

121st Annual Meeting • *The Ohio Academy of Science* • Ashland University • April 13-14, 2012

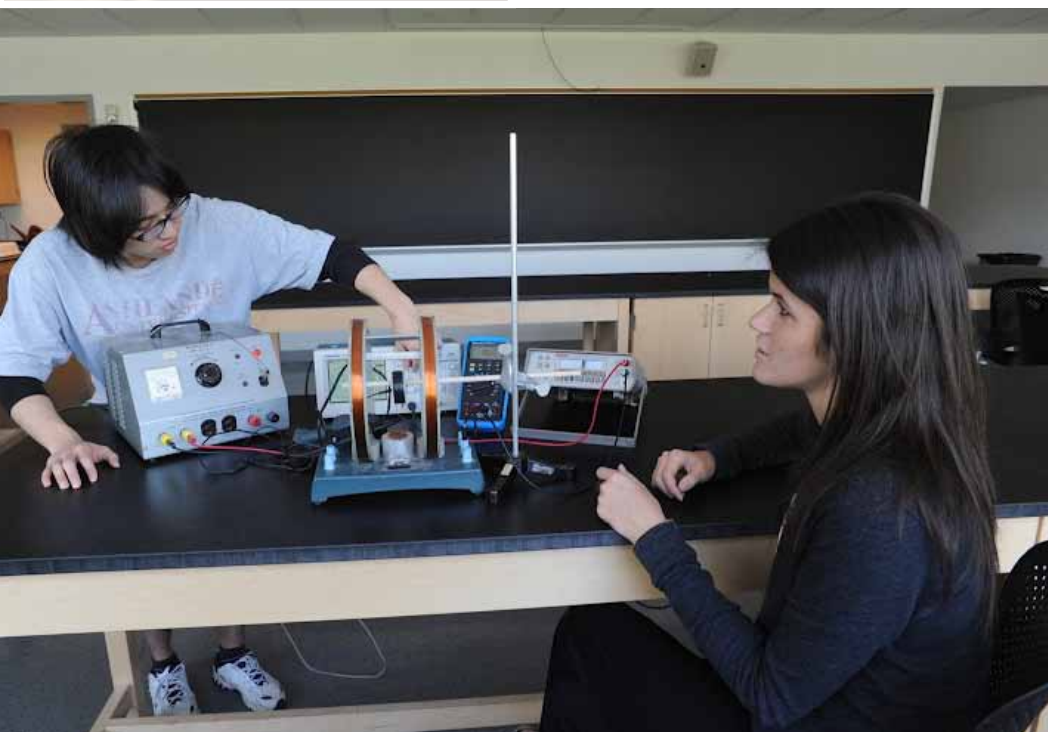
The Ohio Journal of **SCIENCE**

AN INTERNATIONAL MULTIDISCIPLINARY JOURNAL

Volume 112

April Program Abstracts

Number 1



THE OHIO JOURNAL OF SCIENCE

ISSN 0030-0950

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THE OHIO JOURNAL OF SCIENCE considers original contributions from members and non-members of the Academy in all fields of science. While special consideration will be given to manuscripts concerned with Ohio subject matter, other reports with scientific merit will be reviewed for publication. Submission of a manuscript is understood to mean that the work is original and unpublished, and is not being considered for publication elsewhere.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. The opinions expressed by reviewers are their own, and do not represent the views of the Ohio Academy of Science or *THE OHIO JOURNAL OF SCIENCE*.

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FUTURE ACADEMY MEETINGS

2012 April 13-14 at Ashland University,
Ashland, Ohio

Date of Issue—February 2012
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The Ohio Journal of Science

AN INTERNATIONAL MULTIDISCIPLINARY JOURNAL

Volume 112 No. 1

February 2012

April Program Abstracts



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Lynn E. Elfner, Acting Editor
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Website <http://www.ohiosci.org>

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The Ohio Journal of Science (ISSN
0030-0950) is published in March,
April, June, September, and Decem-
ber by The Ohio Academy of Science,
1500 W Third Avenue Suite 228, Co-
lumbus OH 43212-2817. Individual
membership and subscription: \$75.
Domestic institutional subscription:
\$75; Foreign institutional subscrip-
tion: \$90. Single issues for Academy
members: \$10; others \$15. © 2012
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POSTMASTER:

Send address changes to:
The Ohio Journal of Science
1500 W Third Ave Ste 228
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121st Annual Meeting
The Ohio Academy of Science

Theme: Undergraduate Research

Hosted by
Ashland University
Ashland, Ohio
April 13-14, 2012

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Cover photos: Ashland University Students conducting laboratory work or re-
search in the Kettering Science Center laboratories: (clockwise from upper left):
Rachel Day ('11) Biology ; Daphne Guinn ('11) Toxicology ; Jennifer (Miller)
Tully ('11) Geology and Integrated Science; Yusuke Nakazawa ('10) Geology
and Environmental Science and Victoria Goudy ('12) Chemistry. Credits: First
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The Ohio Academy of Science

121st Annual Meeting

Hosted by Ashland University
Ashland, Ohio
April 13-14, 2012

ABOUT THE ANNUAL MEETING

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

Welcome!

Ashland University welcomes you to the 121st 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 presenters and attendees. On-site registration will be available at a higher rate. The Ohio Academy of Science must receive forms by April 6, 2012. Please use Registration Form on the last page. Mail completed form and fee to :

The Ohio Academy of Science

OAS Annual Meeting Registration
PO Box 12519
Columbus OH 43212-0519
FAX 614.488.7629 (for Credit Card or PO only)

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<http://www.ohiosci.org/AshlandRegistrationForm.pdf>

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Friday, April 13: Registration will not be open on Friday.
Saturday, April 14: Registration in the lobby of Dwight Schar College of Education from 7:30 AM-2:00 PM. On-site registration at a higher rate is possible by check, VISA, or MasterCard. Cash is discouraged.

PARKING ON CAMPUS: Watch for signs and see map in program. Please park in Lots B or C. Both lots have disabled parking.

SMOKING POLICY: Smoking is not permitted in any building.

HOUSING: Contact motels directly. See list on page 3.

MEALS: Friday, April 13: none planned. Saturday, April 14: Pre-ordered box lunches available in the Convocation Center. See registration desk for a list of on and off-campus restaurants.

GENERAL SCHEDULE

Friday, April 13, 2012

3:00 PM-5:00 PM Board of Trustees Meeting

Saturday, April 14, 2012

7:30 AM-2:00 PM Meeting Registration in Lobby of Dwight Schar College of Education

8:30 AM-11:00 AM Algae Symposium in Lecture Hall Dwight Schar College of Education

9:00 AM-11 :00 AM Morning Podium and Poster Sessions in Dwight Schar College of Education

11:15AM All-Academy Lecture Upper Convocation Center Parking available in adjacent lots.

All-Academy Lecture *Mentorship, A Key to Success in Research, Teaching and Life*



Dr. J. Patrick Card (Ashland University class of 1972) is Professor of Neuroscience and Co-Director of the Center for Neuroanatomy with Neurotropic Viruses at the University of Pittsburgh.

