, mycelial plugs were treated with 0 (control), 20, 25, 30 and 35 mg/L PAA for 15 minutes (n=10, per concentration). Surface area of mycelia representing *Saprolegnia sp.* growth was measured daily for 5 days, using ImageJ v1.4. Growth reduction was observed at all of the PAA concentrations tested, compared to control, with 33%, 40%, 66% and 100% reduction, at 20, 25, 30 and 35 mg/L PAA, respectively. The same *in vitro* assay showed that PAA also reduced the growth of other oomycete fish pathogens, including *Saprolegnia ferax* (100% reduction at 20 mg/L), and *Aphanomyces astaci* (67% reduction at 30 mg/L). These results indicated that PAA could be a potential control agent for saprolegniasis. PAA degradation assay was performed spectrophotometrically, and it showed that water samples with higher organic matter content had a faster PAA degradation (half-life = 30 minutes) than waters with low organic matter content (half-life > 4 hours). Therefore, water quality needs to be considered when using PAA as a treatment for saprolegniasis.

Poster Board No. 133 - MONITORING HEAT SHOCK PROTEIN 70 AND HEAT SHOCK PROTEIN 90 DURING HERPES SIMPLEX VIRUS TYPE 1 INFECTION. Jordan P. Bagheri, jbagheri1@walsh.edu, Adam C. Underwood, aunderwood@walsh.edu, Darlene G. Walro, dwalro@walsh.edu, Walsh University, Dept. of Biology, 2020 East Maple St., North Canton OH 44720-3336.

Herpes simplex virus type-1 (HSV-1) causes oral and genital lesions and is one of the most commonly acquired human pathogens. Although the virus can code for many of its own proteins needed during virus infection, HSV still requires host proteins to complete the replication cycle. Heat shock proteins (HSP's) constitute a highly conserved family of proteins that have been shown to assist in protein maturation and genome expression in infections with enterovirus. This laboratory is investigating the role of cellular HSP 70 and HSP 90 during HSV infection. Previous work by western immunoblot demonstrated that HSP70 increased 4-fold in HSV-infected cells until 6 hours post-infection and then leveled off to 2-fold the level found in mock-infected cells. The amount of HSP90 did not change over the 12 hour course of the virus infection. Quantitative polymerase chain reaction (qPCR) was performed to determine whether transcription of the HSP's was affected during virus infection. Results of qPCR showed that HSP70 transcription increased until 6 hours post-infection but HSP90 transcription did not change over the course of the infection. Subcellular fractionation of infected cells indicated that HSP70 accumulated in the cytoplasm of the cell. These findings are consistent with the possibility that HSP70 rather than HSP90 is upregulated during HSV infection and may be used during virus protein production in the cytoplasm. These results demonstrate not only an important mechanism of HSP70 in facilitating HSV replication, but also a potential target for antiviral drug development.

Poster Board No. 134 - EXPRESSION OF NATIVE AND MUTATED ACVR1 IN TRANSIENTLY TRANSFECTED HUMAN A375 MELANOMA CELLS. Kristen N. Bricker[1], kbricker1@walsh.edu, Deborah R. Nascimento[2], deborahrn19@gmail.com, Durval B. Palhares[2], dbpalhares@hotmail.com, Marilene G. Palhares[2], marilene.palhares@bol.com.br, Amy Milsted[1], amilsted@walsh.edu, Almir S. Martins[3], alisbetermster@gmail.com, Joseph Lupica[1], jlupica@walsh.edu, Adam Underwood[1], aunderwood@walsh.edu, [1]Walsh University, 2020 East Maple St. NE, North Canton OH 44720, [2]Universidade Federal de Mato Grosso do Sul, Campo Grande/MS, Brasil. [3]Universidade Federal de Minas Gerais, Belo Horizonte/MG, Brasil.

Fibrodysplasia Ossificans Progressiva (FOP) is a condition leading to ossification of soft tissue subjected to trauma. This condition is linked to a heterozygous mutation of the Activin A Receptor type 1 (ACVR1) gene expressing a protein that encodes histidine (H) rather than arginine (R) at residue 206 (R206H). This mutation is located in an intracellular glycine-serine activation domain leading to ligand independent activation of ACVR1. While anti-inflammatory compounds are used to curtail severity of FOP flare-ups, there is no cure for this condition. However, administration of ascorbic acid (AA) has been shown to possibly play a role in stabilizing progression of FOP, although the mechanism is unknown. To begin to identify a mode of action for AA, the coding region of ACVR1 was cloned into the pEF1/Myc-HIS expression vector to generate pEF1/ACVR1 and pEF1/ACVR1-R206H constructs. Conditions were optimized to express and detect ACVR1 and ACVR1-R206H in human A375 melanoma cells to examine whether human A375 cells transiently transfected with either pEF1/ACVR1 or pEF1/ACVR1-R206H constructs will express native or mutated ACVR1 fusion proteins. To begin, 7.5X104 A375 cells were seeded in a 35 mm plate and incubated 24 hours followed by transfection with either native or mutated construct. After 24 hours, protein was collected, quantified, and subjected to sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS PAGE) and western blot analysis using a goat anti-Myc epitope HRP conjugated primary antibody (Bethyl). Both pEF1 expression constructs expressed ACVR1, but further research is needed to determine whether or not the therapeutic potential of AA is being addressed.

Poster Board No. 135 - GENERATION OF NATIVE AND MUTATED PEF1/SOX18 MYC-HIS EXPRESSION CONSTRUCTS TO DETERMINE THE IMPACT OF AMINO ACID EXCHANGE ON NUCLEAR LOCALIZATION. Kristen N. Bricker[1], kbricker1@walsh.edu, Daniel Rasicci[1], drasicci1@walsh.edu, Amy Milsted[1], amilsted@walsh.edu, Jeremy Prokop[2], jprokop54@gmail.com, Adam Underwood[1], aunderwood@walsh.edu, [1]Walsh University, 2020 East Maple St. NE, North Canton OH 44720, [2]HudsonAlpha Institute for Biotechnology.

SOX proteins are transcription factors containing a conserved High Mobility Group-box (HMG-box) DNA-binding domain that regulate embryogenesis and tissue maintenance. Mutations often result in cancer, developmental abnormalities, sex reversal, and circulatory dysfunction. Genomic analysis of 20 human *SOX* genes identified a mutation in the HMG-box of SOX18 that exchanges glutamic acid (E) for lysine (K). Mutation E137K is predicted to modify ability of SOX18 to localize to the nucleus. No literature exists regarding E137K, although it is present in 0.82% of Latino population (as predicted in our analysis). The purpose of this project is to produce native and mutated SOX18 expression constructs to determine if nuclear localization is altered. The hypothesis is: SOX18 proteins encoding the E137K mutation will exhibit reduced nuclear accumulation compared to non-mutated SOX18 expressed in transiently transfected CHO cells. Human SOX18 was cloned into pEF1/*Myc*-HIS expression vector, followed by site-directed mutagenesis to synthesize pEF1/SOX18-E137K. Chinese Hamster Ovary (CHO) cells were transfected with either native or mutated construct, or control (pEF1/*Myc*-HIS), in glass chamber slides. After 24 hours, cells were fixed in methanol, blocked, and SOX18 fusion proteins detected using c-Myc Antibody (9E10) Alexa Fluor® 488 (Santa Cruz Biotechnology, Inc.), diluted 1:800 in blocking solution. CHO were mounted in DAPI-containing medium, and micrographs captured on an Olympus iX51 with DP71 digital camera. Controls showing antibody specificity include CHO transfected with SOX18 incubated with PBS in place of primary antibody. From these trials, it was determined that E137K reduces nuclear localization of SOX18. Future experiments focusing on altered DNA binding and SOX18 homodimerization are underway.

Poster Board No. 136 - THE EFFECT OF HEROIN ON VITAMIN B12 ABSORPTION. Mackenzie G. Durdak, mdurdak001@defiance.edu, (Somanth Dutta, sdutta@defiance.edu), Defiance College, 701 N. Clinton Street, Defiance OH 43512.