THE PRESENTATION WILL FOCUS upon the importance of mentorship in developing a successful career in academia or industry. The mentorship relationships that Dr. Card has enjoyed throughout his career have proven to be essential to establishing a successful and rewarding research program in brain structure and function. Dr. Card will highlight how these relationships have evolved and guided his development as a scientist at various stages of his career, using the evolution of his research program as an example. Particular emphasis will be placed upon the importance of mentorship in acquiring the multidisciplinary expertise that is essential for success in research and teaching.

Dr. Card graduated from Ashland University (then Ashland College) with a degree in Biology in 1972. He received his M.S. in Biological Sciences from Wright State University in 1975, and his Ph.D. in Neuroanatomy from Wayne State University in 1979. He has been a faculty member at the University of Pittsburgh since 1992, and currently serves as Professor in the Department of Neuroscience and is co-Director of the Center for Neuroanatomy with Neurotropic Viruses. The focus of Dr. Card's research is the functional organization of the hypothalamus and central autonomic networks. This work includes studies to define

the synaptic organization and chemical phenotype of the central networks that mediate essential regulatory functions, as well as the development of tools for transneuronal tracing of neural circuits. Dr. Card has authored or co-authored 95 peer-reviewed papers in neuroscience.

12:00 Noon	Announcement of Ohio Patent Awardees and Academy Fellows
12:15 PM	Official Notice of Annual Business Meeting for Academy Members only.
12:30 PM	Lunch. Pre-ordered box lunches in Upper Convocation Center.
1:30-4:00 PM	Afternoon Poster Session in Dwight Schar College of Education

Undergraduate Research Discussion Session in Kettering Science Center Room 112

Algae Symposium Continues in Dwight Schar College of Education Lecture Hall

ABOUT OUR HOST



ASHLAND
UNIVERSITY

Prof. Michael R. Hudson, PhD
Chairperson, Local Arrangements

FOUNDED IN 1878, Ashland University is a private, comprehensive institution committed to challenging and supporting students intellectually, spiritually, socially, culturally and physically. Located midway between Cleveland and Columbus off I-71, Ashland University is home to 2,200 full-time undergraduate students. Eighty-five percent of these students are from Ohio, while students also come from 27 other states and 31 countries. The University's total enrollment is 6,000 students, and this includes graduate programs in business, education and theology and the off-campus centers in Cleveland, Columbus, Mansfield, Massillon and Elyria. In addition to its traditional undergraduate studies, AU offers alternative programs for adults and non-traditional students through the Founders School of Continuing Education. Degree completion, Associate degree, CEUs, and non-degree opportunities are available through a flexible format that includes online and evening classes. Post Secondary Education Option and Early College experiences are also available through the Founders School. Complementing the undergraduate program is a Master of Fine Arts in Creative Writing, a Master of American History and Government; a Master of Business Administration



Founders Hall

degree; a Master of Education degree; a Doctor of Education in Educational Leadership; masters degrees and a Doctor of Ministry degree through the Ashland Theological Seminary; an RN to BSN Track for registered nurses; and a Bachelor's Plus program for students with a non-education degree who want to teach.

Where to stay

The Ohio Academy of Science and Ashland University do not in any way endorse the following companies, products or services. This listing is provided as a resource only. There is no headquarters hotel or motel.

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www.daysinn.com
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Ashland, Ohio 44805
(419) 289-0101

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www.hiexpress.com
1392 Enterprise Parkway
Ashland, Ohio 44805
(419) 281-2900

Surrey Inn Motel
www.surreyinnashland.com
1065 Claremont Ave.
Ashland, Ohio 44805
(419) 289-7700

Hampton Inn
www.hamptoninn.com
2220 S. Main St.
Mansfield, Ohio 44907
(419) 774-1010

Travelodge Mansfield
www.travelodge.com
90 W. Hanley Rd.
Mansfield, Ohio 44903
(419) 756-7600

College House Bed & Breakfast
www.collegehousebb.com
134 College Avenue
Ashland, Ohio 44805
(419) 289-2093

Local Restaurants

Jake's Restaurant
www.eatatjakes.com
1040 Sugarbush Drive
Ashland, Ohio 44864
(419) 281-5253

Buffalo Wild Wings
www.buffalowildwings.com
630 Claremont Ave
Ashland, Ohio 44805
(419) 281-9464

Applebee's
www.applebees.com
2250 Claremont Ave
Ashland, Ohio 44805
(419) 207-9088

Sorella's II Italian Restaurant
www.sorellasii.com
1505 Claremont Ave
Ashland, Ohio 44805
(419) 289-2200

Bob Evans Restaurant
www.bobevans.com
1304 E. Main St.
Ashland, Ohio 44805
(419) 281-4729

Perkins Restaurant
www.perkinsrestaurants.com
658 US 250
Ashland, Ohio 44805
(419) 281-0666

**Water Quality of Ohio's Lakes:
Inland and Erie Revisited
Special Focus: Harmful Algal Blooms (HABs)**

A Third Special Ohio Academy of Science Symposium
on Declining Water Quality in Ohio's Lakes

See abstracts on page 7.

Co-Sponsored by: The Ohio Fracture Flow Working Group

121st Annual Meeting of
The Ohio Academy of Science
Hosted by Ashland University
Dwight Schar College of Education Building
Lecture Hall
Saturday, April 14, 2012
8:30 AM-4:00 PM

Arranged by Julie Weatherington-Rice, Ph.D.
Co-Coordinator Ohio Fracture Flow Working Group
298 W. New England Ave.
Worthington, Ohio 43085
Phone 614-436-5248
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Statement of Need/Purpose and Background of Topic

THIS THIRD SPECIAL SYMPOSIUM presents a follow-up to the 2008 Ohio Academy of Science Special Symposium "Declining Water Quality in the Western Lake Erie Basin, Increasing Invasion of Blue-Green Algae (Cyanobacteria), and Increasing Levels of Soluble Reactive Phosphorus" and the 2010 Special Symposium "Water Quality of Ohio's Lakes: Inland and Erie". Cyanobacteria continue to plague Ohio's inland lakes and the western end of Lake Erie, as well as lakes and reservoirs across the US and Canada. Last year (2010) 20 Ohio lakes and beaches were closed for at least portions of the summer recreational season because of cyanobacteria blooms. There were 41 confirmed cases of health impacts to humans from contact with harmful algal blooms (HABs) and at least three dogs died from water contact with the toxins. Grand Lake St. Mary's was closed again to water contact for part of the summer of 2011. A \$5 million effort to remove dissolved reactive phosphorus (DRP) in the lake is ongoing. The watersheds surrounding the lake have been designated "Distressed Watersheds" by the Ohio Department of Natural Resources (ODNR) Div. of Soil & Water Resources, opening up the ability to require animal manure management plans for farms withholding just over 15 animal units, a significantly lower number than is traditionally overseen by the Ohio Department of Agriculture's Confined Animal Feeding Operations (CAFO) oversight program. This designation brings the farms under potential regulation from 14 to approximately 300.