Vitamin B12 is a water-soluble vitamin that is used in the development of different physiological and cellular processes within the body. B12 is commonly used in the brain to synthesize amino acids and neurotransmitters in order to create neurochemical synthesis. Previous studies have found that opiates such as heroin interfere with the effectiveness of certain vitamins in the body. Although it is known from these studies that heroin use may interfere with the absorption of fat-soluble vitamins such as A and D, it is not known what effect heroin has on vitamin B12 absorption. The purpose of this study is to determine what effect heroin use has on the water-soluble vitamin B12. This experiment requires the use of 27 mice, divided into 3 separate subgroups of 9 mice each, all maintained on a B12 deficient diet provided *ad libitum*. The control group will receive one i.p. injection of physiological saline. The second group of mice will receive 1 i.p. injection of vitamin B12, to produce a known amount of the vitamin within the body. The final group of mice will receive both vitamin B12 and heroin injections every other day. Two milligrams

of heroin per kilogram of body mass will be administered during each injection. Serum levels of vitamin B12 will be determined postmortem. Briefly, sera is reacted with the fluorescent adduct 3-bromomethyl-6,7-dimethoxy-1-methyl-1,2-dihydroquinoxaline-2-one (DMEQ). The fluorescently conjugated vitamin B12 is analyzed using reverse phase high performance liquid chromatography (HPLC) and detected spectrofluorometrically.

Poster Board No. 137 - OBTAINING A CCR5 KNOCKOUT USING THE CRISPR/CAS9 SYSTEM. Weizhuan He, w.he1@mail.lorainccc.edu, (Harry W. Kestler, Hkestler@lorainccc.edu), Isaiah Hagwood, Kayla S. Zamborsky, zamborskyk@yahoo.com, Lorain County Community College, 1005 N. Abbe Rd., Elyria OH 44035.

Some survivors of the Black Plague, caused by *Yersenia pestis*, have a selective advantage in that they lack a functional *ccr5* gene. A 32 base pair deletion mutation, *ccr5 delta 32*, confers resistance to *Yersenia pestis* and HIV infections. Timothy Ray Brown, the only known person to be cured of both HIV and leukemia, received a bone marrow transplant from a homozygous donor who had the ccr5 delta 32 mutation. CCR5 is one of two secondary receptors for entry of the virus into human T-cells. It has been hypothesized that the amino-terminus of the CCR5 delta 32 protein can exert a negative regulatory effect on wild type CCR5 as well as CXCR4, the other secondary co-receptor. This study was designed to determine the effect of the complete removal of the *ccr5* gene in human cells *in vivo*. Gene editing was performed using the CRISPR/Cas9 system to eliminate the expression of the CCR5 protein by removing a section of the sequence from both copies of the *ccr5* gene. The human T-cell line, H9, was co-transfected with one plasmid containing the guide RNA sequences that has homology to the amino-terminus of the *ccr5* gene and the CRISPR/Cas9 and a second plasmid containing a puromycin resistance gene. Puromycin toxicity was determined by serially diluting puromycin into medium and then counting cells. Transformants were obtained by puromycin selection at 21 days after transfection. The presence of the gene in transfected cells was confirmed by PCR of the puromycin gene.

Poster Board No. 138 - ANALYSIS OF A NOVEL MUTATION LOCATED IN THE CCR5 GENE WITH POTENTIAL EFFECTS ON HIV INFECTIVITY. Elianis G. Osorio[1,2], eosorio121200@gmail.com, (Harry Kestler, hkestler@lorainccc.edu), Kennedy A. Figueroa[1], e.g.kennedyfigueroa@gmail.com, Emily C. Negrón[1], e.negron6@mail.lorainccc.edu, Octavia J. Whitfield[1], dr.tavia@gmail.com, [1]Lorain County Community College, 1005 N. Abbe Rd., Elyria OH 44035, [2]4259 Miami Ave., Lorain OH 44053.

A novel mutation in the *ccr5* gene, which codes for the CCR5 protein, was found in a child of an African-American family. The mother contracted HIV before the birth of her first child in the early 1980s, and after she contracted the virus, she unknowingly exposed all 5 of her children to HIV through natural childbirth. Of the 5 children, the second born did not acquire the infection even though she was exposed to the virus at birth. The mother and the infected children all shed genetically similar virus, with the similarity inversely correlated with birth order. A missense point mutation in the cytoplasmic domain of the child's *ccr5* gene was discovered. The mutation (TG5) changes a lysine codon at position 314 into an arginine codon. The allele containing the TG5 mutation was cloned into pCR®4-TOPO® Vector and was then sub-cloned into pLNCX2, the retroviral plasmid vector. Clones made from pLNCX2-TG5 will be used to transfect the packaging cell line PT67 which will assemble viral particles containing the TG5 mutation. The retroviral particles will be recovered and introduced into an H9 cell line as well as others, and the expression of the TG5 gene in H9 and its effect on HIV infectivity will be tested. It has been reported that CCR5 delta 32 can down-modulate wild-type CCR5 and CXCR4, and the ability of TG5 to down-modulate wild-type CCR5 and CXCR4 will be evaluated.

Poster Board No. 139 - EXPRESSION PATTERN OF THE CALCIUM-BINDING PROTEIN CALRETICULIN IN A MAMMALIAN CIRCADIAN CLOCK. Tyler M. Birkholz, birkhot@bgsu.edu, Dilshan H. Beligala, beligad@bgsu.edu, Arpan De, ade@bgsu.edu, Michael E. Geusz, mgeusz@bgsu.edu, Bowling Green State University, Dept. of Biological Sciences and J.P. Scott Center for Neuroscience, Mind, and Behavior, Bowling Green OH 43403.

The hypothalamic suprachiasmatic nucleus (SCN) is the principal circadian pacemaker of mammals. Retinal signals passing directly to the SCN through the optic nerve synchronize the clock's circadian rhythms to daily environmental cycles. These circadian rhythms are driven by clock gene transcription-translation feedback loops within individual cells. Cytosolic Ca^{2+}mobilization, driven by the release of Ca^{2+} from ryanodine-sensitive internal stores, has been shown to modify gene transcription within SCN neurons causing a shift in the phase of the circadian clock. Several calcium-binding proteins have been examined in the SCN for their role in the circadian clock. Calreticulin (CALR) is a major regulator of Ca^{2+} levels in the endoplasmic reticulum (ER) and shows elevated expression in the SCN according to RNA in situ hybridization results. CALR interacts with ryanodine receptors of the ER to influence Ca^{2+} release, yet its function within the SCN is largely unknown. To identify CALR protein distribution in the SCN we performed immunocytochemistry and confocal microscopy of brain slices containing adult mouse SCN along with Hoechst staining to identify cell nuclei. Imaging revealed positive CALR expression along the inferior side of the SCN above the optic chiasm. Some of the cells also expressed SOX2 protein, a regulator of embryonic and adult neurogenesis. These early results show previously unknown expression of CALR within the SCN where retinal axons project to SCN neurons, suggesting that CALR could serve in this pathway of light signals to the clock that maintains its entrainment to the daily rhythms in the external environment.

Poster Board No. 140 - THE RELATIVE REWARD EFFECT: INSTRUMENTAL AND CONSUMMATORY CONTRAST FOR SUCROSE IN SPRAGUE-DAWLEY AND ALCOHOL-PREFERRING (P) RATS. Justin J. McGraw, jmcgraw@bgsu.edu, Robert S. Goldsmith, robgold@bgsu.edu, Erin A. Tepe, etepe@bgsu.edu, (Howard C. Cromwell, hcc@bgsu.edu), Bowling Green State University, 1082 Fairview Ave., Apt. W6, Bowling Green OH 43402.

Relative reward effects highlight the impact of reward value shifts on goal-directed behavior. A popular method used to study relative reward effects is incentive contrast. Positive contrast is an upshift or increase in behavior toward an outcome due to an alternative while negative contrast is the opposite. The ability to compare rewards and utilize value shifts to make advantageous decisions may be altered in alcohol use disorders. We examined the reward comparison abilities of Sprague-Dawley (SD) and alcohol-preferring (P) rats in an operant task using 12 sucrose solution pairings to determine potential line differences in incentive contrast before P rat alcohol exposure. Animals underwent a repeated-measures design consisting of 2 single outcome blocks separated by a mixed outcome block. Appetitive and consummatory measures were used to assess positive and negative contrast toward single outcomes relative to those outcomes when they were compared to alternatives. Preliminary data in unrestricted animals show that alcohol-naïve P rats are more vigilant to obtain sucrose and exhibit higher reward seeking and sucrose intake than SD rats. P rats also show more generalized responding and a complete lack of appetitive and consummatory contrast. Unrestricted SD rats show more reliable consummatory contrast as opposed

to appetitive contrast. Results suggest that alcohol-naïve P rats have inherent predispositions to outcome insensitivity and disrupted reward comparison abilities which are crucial in guiding goal-directed behavior. Future work will examine the impact of food restriction on contrast, alcohol's effect on contrast in P rats, and contrast effects on P rat alcohol consumption.

Poster Board No. 141 - ORDER EFFECTS ALTER WORK EFFORT IN RAT MODEL OF FREE CHOICE. Zackery T. Knauss, zackerk@bgsu.edu, Marko Filipovic, markof@bgsu.edu, Joseph A. Lubera, jlubera@bgsu.edu, Najae M. Bolden, najaeb@bgsu.edu, Melanie M. Queener, mqueene@bgsu.edu, Jasmine P. Smith, jassmit@bgsu.edu, Robert S. Goldsmith, robgold@bgsu.edu, Kylee A. Smith, skylee@bgsu.edu, Jacob E. Bischoff, jebisch@bgsu.edu, Alex Price, pricead@bgsu.edu, Howard C. Cromwell, hcc@bgsu.edu, Bowling Green State University, John Paul Scott Center for Neuroscience, Mind and Behavior and the Department of Psychology, Bowling Green OH 43403.

Examining the external and internal factors involved in motivation to work using animal models (e.g., rodent model) is an important question for psychological and behavioral sciences. The role of effort on work output has been a key variable under investigation. Previous work is highly limited, showing animals inconsistently choose higher effort work options and generally find effort aversive. A goal of the present study is to increase preference for effortful work. The methods included utilizing controlled testing experiences originating with completion of high effort options for greater reward. Our procedures tested choice for different effort options using a free-foraging task that allows animals to self-pace behavior and explore within a larger testing environment. Animals chose between a high effort option (5 lever press) with shifting reward outcome value either food magnitude descending (5, 4, 2, 1 pellets) or ascending (1, 2, 4, 5 pellets) over a 4-week period. Each week the alternative option was low effort and low reward (1 lever press for 1 pellet). Work motivation/output was determined using analysis of high effort reward discrimination, preference and incentive contrast between testing weeks. An order effect was observed with animals working harder and choosing the greater effort option significantly more when rewards were in descending order of magnitude as compared to ascending order. Further analysis will focus on a set of dependent variables including place preference, approach and consumption measures. In addition, the results allow for an analysis of error rates when obtaining reward options in different choice contexts. These findings suggest that rats experiencing higher levels of work initially will continue to choose a higher effort work option more often even when costs of food reward increase compared to a lower effort option. Results can lead to novel methods for understanding key factors involved in work aversion or justification, testing the impact of drugs of abuse on motivation, and exploring brain substrates of reward processing related to effort.

Poster Board No. 142 - CONSTRUCTION OF A LOW COST, FIXED STAGE MICROSCOPE FOR EXPERIMENTS IN NEUROSCIENCE. Mallory Soska, mallory.soska@otterbein.edu, David C. Sheridan, dsheridan@otterbein.edu, Otterbein University, Department of Biology & Earth Science, 1 South Grove Street, Westerville OH 43081.

A fixed stage microscope is essential for electrophysiological studies of the rodent brain. Epifluorescent fixed stage scopes cost approximately $50,000, a prohibitive price tag for labs with limited funding or at non-R01 teaching universities. The goal of this project was to systematically add or subtract commercially available, recycled, or engineered components to improve the capabilities and flexibility of a modular microscope. The Phase 1 microscope produced brightfield images of biological specimens that rivaled those captured with higher end commercial microscopes. In Phase 2, an excitation LED (approximately 465 nm, blue) and emission filter (515 nm long pass) were added to permit epifluorescence imaging of AlexaFluor® 488 stained convoluted tubules and glomeruli in a prepared slide of mouse kidney section. Phase 3 involved engineering or 3D printing rapidly interchangeable filter set components for detection of multiple types of fluorescent proteins. The final, Phase 4 microscope, the CardyScope, included the listed features as well as light polarizers, Nomarski prisms, and water immersion objectives to allow for differential interference contrast (DIC) imaging of rodent brain tissue slices and neurons for *in vitro* anatomical and electrophysiological experiments. The cost of the final, fixed stage microscope was approximately $6,000 and had functional capabilities comparable to higher end microscopes. The cost and functionality of these modular microscopes make it possible for underfunded laboratories to conduct neuroscience experiments that promote student learning.

Poster Board No. 143 - ENHANCING THE DIRECT VISUALIZATION OF MICROGELS VIA SCANNING ELECTRON MICROSCOPY. Tony D. Dobrila[1,2], tonydobrila.2814@gmail.com, Kiril A. Streletzky[1], k.streletzky@csuohio.edu, Petru S. Fodor[1], [1]Cleveland State University, Cleveland OH, [2]6903 Regal Drive, Parma OH 44129.

To gain a greater understanding of the dynamics of microgels in solution, their volume phase transition, and to correlate images of individual particles with Dynamic Light Scattering (DLS) data on their diffusion, 2 sample preparation techniques were developed to enhance the imaging obtained using scanning electron microscopy (SEM). Microgels are micelles of amphiphilic polymers, making them a viable drug delivery mechanism. Direct visualization of microgels is important in understanding their dynamics and size distribution. Accurate imaging of such systems is challenging as microgels lose water content under the standard high vacuum SEM protocols. To address this issue, a controlled environment chamber was first developed, allowing the microgels to dry over a longer period of time at higher humidity levels than standard room conditions. A humidity sensor in a control loop was used to monitor the environment inside the chamber. The humidity was then set using controlled evaporation from a buffer reservoir. Using the controlled humidity environment allowed microgels to better maintain their original structure for imaging and produced microgel size distributions more consistent with DLS. Another sample preparation method used for microgel imaging was suspending particles in ionic liquid (1-Butyl-3-methylimidazolium Trifluoromethanesulfonate). Lower vapor pressures and higher ionic concentrations of these suspensions allowed the capture of real-time microgel dynamics. Microgels in ionic liquids were observed to be smaller than expected, while maintaining size distribution uniformity observed by DLS. Such observations could be due to charge screening or the increased salt concentration due to the ionic liquid.

Poster Board No. 144 - TUNING THE PHASE AND MICROSTRUCTURAL PROPERTIES OF TiO_2 FILMS THROUGH PULSED LASER DEPOSITION AND EXPLORING THEIR ROLES AS BUFFER LAYERS FOR CONDUCTIVE FILMS. Eryn B. Doyle, edoyle@bgsu.edu, Sahil Agarwal, asahil@bgsu.edu, and Farida A. Selim, faselim@bgsu.edu, Bowling Green State University, Physics and Astronomy Department, 806 Ridge St., Bowling Green OH 43403.

Titanium oxide (TiO_2) is a semiconducting oxide of increasing interest due to its chemical and thermal stability and broad applicability. In this study, thin films of TiO_2 were deposited by pulsed laser deposition on sapphire and silicon substrates under various growth conditions and characterized by X-ray diffraction (XRD), atomic

force microscopy (AFM), optical absorption spectroscopy and Hall-effect measurements. XRD patterns reveal that a sapphire substrate is more suitable for formation of the rutile phase in TiO_2 while a silicon substrate yields a pure anatase phase, even at high temperature growth. AFM images indicates that the rutile TiO_2 films grown at 805 °C on sapphire substrate have a smoother surface than anatase films grown at 620 °C. Optical absorption spectra confirmed the band gap energy of 3.08 eV for the rutile phase and 3.29 eV for the anatase phase. All the deposited films exhibited the usual high resistivity of TiO_2, however when employed as a buffer layer, anatase TiO_2 deposited on sapphire significantly improves the conductivity of Indium Gallium Zinc oxide (IGZO) thin films. The study illustrates how to control the formation of TiO_2 phases and reveals another interesting application for TiO_2 as a buffer layer for transparent conducting oxides.

Poster Board No. 145 - NUMERICAL SIMULATION OF HIGH EFFICIENCY ALL-BACK-CONTACT PHOTOVOLTAICS USING LONG LIFETIME CADMIUM TELLURIDE. Christopher K. Pyles[1,2], cpyles@bgsu.edu, Marco Nardone[1], marcon@bgsu.edu, [1]Bowling Green State University, Bowling Green OH, [2]5333 W. Arlington Park Blvd., Fort Wayne IN 46835.