Members of the Ohio Environmental Protection Agency's (EPA) Lake Erie Phosphorus Task Force continue to research

the transport mechanisms from agricultural and urban settings to lakes. The researchers are now better able to identify the conditions that control the transport, and changes in soil and cropping management are being identified that can successfully reduce the DRP loadings to the lakes. In addition, water management structures (agricultural tile bioreactors) have been identified that can be used to remove nutrient loading from agricultural drainage tile discharge waters. A pilot project is funded which allows five of these structures to be built in Ohio this fall. The Ohio DRP research continues to be funded from a variety of sources including US EPA Great Lakes Protection Fund, the Ohio Lake Erie Fund, USDA, ODNR, Ohio Sea Grant, and Healing Our Waters. Much of the current and projected research efforts have been identified in the final version of the Ohio EPA's Lake Erie Phosphorus Task Force report found on Ohio EPA's web site at http://www.epa.state.oh.us/portals/35/lakeerie/ptaskforce/Task_Force_Final_Report_April_2010.pdf.

THE SPRING AND SUMMER of 2011 saw the first outbreaks of cyanobacteria harmful algal blooms (HAB) beginning at Grand Lake St. Marys, Buckeye Lake and Blue Rock State Park. These lakes are much smaller than the western basin of Lake Erie and ostensibly warmed up more quickly. In addition, their watersheds are smaller so activities amenable to releasing nutrients are more quickly reflected in the changes in water quality. The sources of nutrients to Grand Lake St. Marys have been identified as animal manure which overloads the soils and washes into the lake. In contrast, the Buckeye Lake's watershed has few animal facilities. The extra loading of DRP to the lake may be coming from changes in farming practices, including the timing and application processes of commercial fertilizer. Underscoring the complexity of this issue, watersheds of Buckeye Lake, old canal-feeder lake, and Blue Rock State Park likely will require different types of nutrient management than in Grand Lake St. Mary's, also an old canal-feeder lake.

Blooms of *Microcystis* did not return to the western end of Lake Erie and Maumee Bay until late July of 2011, a month later than 2010. While the blooms were significant, the wet, cool spring and early summer appears to have delayed the blooms, once again underscoring the importance of warmer temperatures as part of the triggering mechanism. In 2011, there have not been significant reports of *Lyngbya wollei* (and/or *Plectonema wollei*) in Maumee Bay or the western end of Lake Erie.

Both ODNR and the Ohio Department of Health have added information web links to their home pages to update the public about lake conditions at state parks and public health issues as well as the ongoing link at Ohio EPA's web page. The ODNR web link can be found at http://wwwapp.epa.ohio.gov/dsw/hab/advisory_table.php. The Ohio Department of Health's link is at HABs is on their Beach Monitoring page at <http://www.odh.ohio.gov/odhprograms/ch/bbeach/beachmon.aspx>. Ohio EPA's Inland Lakes program page can be found at http://www.epa.state.oh.us/dsw/inland_lakes/index.aspx. In addition, the Ohio Lake Management Society, a division of the Water

Management Association of Ohio, featured the problems of HABs in their Summer 2011 issue of their newsletter, Ohio Shorelines which can be downloaded from their web page at <ftp://ftp.olms.org/pdf/Shorelines%20Summer%202011.pdf>. They also co-sponsored a state-wide conference on HABs in Celina, Ohio (west end of Grand Lake St. Marys, Celina gets their drinking water from the lake) in March 2011 with the All Ohio Chapter of the Soil & Water Conservation Society. Four informative power point presentations from that conference are on their web site at <http://www.olms.org/conference.php>.

Significance of Topic to Science and Society Including the Economy and Quality of Life

FOR MANY YEARS, the only economic cost reported in Ohio for HABs was the cost to the City of Toledo for activated carbon filtration to their raw water supply during the treatment process. The figure for the summer of 2009 was \$3,000 to \$4,000 per day for 90 days. There still are no reliable cost figures to the impacts to tourism along Lake Erie and at the islands or to the fishing industry in the western lake. A “dead zone” east of the islands remains. To this point, no economic cost has been assigned to that condition.

With the ongoing efforts to remediate Grand Lake St. Marys, new costs have been established. Celina continues to use activated carbon filtration to render Grand Lake St. Mary's water safe to drink. Approximately \$150 million of the local economy comes from tourism associated with the lake. The local economy has been significantly impacted the last three years because of the conditions of the lake. A \$5 million clean-up effort is underway to try to bind up phosphorus already in the lake with alum and/or to remove the high-phosphorus sediments from the bottom of the lake by dredging. This cost does not include any additional costs to the over 300 farms in the watersheds who now must manage their animal manures in a more environmentally responsible way.

These are not the only lakes whose supporting regions have been impacted economically. Business people at Buckeye Lake were so concerned earlier this year that they contacted their State Senator, the Honorable Tim Schaffer, Lancaster, to help determine what recourses they had to turn around their economic losses due to the lake's HAB outbreak. The Ohio Academy of Science arranged a conference call between the Senator and experts in the fields relating to HABs. Fortunately, the HABs dissipated in Buckeye Lake by the end of June and as of August 2011, have not returned.

Undergraduate Research Session Dr. Jeffrey D. Weidenhamer, Presiding Kettering Science Center Lecture Hall Room 112, 1:30 PM

See abstracts at on page 51.

Introduction

A MAJOR CHANGE IN HIGHER EDUCATION in the past three decades has been the increasing emphasis on the process of learning as opposed to strategies for teaching. More recently, the emphasis on learning has been described

as transformative pedagogy. Such forms of learning are characterized by disciplinary integration, experiential learning, and problem-based learning. These active, engaged approaches to learning are often connected to service learning, civic engagement and/or leadership development. Undergraduate research is an extremely effective way to engage students with experiential learning. In undergraduate research, students conduct investigations that make an original intellectual contribution to the discipline. The benefits of such activity are many: (1) Student learning is enhanced through mentoring relationships with faculty; (2) Retention of students is increased; (3) Participation in undergraduate research increases enrollment in graduate education; and (4) Undergraduate research provides effective career preparation. Through such research projects, undergraduates develop an understanding of research methodology, and develop critical thinking, creativity, problem solving and intellectual independence. For faculty members, mentorship of undergraduates in research projects allows them to stay current in their research discipline, integrate their scholarship and teaching, and establish relationships with motivated students that continue long after graduation.