The concept of All-Back-Schottky-Contact (ABSC) thin-film photovoltaic (TFPV) devices was recently introduced as a means to reduce the cost of solar electricity while improving reliability. Rather than a typical p-n junction, electron-hole pair separation is achieved by Schottky junctions formed between the semiconductor and interdigitated, bi-metallic back contacts. This type of device minimizes the number of semiconductor layers and removes the need for extrinsic doping to build a high efficiency device. Here, theoretical study is presented of the optimal parameter set for an ABSC device that employs long-lifetime, polycrystalline cadmium telluride (CdTe) as the absorber layer and CdMgTe as a passivation layer. The parameter space includes relevant geometric and material properties. The Poisson equation coupled with the continuity equations for electrons and holes in an illuminated semiconductor device are solved using the finite element method (COMSOL Multiphysics® software) to simulate device performance and determine the power conversion efficiency. It is determined that >20% efficiency can be achieved for a reasonable device architecture as long as surface defects are effectively passivated. These results provide guidance for the fabrication of a prototype.

Poster Board No. 146 - STUDYING THE EFFECT OF CROSS-LINKER ON POLYMERIC MICROGELS. Samantha C. Tietjen[1,2], stietjen.2015@gmail.com, Samantha Hudson[3], Kiril A. Streletzky[1]. [1]Cleveland State University, Cleveland OH, [2]4530 Poe Road, Medina OH 44256, [3]Hiram College, Hiram OH.

Microgels are spherical particles suspended in solution, comprised of crosslinked polymer chains. Due to the amphiphilic property of the parent polymer, microgels display a temperature dependent volume phase transition (de-swelling), and thus have the potential to be used for drug delivery. Previous studies suggest that increasing the concentrations of the chemical cross-linker reduces the hydrodynamic radius (R_h) and the de-swelling ability, thus primary experiments focused on the variation of cross-linker to polymer ratios. Microgels were synthesized using the polysaccharide polymer hydroxypropyl cellulose (HPC) and chemical cross-linker divinyl sulfone (DVS), in a surfactant solution. Synthesized particles were characterized using dynamic light scattering (DLS) for temperature and angular dependence to study their shape and determine the apparent R_h of the swollen and de-swollen states. Initial microgel synthesis revealed a dependence of R_h on microgel concentration in samples, requiring a correction for infinite sample dilution during analysis. Increasing DVS:HPC ratio from 1 to 30 causes R_h to decrease from 150 to 190 nm at 25 °C, and from 65 to 95 nm at 50 °C. Ratios from 40 to 50 resulted in swelling from 70 nm at 25 °C to 165 nm at 50 °C. At a ratio of 60, an apparent bulk gelation occurred. The increase in DVS:HPC ratio allowed for the controlled synthesis of more compact microgels that display reversible temperature controlled deswelling. However, at ratios above 30, particles were found to grow in size above the transition temperature.

Poster Board No. 147 - CHARACTERIZATION OF DEFECTS IN B-GA_2O_3 THIN FILM GROWN BY METAL ORGANIC CHEMICAL VAPOR DEPOSITION. Armando Hernandez, aherna@bgsu.edu, Sahil Agarwal, Pooneh Saadatkia, Farida A. Selim, faselim@bgsu.edu, Bowling Green State University, Center for Photochemical Sciences, Department of Physics and Astronomy, Bowling Green Ohio 43403.

ß-gallium(III)oxide (Ga_2O_3)is emerging as a semiconducting material of great interest for fabrication and advancement of high powered devices because of its very wide bandgap, excellent electrical properties and high breakdown voltage. In this work, epitaxial films of as-grown and Si doped ß-Ga_2O_3 were fabricated by metalorganic chemical vapor deposition (MOCVD) and were characterized by X-ray diffraction (XRD), thermoluminescence (TL) and Hall effect measurements. The XRD patterns revealed formation of pure epitaxial ß-Ga_2O_3 phase. Luminescence was recorded in the range of 200 to 800 nm using TL between −190 °C to 360 °C to detect all emission centers. An electron trap was identified at very low temperatures. Electrical properties including resistivity, density and mobility were determined using Hall effect measurements. This study illustrates an efficient method to grow pure epitaxial ß-Ga_2O_3 as well as identify its fundamental properties and investigate the role of defects.

Poster Board No. 148 - STUDY OF ELECTRONIC DEFECTS IN β-Ga_2O_3 SINGLE CRYSTALS USING THERMOLUMINESCENCE SPECTROSCOPY. Md Minhazhul Islam[1,2], mdmini@bgsu.edu, Dhan Rana[2], drana@bgsu.edu, Armando Hernandez[1,2], aherna@bgsu.edu, Farida A. Selim[1,2], faselim@bgsu.edu, [1]Center for Photochemical Sciences, [2]Bowling Green State University, Department of Physics and Astronomy, Bowling Green OH 43403.

The presence of electronic defects in gallium oxide single crystals greatly affects the transport of electrons and excitons. The origin of these electronic defects could be the anion/cation vacancies or the incorporation of impurities into the crystals during the growth process. The defects can act as electron/exciton traps. Consequently, they can affect the optical as well as electrical properties of Ga_2O_3 crystals by introducing intermediate energy levels in the bandgap. Identification of the nature of the defects is crucial for the successful application of ß-Ga_2O_3 in optoelectronics. Both shallow and deep level defects in ß-Ga_2O_3 single crystals were studied using temperature and wavelength resolved thermoluminescence spectroscopy. Undoped, Fe-doped, Sn-doped and Mg-doped ß-Ga_2O_3 single crystals have been studied. Thermal activation energies of defects have been calculated using multiple heating rates and/or initial rise method depending on the kinetics and suitability. Undoped Ga_2O_3 exhibited three, Fe-doped four, and Mg-doped two luminescence peaks associated with respective defect energy levels. Sn-doped Ga_2O_3 did not display any luminescence peak. The defects were found to be related to oxygen vacancies and iron impurities. Optical absorption spectroscopy was performed on the samples and bandgaps were calculated from Tauc plot. It was found that the dopants do not change the bandgap. Hall effect measurements were carried out for all samples in identical conditions and electrical parameters were determined at room temperature.

Poster Board No. 149 - ELECTRICAL CHARACTERIZATION OF CZ (CZOCHRALSKI) AND EFG GROWN β- GA_2O_3 USING MMR HALL EFFECT MEASUREMENT SYSTEM. Dhan B. Rana[1,2], drana@bgsu.edu, Pooneh Saadatkia[1], poonehs@bgsu.edu, Farida A Selim[1], faselim@bgsu.edu, [1]Bowling Green State University, Department of Physics and Astronomy, Bowling Green OH, [2]834 4th Street, Apt. #6, Bowling Green OH 43402.

Gallium oxide (Ga_2O_3) is the widest band gap (4.8 to 5.0 ev) transparent (up to UV-C range) semiconducting oxide known so far. Due to large band gap and expected Baliga's figure of merit (FOM), it possesses excellent material properties for high power device applications. It exists in 5 different polymorphs (α, ß, γ, δ and ε), ß being the most stable polymorphs throughout all temperature. Electrical characterization of CZ (Czochralski) grown and EFG (edge defined film fed growth) grown sample was carried out by using MMR Hall effect measurement system, which uses Van der Pauw technique. The electrical contacts on the samples were made using indium and the electrical transport properties were evaluated. The conductivity of samples was found to be highly dependent on doping material. Un-doped ß-Ga_2O_3 single crystal is highly resistive ($\approx 10^7$ ohm·cm), but the Sn-doped ß-Ga_2O_3 has substantially decreased resistivity. The resistivity of Mg-doped and Fe-doped samples were relatively higher than the undoped samples. Positron annihilation measurements were conducted to investigate the effect of compensating defects on conductivity.

Poster Board No. 150 - POSITRON MEASUREMENT OF TRANSIENT PHOTOCONDUCTIVITY IN OXIDES. Pooneh Saadatkia[1,2], poonehs@bgsu.edu, Petr Stepanov[1,2], Farida Selim[1,2], [1]Center for Photochemical Sciences, [2]Bowling Green State University, Department of Physics and Astronomy, Bowling Green OH 43403.

Complex oxides with the ABO_3 perovskite crystal structure reveal a range of spectacular phenomena such as superconductivity, ferroelectricity, and metal-insulator transitions. $SrTiO_3$, has been the focus of intense research in the world of oxide materials due to its functional, dielectric and ferroelectric properties. Vacancies are usually suggested to be the dominant point defects in perovskite oxides which significantly affect the material properties. Therefore, identifying the nature of vacancy defects is crucial to understand the origin of novel phenomena in complex oxides such as room temperature persistent and transient photoconductivity in bulk single crystals of STO, as well as unusual thermo-luminescence and photoluminescence behavior of STO during phase transition. This can be achieved using positron annihilation lifetime spectroscopy (PALS) which is an excellent technique to identify vacancy-related point defects in materials on the atomic scale. PALS and digital coincidence Doppler broadening spectroscopy have been applied to examine the presence of defects and their role in room temperature photoconductivity of bulk STO single crystals.

Poster Board No. 151 - EFFECTS OF POPULATION DENSITY AND FOOD AVAILABILITY ON *XENOPUS* METABOLIC RATE AND ORGAN SIZE. Muna M. Ahmed, Muna.Ahmed@Otterbein.edu, Nikolina Stefanova, Nikolina.Stefanova@Otterbein.edu, (Sarah Bouchard, SBouchard@Otterbein.edu), Otterbein University, Dept. of Life Sciences, 1 S. Grove St., Westerville OH 43081.

Standard metabolic rate is the energy expended by a resting organism. Studies suggest that metabolic rate may be plastic in response to developmental conditions. Such plasticity could help organisms survive low resource environments. Changes in metabolic rate could occur via changes in organ size, such as the gut and the brain. African clawed frog tadpoles, *Xenopus laevis*, were reared at low and high population densities with low or high food levels. The hypothesis was that tadpoles reared with low food levels (at either low or high density) would have lower metabolic rates, larger guts, and smaller brains than those reared at high food levels. Tadpoles were reared in 12-liter tanks replicated 38 times. There were 20 low-food tanks with high (n=10) or low densities (n=10) and 18 high-food tanks with low (n=9) or low densities (n=9). High density tanks each had 15 tadpoles and low density tanks each had 3 tadpoles. Tadpole growth was determined by measuring changes in tadpole length over time. Metabolic rates were measured on at least 2 tadpoles from each tank (n=14 to 18 tadpoles per treatment) by measuring changes in oxygen levels with closed system respirometry. Tadpoles were euthanized and preserved in 10% formalin, so that their brains and guts can be dissected and weighed. We will determine effects on organ masses from each tadpole that we dissect. Preliminary analyses suggest that tadpoles reared at low food levels have lower metabolic rates than those reared at high food levels.

Poster Board No. 152 - INCREASING MEMBRANE REPAIR AS A NOVEL THERAPEUTIC APPROACH IN THE TREATMENT OF MYOSITIS. Ana Capati, capati.1@osu.edu, Kevin E. McElhanon, kevin.mcelhanon@osumc.edu, Thomas A. Bodnar, bodnar.51@buckeyemail.osu.edu, Brian J. Paleo, paleo.1@buckeyemail.osu.edu, Eric X. Beck, eric.beck@osumc.edu, Aubrey L. Rose, rose.1279@osu.edu, Wael Jarjour, wael.jarjour@osumc.edu, (Noah Weisleder, noah.weisleder@osumc.edu), The Ohio State University, Department of Physiology and Cell Biology, Dorothy M. Davis Heart and Lung Research Institute, 473 W. 12th Ave., Columbus OH 43210.

Myositis is an idiopathic autoimmune disorder characterized by severe skeletal muscle inflammation and degeneration. Treatment is limited to systemic immunological suppression and development of future therapeutic strategies are contingent upon the elucidation of pathogenic mechanisms. Recent studies under Dr. Noah Weisleder at The Ohio State University show that muscle antigen exposure due to compromised membrane resealing accompanies myositis progression. TRIM72 is a critical facilitator of the membrane resealing process and has been identified as a novel myositis specific autoantigen (MSA). TRIM72 proteins may act as autoantigens following membrane injury, resulting in TRIM72 autoantibodies that compromise membrane resealing and increase inflammation. Using an indirect ELISA, myositis patient sera was screened for increased levels of TRIM 72 antibodies. Patient sera positive for high levels of TRIM72 antibodies (>1 standard deviation) will be tested for membrane resealing capacity using a glass bead damage assay and human embryonic kidney (HEK) cells. Readout is intracellular lactate dehydrogenase (LDH) release after membrane injury. Further experiments will utilize a multi-photon infrared laser injury assay and a lipophilic dye that fluoresces only when exposed to membrane phospholipids to quantify cellular membrane damage in the presence of positive patient sera. If TRIM72 autoantibodies prove to be crucial in myositis associated membrane-resealing impairment, it presents a potential therapeutic target. Exogenous poloxamer 188 (P188) is proven to enhance membrane-resealing capacity in muscle membranes. Later laser injury assays will be performed in the presence of P188 to investigate if there is an improvement in myositis related membrane resealing capacity.

Poster Board No. 153 - NOVEL MEMBRANE INJURY ASSAYS TO ASSESS IMPACT OF POLOXAMERS ONMEMBRANE REPAIR. Alex Carsel, carsel.2@buckeyemail.osu.edu, Brian Paleo, paleo.1@buckeyemail.osu.ed, Kevin McElhanon, kevin.mcelhanon@osumc.edu, Eric X. Beck, eric.beck@osumc.ed, Noah Weisleder, noah.weisleder@osumc.edu, The Ohio State University, Department of Physiology and Cell Biology, Dorothy M. Davis Heart and Lung Research Institute, 473 W. 12th Ave., Columbus OH 43210.

Membrane repair is an endogenous cellular process that actively reseals membrane disruptions to allow a cell to survive injuries that would normally destroy the cell. Co-block polymer (poloxamer) compounds have the capacity to increase plasma membrane repair in skeletal muscle tissue. Specifically, poloxamer 188 (P188) can increase plasma membrane repair in a number of tissues, including muscle tissue. There are several advantages to the use of poloxamer compounds as therapeutic agents to remedy muscular degenerative diseases like Duchenne muscular dystrophy (DMD), as seen previously in mouse and dog models with P188. Since the poloxamer group is a diverse group of chemical polymer entities, it is likely that there are other poloxamers that could prove to be more effective than P188. Establishing which existing poloxamers will provide new potential therapeutic agents for DMD and help guide development of novel poloxamers that have even greater efficacy. We will use a novel saponin cell wounding assay to injure mouse C2C12 myoblasts cells. C2C12 cells will be cultured overnight until confluent in a 10% serum culture medium. The cells will be damaged with varying doses of saponin to permeabilize the membrane. The amount of intracellular lactate dehydrogenase (LDH) that leaks into the extracellular Tyrode solution will be measured by spectrophotometry to resolve the extent of membrane repair in the presence of various poloxamers. This should determine poloxamer characteristics that maximize effectiveness as therapeutic agents, which will help to design better therapies in the future.

Poster Board No. 154 - VISUAL DETECTION THRESHOLDS OF WALLEYE UNDER VARYING TYPES OF TURBIDITY. Andrew L. Oppliger, oppliger.6@osu.edu, Chelsey L. Nieman, nieman.36@osu.edu, and Suzanne M. Gray, gray.1030@osu.edu, The Ohio State University, School of Environment and Natural Resources, 2021 Coffey Rd., Columbus Ohio 43210.

Increasing turbidity could alter the visual ecology of Lake Erie Walleye (*Sander vitreus*) through changes to the visual environment. Knowledge of how individual Walleye respond to changes in the visual environment will provide a framework for understanding expected community and population level interactions. The ability of an animal to distinguish between an object and its background (i.e., visual sensitivity) is expected to be altered by fluctuating turbidity due to decreased light penetration and a change in the color of light underwater. The objective was to determine if varying turbidity types differentially influence visual sensitivity of Walleye. To determine how visual sensitivity is impacted by turbidity, optomotor response tests were used to establish visual detection thresholds for three different types of turbidity: algal, sedimentary, and a combination of the two. Turbidity was increased incrementally in a cylindrical tank to a point in which the Walleye ($n = 6 \times 6$ trials/fish = 36 trials) was unable to distinguish between a rotating black stimulus and a white background, indicated by an inability to follow the moving object. Visual detection thresholds were determined to be significantly higher in the sedimentary treatment (mean = 99.98 ± 5.31 NTU) than the combination (mean = 66.47 ± 3.27 NTU) and algal (mean = 40.35 ± 2.44 NTU) treatments. This indicates that algae may disrupt vision at a much lower turbidity than suspended sediment. Walleye remain an important species in the Lake Erie sport fishing industry, as well as an ecological top predator, thus understanding the potential impacts of changing turbidity levels on the visual ecology of Walleye allows us to understand the dynamics of how populations may respond to increasing anthropogenic turbidity.