Text derived from the materials and pedagogy of:

—Project Kaleidoscope at AAC&U

—The Council on Undergraduate Research



Special Presentation: *Mentoring Undergraduates for Success in Research*

Dr. S. Tonia Hsieh
Department of Biology, Temple University, Philadelphia

Dr. S. TONIA HSIEH IS AN assistant professor of biology at Temple University in Philadelphia, PA. She started conducting research as a high school student at the National Aeronautics and Space Administration (NASA) in California, because she wanted to learn what it feels like to be a rocket scientist. As an undergraduate at the University of California, Berkeley, she started a research project examining climbing gecko lizards, and ultimately discovered that geckos stick to surfaces using van der Waals forces. She then continued her studies at Harvard University, earning her Ph.D. in 2005. Tonia attributes her successes in research to having excellent mentors at every stage of her career. As a result, she has made undergraduate research and K-12 STEM education a priority in her research program, and has multiple undergraduates who have won awards for their research, as well as presented talks at national meetings. She has also recently started a science collaboration and K-12 educational outreach website (lizardbase.org) which serves as a data depository for scientific data while simultaneously offering inquiry-based curricula to K-12 classrooms, promoting direct student involvement in actual data collection activities before they arrive at college.

Brief Schedule of Abstracts

See First Author index on page 52 and Fields of Interest index on page 53.

Harmful Algal Blooms Symposium

8:30 AM-11:00

1:30 PM-4:00 PM

Dwight Schar College of Education Lecture Hall

Undergraduate Research Session

1:30-4:00 PM

Kettering Science Center Lecture Hall

Room 112

Concurrent Podium Sessions 9:00 AM-11:00 AM**Session 1—Page 10**

Dwight Schar College of Education Room 103

T.B.A. – Session Chair

Session 2—Page 12

Dwight Schar College of Education Room 172

T.B.A. – Session Chair

Session 3—Page 14

Dwight Schar College of Education Room 171

T.B.A. – Session Chair

Session 4—Page 16

Dwight Schar College of Education Room 135

T.B.A. – Session Chair

Multidisciplinary Poster Sessions

Both in Dwight Schar College of Education, Second Floor. See abstracts for specific rooms.

Morning 9:00 AM-11:00 AM—Page 18

All fields of interest; See Fields of Interest index on page 53.

Undergraduates, graduate students and professionals

Afternoon Poster Session—1:30 PM—Page 37

All fields of interest; See Fields of Interest index on page 53.

Pre-college students

Notes

**Water Quality of Ohio's Lakes: Inland and Erie Revisited
Special Focus: Harmful Algal Blooms
Julie Weatherington-Rice, Presiding
Dwight Schar College of Education Lecture Hall**

8:30 AM Welcome and Introduction

From the land to the lakes

8:35 DESIGN, INSTALLATION AND PERFORMANCE OF FIELD BIOREACTORS IN IOWA, ILLINOIS AND OHIO TO TREAT SOLUBLE NUTRIENTS IN DRAINAGE WATERS. Larry C. Brown brown.5@osu.edu , Matt Helmers mhellers@iastate.edu, Richard Cooke rcooke@uiuc.edu , Bruce Atherton bruce.atherton@ia.usda.gov , Aleksandra Drizo adrizo@uvm.edu , Kevin King king.220@osu.edu . Department of Food, Agricultural and Biological Engineering, The Ohio State University, 590 Woody Hayes Drive, Columbus, OH 43210-1058.

Wood chip bioreactors have been installed in several Midwestern states to treat nitrate-nitrogen from agricultural subsurface drainage before discharging to surface water bodies. Research and demonstration of this innovative technology was initiated in the early 2000s in Illinois, then in Iowa in the late 2000s, and more recently in Ohio. These bioreactors were designed based on research from Illinois, from which draft design specifications were developed by Iowa State University and Iowa USDA-NRCS. The system consists of a bed or trench which is filled with wood chips and constructed adjacent to subsurface drainage laterals or mains. Depending on the field size, its subsurface drainage system layout, and available space, the bioreactor is designed to accept all or a large portion of the subsurface drainage flow that is diverted from the field drainage system. This technology enhances the natural processes of denitrification—the conversion of nitrate-nitrogen to nitrogen gas. Research from Illinois indicates changes in bioreactor inflow and outflow nitrate-nitrogen concentrations of between 20 and 90 percent. Similar reductions are being observed in Iowa. The work in Ohio was initiated recently, but similar results are expected. The percent reduction appears to be a function of inflow nitrate-nitrogen concentration, temperature, and residence time. Subsurface drainage flows are variable depending on time of year and precipitation amounts and durations, and therefore percent reductions are also variable. A summary of the work from each state will be presented, as well as design details, the application potential of the practice across the Midwest, and potential for capture of soluble phosphorus.

8:45 STAKEHOLDER CRITERIA AND ECOLOGICAL MODEL: INFORMING SELECTION OF APPROACHES ADDRESSING HARMFUL ALGAL BLOOMS IN GRAND LAKE ST. MARYS. Harry J. Stone. stonh@battelle.org , Tom Gulbransen, gulbran@battelle.org , Henry Pate, pateh@battelle.org , Battelle, 10300 Alliance Rd. Suite 155, Cincinnati, OH 45242.

Harmful algal blooms (HABs) interfere with recreation and tourism at Grand Lake St. Marys (GLSM). Battelle was contracted by the Western Ohio Educational Foundation (funded by GLSM Restoration Commission and Ohio Department of Natural Resources) to design and implement a systematic screening process supporting selection of approaches to restore full lake enjoyment. Screening of 75 potential technologies (received by stakeholders) will be followed by detailed evaluations and pilot testing of highly-ranked approaches. Battelle facilitated development of stakeholder consensus on criteria for screening proposed approaches. Each vendor proposing an approach was e-mailed a request for information (RFI) with questions addressing the consensus screening criteria. RFI responses were scored for each criterion. Multiple criteria decision analysis (Criterium Decision Plus© software) was used to build a model of weighted GLSM goals and criteria, and integrate the RFI responses to generate ranked matrices. The preliminary list of high-ranking approaches from the model was further screened using a conceptual ecosystem model to identify concerns specific to application of an

approach at GLSM, e.g., high pH in the lake reduces efficacy of copper-based algacides. Selected improvement strategies addressed long-term reduction of phosphorus loading (treatment of tributaries, and phosphorus removal or inactivation in lake sediments) and short-term disruption of cyanobacteria blooms and scum formation (aeration/circulation and chemical and non-chemical algacides).

8:55 MICROCYSTIN CONCENTRATIONS INCREASING AT SELECT OHIO DRINKING WATER SOURCES, POSITIVE CORRELATION WITH pH AND WATER TEMPERATURE, AND IMPLICATIONS OF SURFACE SCUMS. Heather A. Raymond, heather.raymond@epa.state.oh.us , Ohio EPA Division of Drinking and Ground Waters, 50 West Town Street, Suite 700, Columbus, OH 43215; Holly Kaloz, holly.kaloz@epa.state.oh.us .