Poster Board No. 155 - EVALUATING POLOXAMERS AS AGENTS FOR ACCELERATION OF SKELETAL MUSCLE MEMBRANE REPAIR. Aubrey L. Rose, rose.1279@buckeyemail.osu.edu, (Noah Weisleder, noah.weisleder@osumc.edu), Thomas A. Bodnar, bodnar.51@buckeyemail.osu.edu, Sayak Bhattacharya, sayak.bhattacharya@osumc.edu, Kevin McElhanon, kevin.mcelhanon@osumc.edu, Brian J. Paleo, paleo.1@buckeyemail.osu.edu, Eric X. Beck, eric.beck@osumc.edu, The Ohio State University, Department of Physiology and Cell Biology, Dorothy M. Davis Heart and Lung Research Institute, 473 W. 12th Ave., Columbus OH 43210.

Sarcolemmal membrane fragility is a major pathologic mechanism in various muscular dystrophies. Muscle fibers with more fragile membranes are more likely to be damaged and are more prone to necrosis. One potential therapeutic approach targeting membrane fragility is to increase membrane repair by exposing muscle fibers to poloxamer 188 (P188), a polymer that is able to bind to exposed lipid bilayer to reseal membrane injuries. P188 is one of many poloxamers, all of which contain a hydrophobic region of polyoxypropylene flanked by two hydrophilic chains of polyoxyethylene of varying length in different poloxamers. Although P188 has shown promise in increasing membrane repair, few other poloxamers have been tested for their effects on membrane repair. It was hypothesized that other poloxamers in the P188 family such as F38, P84, and P407 will reseal membranes as effectively, or more effectively, than P188. To investigate this hypothesis, a novel rotation damage assay was used, where cells are exposed to poloxamers and damaged through impact with small glass beads (106 μm diameter), and the lactate dehydrogenase (LDH) released from the cell into the supernatant is measured. Initial observations show that exposing cells to multiple poloxamers leads to a significant decrease in LDH levels when compared to vehicle controls, indicating improved membrane repair. A laser injury assay was used to confirm these results in muscle fibers that were damaged with a multiphoton laser to allow entry of a lipophilic dye. Entry of this fluorescent dye was measured over time to determine the membrane repair capacity.

Poster Board No. 156 - ENDOPHYTIC ROOT FUNGAL COMMUNITY COMPOSITION AND THE SUCCESS OF LESSER CELANDINE. Allison Paolucci[1], a.paolucci@vikes.csuohio.edu, Emily Rauschert[1], e.rauschert@csuohio.edu, David Burke[2], dburke@holdenarb.org, Sarah Kyker[2], skyker@holdenarb.org, [1]Cleveland State University, Dept. of Biology, Geology, and Environmental Science, Cleveland OH 44115, [2]The Holden Arboretum, 9550 Sperry Rd., Kirtland OH 44094.

Lesser celandine (*Ranunculus ficaria*) is an invasive spring ephemeral in northeast Ohio. However, little is known about the mechanisms behind its variable success in the region. One possible mechanism behind the performance of lesser celandine is the presence of fungal root associations. This study focuses on determining the influence of endophytic root fungi colonization on the variable success of lesser celandine. It is hypothesized that plant performance will be correlated to community composition of endophytic root fungi. Sites ($n = 64$) chosen in Rocky River Metroparks, Ohio along a 35 meter disturbance gradient from the river. Methods of terminal restriction fragment length polymorphism and cloning were used in conjunction to determine the differences in the community composition of endophytic root colonization for each site. These were then compared to plant biomass to determine differences in success across test sites. Lesser celandine that was colonized by fungal communities consisting of parasitic fungal endophytes, ericoid mycorrhizae, and dark septate endophytes had a higher biomass (0.63 g) than plants that were colonized by fungal communities consisting of other groups of general root endophytes (0.29 g) (t-test, $df = 60.9$, $P < 0.0001$). However, colonization was not associated with reproductive output of lesser celandine (t-test, $df = 61.8$, $P > 0.05$). Further analyses should be conducted to determine the presence of arbuscular mycorrhizae and its influence on success of lesser celandine in conjunction with general fungal endophytes.

Poster Board No. 157 - COPPER METALLOPOLYMER AS A BIOMIMETIC CATALYST FOR CATECHOL OXIDASE. Travis C. Green, greentc@bgsu.edu, Alexis D. Ostrowski, alexiso@bgsu.edu, Bowling Green State University, Center for Photochemical Sciences, 141 Overman Hall, Bowling Green OH 43402.

Coordination complexes can provide a way to tune the mechanical properties, reactivity and assembly of materials. These coordination complexes can also be useful creating supramolecular metallopolymer materials comprised of a short chain telechelic polymer backbone, metal binding ligand and transition metal ions. The metal binding ligands are covalently linked to the polymer backbone and the transition metal ions act to cross link the polymers to form a supramolecular network. Recent work has focused on choosing complexes that can act as catalysts to form biomimetic materials. Specifically, covalently linking a copper (II) complex to a polymer to create a biomimetic catalyst for catechol oxidase. Recent work has shown that using metal binding groups on a polymer can create effective metallopolymer catalysts. Using a hydrophobic polymer backbone a polymer analog of our complex has been synthesized to investigate the effects of the polymer on the reactivity of the complex. Using UV-Vis spectroscopy the reactivity of the copper complex and metallopolymer complex have been studied and an increase in reactivity was observed after the inclusion of a polymer backbone. This increased reactivity has been investigated in terms of redox potential of the copper and the second coordination sphere created by the polymer.

Poster Board No. 158 - EFFECTS OF A HISTORY OF CONCUSSION ON COGNITIVE PERFORMANCE IN COLLEGIATE ATHLETES: AN FMRI STUDY. Joshua M. Ricker, rjoshua@bgsu.edu, Kylee Smith, skylee@bgsu.edu, Alexandra Schmidt, schrale@bgsu.edu, Xin Wang, Xin.Wang2@utoledo.edu, Howard C. Cromwell, hcc@bgsu.edu, Bowling Green State University, 206 Psychology Building, Bowling Green OH 43403

With concussions occurring at a rate of between 1.6 and 3.8 million per year in the United States, the well-being of athletes has become a recent cause for concern. The heterogenous nature of these injuries leads to a range of symptoms that fall under multiple categories: physical, neurobehavioral, and cognitive. The current study set out to examine the cognitive and physical effects of concussions using collegiate athletes. Subjects underwent fMRI scanning while performing the emotional face assessment task (EFAT) and a modified version of the conjunctive continuous performance task (CCPT). The EFAT assesses a subject's ability to judge affect while examining faces expressing different emotions. The CCPT measures sustained attention by requiring the subject to attend to changing stimuli and responding to a specific shape and color. Results are expected to reflect different patterns of activation between those with and without a history of concussion. Those without a history of concussion are expected to show activation in frontal lobe attentional networks during the CCPT, and activation in subcortical nuclei such as the amygdala during the EFAT, while those with a history of concussion will show reduced activation in these areas. Those with a history of concussion are also expected to have a slight decrease in accuracy and reaction times on the two tasks. This study will add to the development of the neural profile and cognitive effects that may persist in those with a history of concussion. This, in turn, will help in understanding the complexity of the effects of concussions.

Poster Board No. 159 - GUILT, SHAME, AND EMBARRASSMENT AS MODERATORS OF FOOD INSECURITY. Emma M. Kett, ekett@bgsu.edu, Philip J. Welch, pjwelch@bgsu.edu, Bowling Green State University, 124 College of Health & Humans Services, Bowling Green OH 43403.

According to the United States Department of Agriculture, food insecurity is reduced quality, variety or desirability of diet with or without reduced food intake. Food insecurity affects 12% of US adults and approximately 17% of adults in Ohio. Food insecurity is linked to low socioeconomic status (SES) and to diseases such as type 2 diabetes, hypertension, and obesity. Pilot research conducted by the second author suggests the ability to become food secure may be restricted, in part, by feelings of guilt, shame, and embarrassment. The purpose of this study is to understand the emotions surrounding food insecurity and to model how those emotions may hinder the ability to become food secure. A literature review of EBSCO, Web of Science, and PubMed yielded 28 observational and qualitative studies using the keywords food insecurity and shame, emotion, mental health, guilt, and anxiety. Key phrases from the results and discussions of each article were analyzed by determining the number of times a specific emotion was mentioned. Themes of shame, guilt, anxiety, embarrassment, and poor mental/emotional health in relation to food insecurity emerged from this analysis. The resources that are available to adults experiencing food insecurity need to be changed to help reduce this problem. Offering emotional and psychological support to users of food assistance programs could alleviate the negative emotions associated with the inability to provide healthy foods for oneself and family members. This presentation describes a new model explaining the potential psychological variables that moderate the ability to become food secure.

Poster Board No. 160 - NUTRIENT LIMITATIONS IN THE CENTRAL BASIN OF LAKE ERIE. Madeline M. Lambrix[1] lambrix.1@osu.edu, Justin D. Chaffin[1,2],chaffin.46@osu.edu, 95 E. Norwich Ave., Columbus OH 43201. [1]The Ohio State University, [2]The Ohio State University, Franz Theodore Stone Laboratory.

Freshwater phytoplankton growth is assumed to be phosphorus (P) limited, but nitrogen (N) limitation has been documented in N-fixing cyanobacteria dominant N-limited waters. The central basin of Lake Erie has low P and high nitrate-N concentrations, but blooms of the N-fixing cyanobacteriua of the genus *Dolichospermum* occur nearly every summer. Low P and high N concentrations make the presence of *Dolichospermum* spp. difficult to understand. Iron (Fe) is required for nitrate assimilation and if Fe availability is too low, nitrate assimilation will be constrained. Four nutrient enrichment experiments were conducted with water from offshore Avon, Ohio, from June 2nd to July 11th, 2017. We hypothesized that more algal productivity would occur with combination enrichments of P (1.0 µM) plus Fe (0.5 µM) and P plus ammonium-N (25 µM) than compared to P alone enrichments, because increased Fe and P would allow for ambient nitrate assimilation and ammonium assimilation is not dependent on Fe. Chlorophyll a (chla) and nitrate concentrations were measured before and after 1-week incubation. In 3 of 4 experiments, chla concentrations were significantly ($p<0.05$, ANOVA) higher in P treatments compared to the control, which indicate that P was the primary limiting nutrient for phytoplankton growth, but enrichments of ammonium plus P resulted in higher chla than P alone. In all experiments, P plus Fe additions compared to P alone did not have a significant ($p>0.05$, ANOVA) impact on nitrate assimilation. Our results indicate that nitrogen and trace metal limitations may favor *Dolichospermum* spp. production in high P, low N water.

Poster Board No. 161 - NUTRIENT REMOVAL POTENTIAL OF CONSTRUCTED WETLANDS IN GRAND LAKE ST. MARYS WATERSHED. Stephen J. Jacquemin, stephen.jacquemin@wright.edu, Phillip Poore, poore.3@wright.edu, Nichole Mazzone, mazzone.9@wright.edu, Tiffany Ricketts,ricketts.15@wright.edu, Nicholas Gnau, gnau.9@wright.edu, Wright State University - Lake Campus, Celina OH 45822.

Constructed wetlands are becoming an increasingly important management tool to reduce nutrient rich agricultural runoff in the Great Lakes region. The objective of this study was to assess the removal efficiency of two constructed wetlands operating on tributaries of Grand Lake St. Marys (Prairie Creek and Coldwater Creek) located in northwest Ohio. Water samples were collected weekly during summer and fall 2017 (n=24) from inflow and outflow points. They were analyzed for nutrient (nitrate-N, total phosphorus, dissolved reactive phosphorus) concentrations following standard EPA colorimetric methods. Overall, while both wetlands experienced high mean nutrient inputs (concentrations in mg/L) across both fall and summer seasons ranging from 0.4 to 4.3 NO_3^-, 1.1 to 1.7 TP, and 0.2 to 0.6 DRP, respectively, high removal efficiencies (often in excess of 75%) produced significantly reduced outflow concentrations (*paired t tests*; $p<0.05$) largely consistent with EPA recommended TMDL target values for watersheds of these size (~20 mi^2: 1.0 mg/L NO_3, 0.10 mg/L TP). Extending these concentration reductions to effect size and loading impact, mean monthly stream discharge rates compared with wetland discharge data (continuously monitored using pressure transducers) revealed that PC and CC Treatment Train Wetlands were found to have processed an average of 10% to 29% of flows during summer and 35% to 40% of flows during the fall season, respectively. This study demonstrates the importance of constructed wetlands towards freshwater conservation strategies.

Poster Board No. 162 - MOSQUITO COMMUNITY STRUCTURE AND WNV OCCURRENCE IN MOSQUITOES IN WOOD COUNTY, OHIO, DURING 2017. Hannah Alanis, halanis@bgsu.edu, Erica Eskins, eskinse@bgsu.edu, (Daniel Pavuk, dmpavuk@bgsu.edu), Bowling Green State University, Department of Biological Sciences, Bowling Green OH 43403.

Mosquitoes (Diptera: Culicidae) are known vectors of a variety of pathogen that cause devastating diseases in humans and other animals worldwide. During the past 2 years (2016 and 2017) the Ohio Department of Health, in collaboration with county health departments and with funding from The Ohio Environmental Protection Agency, has begun a statewide mosquito surveillance and West Nile Virus (WNV) testing program. The purpose of this program is to capture *Culex* spp., which are known vectors of West Nile Virus to humans and horses, and test these mosquitoes for the occurrence of WNV. Two hypotheses were also being tested. Hypothesis 1: the mosquito community in Wood County, Ohio, is characterized by more than 15 species over the trapping period (June through August, 2017). Hypothesis 2: the occurrence of West Nile Virus in *Culex* spp. collected in Wood County, Ohio, would increase during late summer (August and September, 2017). Three mosquito traps were utilized in Wood County, Ohio, during 2017 to capture mosquitoes: the CDC Light Trap, a gravid mosquito trap, and a BG Sentinel trap. Mosquitoes were trapped each week from early June until the end of August. None of the *Culex* spp. samples from June and July tested positive for WNV. Twenty-seven of the 43 trap catches of *Culex* spp. from August tested positive for West Nile Virus. Seventeen mosquito species were identified over the 2017 trapping period, which reflects a diverse mosquito community in Wood County, Ohio.

Poster Board No. 163 - PARASITOID COMMUNITY ASSOCIATED WITH THE OBLIQUE-BANDED LEAFROLLER, *CHORISTONEURA ROSACEANA*, IN SOYBEAN AGROECOSYSTEMS. Audrey Keune, akeune@bgsu.edu, (Daniel Pavuk, dmpavuk@bgsu.edu), Bowling Green State University, Department of Biological Sciences, Bowling Green OH 43403.

Soybean (Glycine max) supports a wide diversity of insect herbivores. Many species of natural enemies, such as predators and parasitoids, of those herbivores exist. Study of natural controls of insect herbivores feeding on soybeans is increasingly needed in order to reduce the reliance on synthetic insecticides and mitigate environmental pollution by these chemicals. During a 2016 study of insect diversity in soybean agroecosystems of Wood County, Ohio, a relatively large number of oblique-banded leafroller (OBLR) caterpillars were observed feeding on soybean. This species is polyphagous, feeding on numerous species of tree and herbaceous species, including soybean. A study of this species was initiated to determine the parasitoid community associated with OBLR caterpillars feeding on soybean. The hypothesis was that the parasitoid community associated with OBLR would have no species in common with the recorded parasitoid communities of other caterpillars feeding on soybean. Over 200 OBLR caterpillars were collected from four soybean fields throughout the growing season and reared in the lab on fresh soybean leaves under constant conditions (16:8 [light:dark], 25 °C, and 70 to 80% humidity) to determine the parasitoid community utilizing OBLR larvae in soybeans. A large number of parasitoids emerged from collected OBLR caterpillars, including species of Ichneumonidae, Eulophidae and Chalcididae.

Poster Board No. 164 - LONGHORNED BEETLE (COLEOPTERA: CERAMBYCIDAE) SPECIES DIVERSITY AND COMMUNITY STRUCTURE IN TEMPERATE FORESTS DIFFERING IN SIZE. Daniel Pavuk, dmpavuk@bgsu.edu, Bowling Green State University, Biological Sciences, Bowling Green OH 43403.