In response to cyanobacteria blooms in 2010 and 2011, Ohio EPA collected 453 raw and finished cyanotoxin samples at 28 public water systems; seven water systems voluntarily collected an additional 227 samples. There was only one treated-water microcystin detection, but microcystin was detected in 65% of source waters sampled. Average microcystin concentrations in 2011 were four times higher at the City of Celina's intake (maximum 43.4 µg/L) and over 14 times higher at western Lake Erie basin water systems' intakes (maximum >5 µg/l) compared with 2010 concentrations. Based on western Lake Erie basin data from 2011 (N=37), there was a moderate positive correlation between microcystin concentration and pH ($R^2 = 0.35$) and water temperature ($R^2 = 0.42$), but there was no correlation between microcystin and turbidity. At Celina, a weak positive correlation was found between microcystin concentration and water temperature but correlations were not apparent between microcystin and pH or turbidity, potentially due to alum treatments and persistence of toxins throughout the winter. Another recent observation is toxin concentrations at water system intakes are often less during blooms that produce scums compared to blooms distributed throughout the water column. Since cyanobacteria blooms are often not visually apparent, Ohio EPA is using MERIS satellite data interpreted by NOAA to detect them remotely. Timely data help water systems determine when treatment should be optimized to remove cyanotoxins and taste and odor compounds. Targeting advanced treatment, which can cost over \$100,000 per month, to when it is necessary provides a cost benefit to water systems.

9:05 EFFORTS TO RESTORE GRAND LAKE ST MARYS FROM PHOSPHORUS OVERLOAD Tim Lovett, Chair, tlovett003@woh.rr.com , Grand Lake St. Marys Lake Improvement Association P.O. Box 118 Montezuma, Ohio 45866.

Grand Lake St. Marys, located in western Ohio, is one of the original Ohio Canal feeder lakes. Built in the 1840s, it is approximately 80 square miles in area but averages only five feet in depth. Excessive soluble reactive phosphorus (SRP) loadings to Grand Lake St. Marys mostly from the agricultural watershed that houses a number of concentrated animal feeding operations, has fed massive Harmful Algal Blooms (HABs) that resulted in posted health warnings of water contact during 2009, 2010 and 2011.. The watershed is distressed due to excessive nutrient loading that has resulted in new agricultural rules. The Grand Lake St. Marys Restoration Commission was formed, with twelve State, local and university members, to work with the Federal and State efforts to clean up and restore the lake. Eight steps have been identified to revive the lake: alum application; dredging; alternative and beneficial uses of organic waste; treatment train establishment and monitoring stations; rough fish removal; micronutrient modification; aeration and circulation; and water level management. Solutions identified and/or already in place include: Prairie Creek Treatment Plan Project; Barnes Creek Sediment Collector (installed Jan. 2011); Southmoor Shores Airy Gator; floating wetlands plantings (over 5,000 floating wetland plantings in 2011, managed by volunteers); littoral wetlands in Prairie Creek Bay; in lake

dredging; rough fish removal (local annual Carp Derby, begun June 2010); alum treatment (2011 and planned for 2012); and a very active public awareness campaign. Due to a change in procedure, posted health warnings of HABs were reduced to beach areas only in 2011.

9:15 LOOKING INLAND: OHIO RESERVOIR WATER QUALITY. Joseph D. Conroy, joseph.conroy@dnr.state.oh.us. Inland Fisheries Research Unit, Division of Wildlife, Ohio Department of Natural Resources, Hebron OH 43025.

Ecosystem-based fisheries management relies on proper understanding of system productivity. In Ohio, fisheries scientists leverage basic limnological (temperature and dissolved oxygen, suspended sediments, and nitrogen and phosphorus concentrations) and lower trophic level (chlorophyll *a* concentration and phytoplankton and zooplankton abundances) data to effectively manage reservoir sportfish populations. These data, however, also provide an important reference to examine spatial and temporal water quality dynamics especially in light of intra-or extra-reservoir features. For example, a principal components analysis which explained > 88% of the variation in a rigorous limnological dataset (N =111 spring and N =152 summer samples during 2003-2010) for three reservoirs (Acton, Pleasant Hill, and Burr Oak) which span a productivity gradient indicated significant seasonal (spring vs. summer) and annual differences. Acton seasonal observations related most closely to changes in non-volatile suspended sediment concentrations, Burr Oak seasonal observations related most closely to changes in Secchi transparency, and Pleasant Hill seasonal observations were intermediate. Although not surprising, these results emphasize the importance of annual seasonal inputs which set the stage for water quality problems and ecosystem productivity in Ohio reservoirs.

9:25 Break

9:35 SUMMER PHYTOPLANKTON COMMUNITIES IN PRODUCTIVE OHIO RESERVOIRS: IMPORTANCE OF CYANOBACTERIA, ECOREGION, AND LAND USE PATTERNS. Kyle C. Scotese, k.scotese@bsaenv.com, BSA Environmental Services, Inc. 23400 Mercantile Road Suite 8, Beachwood OH 44122; John R. Beaver, j.beaver@bsaenv.com; Alison D. Minerovic, a.minerovic@bsaenv.com; Claudia E. Tausz, c.tausz@bsaenv.com; Kristen M. Buccier, k.buccier@bsaenv.com.

Described here are characteristics of phytoplankton communities of Ohio reservoirs with emphasis on the interrelationships among cyanobacterial populations, land use within three ecoregions, and associated environmental variables. Fifty-nine phytoplankton samples were collected from 25 mostly productive reservoirs located within three distinct ecoregions corresponding to intense agricultural land use (Eastern Corn Belt Plains), intermediate forestation and intermediate agricultural land use (Erie Drift Plain), and heavily forested land (Western Allegheny Plateau) between May and October in 2008 through 2011. Cyanobacteria populations peaked in late summer months and were dominated by nitrogen-fixing taxa only in Western Allegheny Plateau and Erie Drift Plain sites and commonly included *Anabaena*, *Anabaenopsis*, *Aphanizomenon*, and *Cylindrospermopsis*. Canonical correlation analysis suggests that both phosphorus and nitrogen limitation occur but the qualitative and quantitative characteristics of phytoplankton populations in Ohio reservoirs are strongly influenced by underlying land use practices. Coarse resolution at the ecoregion scale can be valuable in describing potential cyanobacteria composition where detailed nutrient budgets are not available for particular reservoirs and lakes.

9:45 CITIZEN SCIENCE IN THE MUSKINGUM RIVER WATERSHED, OHIO. Dana M. Oleskiewicz, oleskiewicz@windstream.net, Ohio Lake Management Society, 9092 Willson Drive, Chagrin Falls OH 44023; Joseph D. Conroy, joseph.conroy@dnr.state.oh.us, Ohio Department of Natural

Resources; John R. Beaver, BSA Environmental Services, Inc., j.beaver@bsaenv.com; Kyle C. Scotese, k.scotese@bsaenv.com; and Alison D. Minerovic, a.minerovic@bsaenv.com.

Solving water quality problems require sound scientific information and public support. Citizen science can provide both baseline data on water systems and the necessary connection between the local residents and their water resource. The CLAM project was initiated to increase Ohio's ability to address emerging issues such as HABs, assist Division of Wildlife in fisheries decisions, and provide information to Muskingum Watershed Conservancy District MWCD for reservoir management. Citizens need to identify water quality issues and implement strategies to solve problems. The Citizen Lake Awareness and Monitoring (CLAM) program has cultivated citizen scientists on Ohio lakes for 20 years. A partnership between CLAM and the Ohio Department of Natural Resources Division of Wildlife (DOW), along with the MWCD resulted in local residents taking an active role in documenting lake water conditions in the Muskingum River Watershed. Citizen scientists, as Lake Keepers, collected Level III Ohio Qualified Data on nine MWCD owned lakes in 2010 and 2011. They recorded seasonal water transparency, water temperature, dissolved oxygen profiles, and measured water samples to measure total nitrogen, total phosphorus, suspended sediment, and chlorophyll *a* concentrations. Protocols for monitoring Harmful Algal Blooms (HABs) were established to determine the presence of HABs, as well as to determine concentrations of cyanobacteria toxins. Water monitoring results are archived in an on-line CLAM database (www.olms.org). Analyses and reports can be viewed by the public, as well as community leaders for making water quality improvements.

9:55 MONITORING OF TOXIN-PRODUCING CYANOBACTERIA IN LITTORAL REGIONS OF THE MUSKINGUM RIVER WATERSHED, OHIO. Alison D. Minerovic, a.minerovic@bsaenv.com, BSA Environmental Services, Inc., 23400 Mercantile Road, Beachwood, Ohio 44122; Kyle C. Scotese, k.scotese@bsaenv.com; Robert D. Davic, rdavic@yahoo.com, Ohio Lake Management Society; John R. Beaver, j.beaver@bsaenv.com; and Dana M. Oleskiewicz, oleskiewicz@windstream.net, Ohio Lake Management Society.

The Muskingum River Watershed is Ohio's largest wholly contained watershed, covering about 20 percent of the state, and is heavily utilized for outdoor recreation. Reservoirs in the Muskingum River Watershed are located in two Ohio ecoregions: the Western Allegheny Plateau and Erie Drift Plain. Both ecoregions are more forested and less productive agriculturally than the Eastern Corn Belt Plain of western Ohio. Phytoplankton grab samples and raw water samples were collected by citizens trained by the Ohio Lake Management Society from littoral regions of nine reservoirs and analyzed for algal composition, nutrients, and cyanotoxins. Six times between July and October 2011, samples were collected from areas of each reservoir most frequented by the public such as docks and beaches. Seven of the nine lakes were consistently dominated by cyanobacteria between July and October, with an average biovolume of over 50%. Higher percentages of nitrogen-fixing cyanobacteria were found in more heavily forested sites based on GIS land use data. The most common cyanobacteria species in terms of biovolume was *Cylindrospermopsis raciborskii*, which often reached concentrations typical of algal blooms. However, when tested for cylindrospermopsin, only two of 41 samples produced quantifiable concentrations > 0.1 µg/L between July and October. Out of 62 samples tested for microcystin, seventeen samples from August and September produced concentrations greater than the quantifiable threshold of 0.15 µg/L. These results suggest a relationship between land use patterns and nitrogen-fixing cyanobacteria taxa in Ohio reservoirs.

10:05 GRAND LAKE ST. MARYS, OHIO: DISTRESSED DESIGNATION AND RULES IMPLEMENTATION. John W. Kessler, john.kessler@dnr.state.oh.us, Ohio Department of Natural Resources Division of Soil and Water Resources, 2045 Morse Road, Building B-3, Columbus, OH 43229.

During the summers of 2009 and 2010 many Ohio lakes exhibited harmful algal blooms. Grand Lake St. Marys had the highest levels of associated toxins. Consequently, the State of Ohio enacted regulations (Ohio Administrative Code 1501:15-5-01 to 1501:15-5-20) in early 2011 to establish a process for designating a watershed as 'distressed' due to excessive nutrients from agricultural sources. The regulations also increased requirements to handle and manage manure in distressed watersheds. A distressed designation depends on strong evidence linking the nutrient loading and subsequent algal blooms with poor water quality, threats to drinking water, recreation and public health, and other factors such as fish kills. Upon designation as a distressed watershed, and within a two year transition, manure must be managed according to an approved nutrient management plan and meet state and federal standards. The designation restricts land application of manure between December 15 and March 1, or when the ground is frozen outside those dates. The Ohio Department of Natural Resources is implementing these rules on behalf of Ohioans.

10:15-11:00 Q & A

Afternoon Session 1:30

In Lake Erie and the bays

1:30 DISSOLVED OXYGEN IN LAKE ERIE: TEMPORAL, SPATIAL, AND WEATHER INFLUENCED TRENDS IN THE CENTRAL BASIN, SANDUSKY SUBBASIN, AND WESTERN BASIN. Maya, C. Hughes¹, hughes.1251@osu.edu, 1562 Hunter Ave, Columbus, OH 43201, Phoenix Golnick^{1,2}, pgolnick001@defiance.edu, Douglas D. Kane^{1,2}, dkane@defiance.edu. ¹F.T. Stone Laboratory, Put-In-Bay, OH 43456, ²Defiance College, Natural Sciences and Mathematics Division, Defiance, OH 43512.

In order to understand the effects of weather on stratification and dissolved oxygen in Lake Erie, sites in the central basin, Sandusky subbasin, and western basin were sampled once a week in June and July in 2011. A multiparameter sonde (YSI inc. 650 MDS) was used at each site to measure temperature, dissolved oxygen, and chlorophyll *a* every 0.5 m from the surface of the water to the bottom of the lake. Hypoxia was first observed on 6 June 2011 in the Sandusky Subbasin (1.93 mg/L). All sites (except Ballast Island Deep in the western basin) were stratified at all dates sampled. Data were compared to 2010 in order to evaluate the effects of spring weather on stratification and dissolved oxygen. Spring weather differed between 2010 and 2011 (obtained from NOAA's National Buoy Data Center (station 45005-W Lake Erie 28NM Northwest of Cleveland, OH)), with a decrease in temperature and an increase in precipitation and storm events in 2011. Hypolimnion thickness and the depth of the start of the hypolimnion were significantly different between 2010 and 2011 (paired t-test, $p=0.048$; paired t-test, $p=0.005$). Further, a general linear model and interaction plot revealed a significant relationship between mean hypolimnion dissolved oxygen and month, basin, and basin with year, but not between years. Thinner and deeper hypolimnia in 2011 throughout all basins suggest an increase in vertical mixing as a result of a colder, wetter, and windier spring. Thus weather influences dissolved oxygen differently between the central basin, Sandusky subbasin, and western basin.

1:40 EFFECTS OF NITROGEN DILUTION ON ALGAL GROWTH IN LAKE ERIE WATER SAMPLES, Nathan A. Arroyo, arroyo.7@osu.edu, The Ohio State University, 398 Alexandria Colony East, Columbus, OH 43215, Darren L. Bade, dbade@kent.edu, F.T. Stone Laboratory, Put-In-Bay, OH 43456, Kent State University, Dept of Biological Sciences, PO Box 5190, Kent OH 44242.