Longhorned or cerambycid beetles (Coleoptera: Cerambycidae) are an important component of temperate forest ecosystems. Many longhorned beetle species feed on dead and dying trees and facilitate the decomposition of these trees. Fragmentation of temperate forests may be causing the loss of insects in these forests, including loss of cerambycid beetle species. Three types of traps were used to capture longhorned beetles in forests in northwest Ohio during 2008 to test the hypothesis that larger forests have a greater species diversity and abundance of cerambycid beetle than smaller forests. The traps used were the Lindgren funnel trap, the Intercept™ panel trap, and a window pane type trap. The traps were hung from tree branches and the bottom of each trap was at least 1 meter above the ground. Each trap had a collecting bottle containing a 50:50 mixture of propylene glycol:water to kill and preserve beetles captured in the trap. A small plastic bottle with four 2 millimeter holes in the top was filled with 95% ethanol and was used as a chemical attractant. Traps were deployed starting the first week of June and were left to capture beetles continuously until the first week of October. A total of 129 cerambycids were captured, with 70 of these being caught in the largest forest (Oak Openings Preserve). Large forests had a greater cerambycid species richness than small forests ($t=3.16$, $P=0.02$), and there was a significant relationship between forest size and cerambycid species richness ($R^2=0.80$).

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- Follow East Wooster St. (OH-64) for 1.3 miles
- Turn right on Thurstin St.
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Notes!

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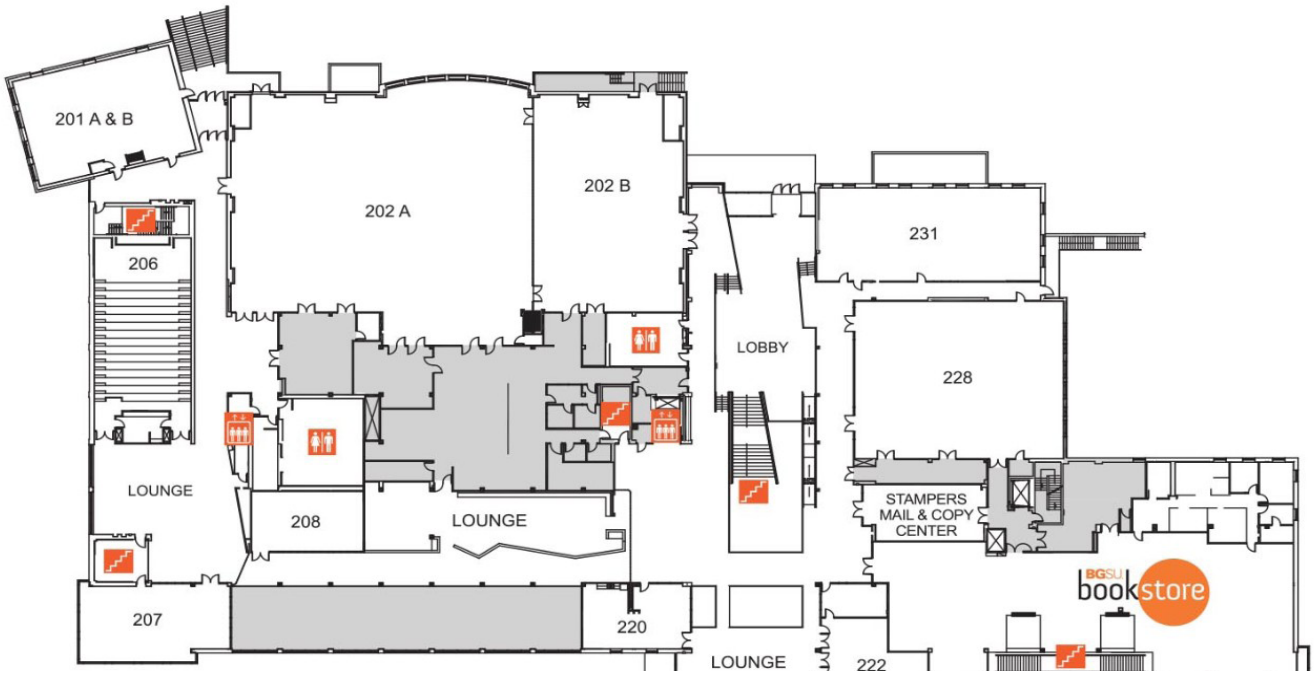
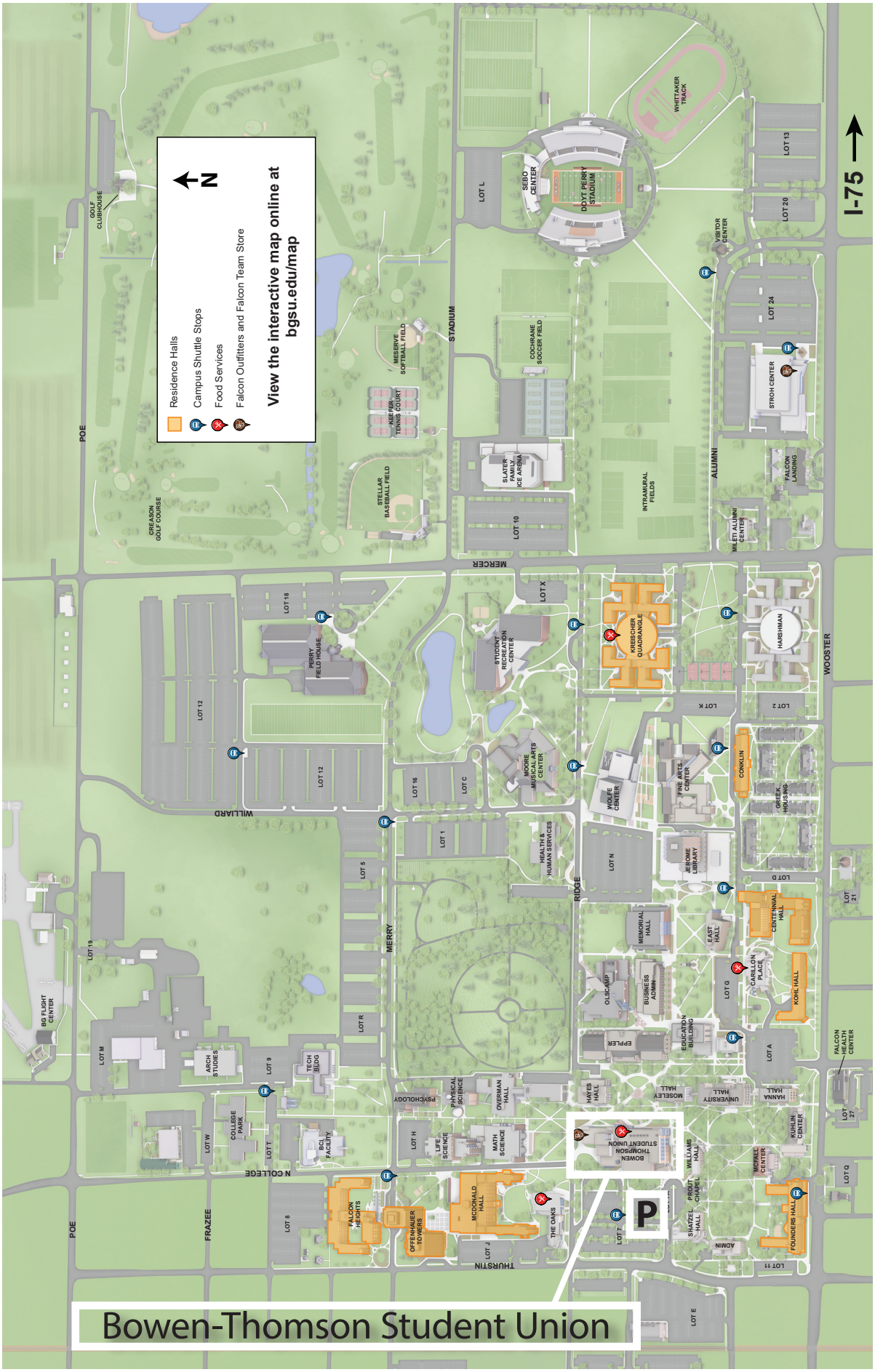
Index to First Authors

Bowen-Thomson Student Union (BTSU) 2nd floor



Bowen-Thomson Student Union (BTSU) 3rd floor

Bowling Green State University Campus Map



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April 14th, 2018
Bowling Green State University

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