As a result of nutrient pollution, Lake Erie suffers from many symptoms of eutrophication including algal blooms. Two bioassay dilution experiments were conducted to test the hypothesis that by lowering the amount of Nitrogen (N) in Lake Erie, the amount of algal growth would be limited. An initial dilution series (0%, 20%, 40%, 60%) was created by mixing Lake Erie water from near the South Bass Island Harbor entrance buoy with artificial lake water that lacked the major nutrients of phosphorus (P) and N for a total of 1.2L of water for each dilution percentage. The artificial lake water contained only the major ions found in Lake Erie water except Ca^{+2} and Si^{+4} which were not readily available at the field station. In a second dilution series (0%, 20%, 40%, 60%) with water from the same site and also totaling 1.2L of for each dilution percentage, 10 $\mu\text{mol P/L}$ was added to each sample to insure P was present in excess. All treatments were prepared in triplicate in BOD bottles, and incubated *in situ* for one week. Chlorophyll *a* was measured fluorometrically before and after the experiment as a surrogate for algal biomass. The same procedure was used with water from western Sandusky Bay and with the inclusion of Si^{+4} in the artificial lake water for the second experiment. The first experiment showed a slight positive growth with an average of 1.98 $\mu\text{g Chlorophyll } a/L$ over all levels of the dilutions series that did not include P and higher positive growth average of 30.11 $\mu\text{g Chlorophyll } a/L$ in the set of dilutions with added P. However, with excess P, the effect of increasing dilution showed growth decreased as the concentration of nitrogen decreased from a 0% dilution average of 46.20 $\mu\text{g Chlorophyll } a/L$ to a 60% dilution average of 20.27 $\mu\text{g Chlorophyll } a/L$. The average growth of all treatments in the second experiment was negative, but the growth in the P added sets was on average 10.24 $\mu\text{g Chlorophyll } a/L$ less negative than the control. In the experiments, P was a limiting nutrient at both locations.

1:50 PHOSPHORUS, NITROGEN AND MAUMEE BAY ALGAE GROWTH: FOCUS ON CONCENTRATION. Justin D. Chaffin, Justin.chaffin@rockets.utoledo.edu, Thomas B. Bridgeman, Thomas.bridgeman@utoledo.edu, Department of Environmental Sciences and Lake Erie Center, University of Toledo, 6200 Bayshore Rd. Oregon OH 43616.

Harmful algae blooms caused by excess nutrients are becoming more common in Maumee Bay (MB) of western Lake Erie. Phosphorus (P) concentrations are too high, but reducing nitrogen (N) may improve water quality. Dilution assays were conducted with MB water on June 27, July 15, and August 5 2011 to test this hypothesis. MB water containing known concentrations of algae and nutrients was diluted with filtered (no algae) low-nutrient central basin water and/or filtered MB water; therefore both P and N were reduced (-PN) ranging from 20% to 100% of initial MB. Further, N was added back to a set for effect of P-only reduction (-P) and P added to another set for the N-only reduction effect (-N). Algae growth rates were calculated from initial and final chlorophyll *a* (chl_a) measurements. In all experiments, -P and -PN reduced growth rate up to 83% and resulted in similar curves, while -N only reduced growth by 36%. These results indicate that N reductions may not be as effective as P reduction in reducing algal blooms. Monod growth parameters predict P-limited growth is 50% of maximum growth when P:chl_a ratio is 0.9 mg/mg. Further growth limitation is observed at lower P:chl_a ratios. If a desirable level of P-limited chl_a in MB is, for example, 10 mg/L, then P should be 9 mg P/L. Dissolved P concentration in MB is extremely variable but averages about 20 mg P/L; therefore a reduction in P concentration of more than half is required to achieve a 10 mg/L chl_a target.

2:00 INDICATORS OF PHOSPHORUS LIMITATION IN LAKE ERIE. Leigh A. Martin, lmarti33@kent.edu, Darren L. Bade, dbade@kent.edu, Kent State University, Dept of Biological Sciences, PO Box 5190, Kent OH 44242.

Despite ongoing efforts to reduce phosphorus loads in Lake Erie since the 1970s, eutrophication continually causes fish kills from anoxia, vascular plant and periphytic phytoplankton losses, and potential health risks from harmful algae blooms. While phosphorus (P) is typically considered the dominant limiting nutrient to algal growth in freshwater systems, prior evidence has shown that this is not always the case in Lake Erie; the project hypothesized that trends of increased soluble reactive P loading will cause other factors besides P to be limiting. Additionally, the project hypothesized that phosphorus limitation should be more likely in offshore regions, congruent to the nearshore phosphorus shunt hypothesis. Water samples were taken from eight transects spanning nearshore to offshore depths throughout the lake in June and August and from two transects in the Central Basin in July. We measured two indicators of phosphorus limitation. The P-debt assay, which measures radioactive P incorporation relative to chlorophyll a concentrations, indicates P limitation ($>0.075 \mu\text{mole P}/\mu\text{g chl a}$) at the Cattaraugus Creek and Westfield transects in August. There was no pattern of increasing P limitation from nearshore to offshore. P turnover time, which measures the turnover time of soluble reactive P relative to algal or bacterial uptake, revealed P limitation (<60 minutes) for most depths along the Cattaraugus Creek and Erie transects in June and the Fairport Harbor and Geneva transects in July. P limitation appeared more prevalent throughout the lake in August and was observed along the Grand River, Turtle Creek, Erie, and Ashtabula transects.

2:10 CONTINUED DECLINE IN LAKE ERIE WATER QUALITY: INCREASING CYANOBACTERIAL BIOMASSES OVER TIME (1996-2010). Douglas D. Kane¹, dkane@defiance.edu, Joseph D. Conroy, joseph.conroy@dnr.state.oh.us, R. Peter Richards³, prichard@heidelberg.edu, David B. Baker³, dbaker@heidelberg.edu, David A. Culver⁴, culver.3@osu.edu. ¹Defiance College, Natural Sciences and Mathematics Division, Defiance, OH, 43512, ²Inland Fisheries Research Unit, Division of Wildlife, Ohio Department of Natural Resources, Hebron, OH 43025, ³National Center for Water Quality Research, Heidelberg University, Tiffin, OH 44883, ⁴Limnology Laboratory, Department of Evolution, Ecology, and Organismal Biology, The Ohio State University, Columbus, OH 43212.

Record levels of cyanobacterial Harmful Algal Blooms (HABs) throughout Lake Erie during 2010 and 2011 indicate continued extensive water quality impairment. These impairments include beach closings, additional drinking water treatment costs, and a general loss of aesthetics, all of which negatively affect local economies. Thus this work updates previous analyses of correlations between soluble reactive phosphorus (SRP) and cyanobacterial biomass with additional years of data. Linear regression models were constructed to determine if cyanobacterial biomass increased with time. During the 1996-2010 period for which data were available, cyanobacterial seasonal (May-October) arithmetic mean wet-weight biomasses (mg L⁻¹; SAB, with outliers removed) were not significantly correlated with water-year Maumee River SRP loads ($r^2 = 0.16$, $P > 0.05$), which differed from previous analyses we conducted. However, cyanobacterial SAB has significantly increased with time in both the western ($r^2 = 0.46$, $P < 0.01$) and central basins ($r^2 = 0.55$, $P < 0.01$) of Lake Erie. Further analyses of the timing of soluble phosphorus loads and other nutrients (i.e., nitrate) and their correlations with cyanobacterial biomass may be warranted.

2:20 SATELLITE MULTISPECTRAL COMPOSITIONAL MAPPING OF LAKE CYANOBACTERIAL BLOOMS (US PATENT NO. 7,132,254) AND LAND CHEMICAL COMPOUNDS. Robert K. Vincent, rvincen@bgsu.edu. Department of Geology, Bowling Green State University, Bowling Green, OH 43403-0211.

Recent advances in satellite mapping of chemical compounds and elemental content on both water

and on land have opened new means to quantitative environmental monitoring that has a denser net of measurement sites (about 5 measurements per acre with LANDSAT TM data), is less expensive per measurement than traditional *in situ* methods, delivers more timely data, and has synoptic coverage when needed. Examples include specific pigments in cyanobacteria blooms in Lake Erie (resolution down to ppb), total phosphate content in surface waters of lakes and rivers (10 ppb rms error), total phosphate concentration in bare soil (ppm), and others. The methodology for producing quantitative algorithms that convert satellite multispectral image data into contents of elements or chemical compounds could possibly be used for mapping the areal extent of at least some specific pollutants (such as oil, pcb, pesticides and herbicides) that have formerly been untimely detected and too expensive to map with *in situ* sensors. Ongoing research is required to discover which pollutants have the greatest probability of being mapped. Remotely piloted aerial sensor platforms could also be well employed for such work.

2:30-4:00 Q&A and Summary

Individual Podium Session # 1
Schar Room 103
T.B.A. – presiding

09:00 THE DETERMINATION OF THE DISTRIBUTION OF CHTHAMALUS FRAGILIS IN A NORTHERN FLORIDA SALT MARSH Brittany A Bianco, b-bianco.1@onu.edu, Kandoi Doi k-doi@onu.edu, Garrett D Fruchey, g-fruchey@onu.edu, (Brian E Keas b-keas@onu.edu), Department of Biological and Allied Health Sciences, Ohio Northern University, 525 S. Main St., Ada OH 45810

Chthamalus fragilis is a widespread barnacle attached to a variety of hard substrates in the high intertidal zone along the eastern coast of the USA. Along the northern Gulf of Mexico, *C. fragilis* often attaches to the stems of smooth cordgrass, *Spartina alterniflora*. Previous research has shown a strong affinity for attachment to already colonized stems (gregarious behavior, common to barnacles) and to sites in the axillary regions of the plants, but the overall distribution of barnacles within a salt marsh has not been studied. This study established a series of three transects from open water to upland elevations in a salt marsh at Wakulla Beach, Wakulla County, Florida. Four quadrats along each transect were used to sample the vegetation (species, height, number, density) and the attached fauna, including *C. fragilis* and the marsh periwinkle, *Littoraria irrorata*. For *C. fragilis*, data collection focused on the number, size and distribution on individual stems. Data were then analyzed using correlation analyses to examine the patterns of barnacle distribution among a seaward-landward gradient, vegetation density, and associations with *L. irrorata*.

09:15 SEASONAL DISTRIBUTIONS AND COMPOSITIONS OF BENTHIC COMMUNITIES IN A LIMESTONE QUARRY DISCHARGE INFLUENCED STREAM REACH. Dawn T. DeColibus, d-decolibus@onu.edu, Bethany J. Blakely, b-blakely@onu.edu, Leslie A. Riley, l-riley.1@onu.edu (advisor), Robert G. Verb, r-verb@onu.edu (advisor), Department of Biological and Allied Health Sciences, Ada, OH 45817

Riley Creek is an intermittent, third-order stream located in the Till Plains of Allen County, in west-central Ohio. Near Bluffton, Ohio, along Interstate 75, a portion of Riley Creek receives effluent from a limestone quarry operated by the Bluffton Stone Company. The water discharged by the quarry is elevated in concentrations of calcium carbonate which lead to marl deposits on the benthos of the river. To determine if quarry waters influenced the composition and distribution of lotic communities, upstream and downstream sites were sampled seasonally from fall 2010 - summer 2011. Twelve sites, six upstream and six downstream of the quarry discharge, were sampled for aquatic organisms (e.g., macroinvertebrates, macroalgae,

and diatoms) and physical and chemical parameters (e.g., current velocity, pH, total alkalinity). Current velocities (ANOVA, $p < 0.001$) and macroinvertebrate taxonomic richness (ANOVA, $p < 0.05$) increased in sites below the quarry discharge. Neither macroalgae (ANOVA, $p = 0.78$) or diatom richness (ANOVA, $p = 0.21$) differed relative to the discharge point. However, the upstream diatom communities contained a higher percentage (ANOVA, $p < 0.05$) of motile diatoms with well-developed raphe systems. The dominance of these types of diatoms (e.g., *Pinnularia*, *Nitzschia*, *Surirella*) and lower macroinvertebrate richness in the upstream sites may indicate an influence of the marl flocculant settling onto the benthos from the discharging quarry water.

09:30 DIURNAL VARIATIONS IN ESSENTIAL OIL COMPOSITION OF THYMUS VULGARIS AND DETERMINATION OF THE CONSTITUENT'S SYNERGISTIC ANTIMICROBIAL ACTIVITY. Sarah Kradel (s-kradel@onu.edu) [Vicki Abrams Motz (v-motz@onu.edu), Linda Young (l-young@onu.edu), Christopher Bowers (c-bowers@onu.edu)] 402 W. College Avenue, Unit 3585, Ada, OH 45810

The proportion of components in the essential oil is used to determine the chemotype, distinguishing between variant species. This study examines essential oil composition of *Thymus vulgaris* plants and diurnal variations of oil within them. Thymol, the predominant phenolic component of *Thymus vulgaris*, has been used as an antimicrobial agent. Preliminary testing in this lab indicates that ethanolic extracts of *Thymus vulgaris* exhibit greater antibiosis against methicillin-resistant *Staphylococcus aureus* (MRSA) than the corresponding concentration of thymol alone, indicating synergistic activity. This study explores possible synergism between the constituents: thymol, carvacrol, linalool, and p-cymene. Ten, 3 year old *Thymus vulgaris* plants grown organically in full sun, unsupplemented beyond rainfall, were harvested, on the day of a full moon, at the end of the growing season, at 8am, at noon, and at midnight. Plants were dried, extracted in 95% ethanol, and reconstituted to a concentration of 1.000g thyme/mL ethanol. Samples were analyzed utilizing Gas Chromatography/Mass Spectroscopy (GC/MS), determining levels of the four compounds. Thymol concentrations decreased significantly ($p < .05$ by ANOVA) from a morning high (1.22E-03g/ml) to a midnight low (6.67E-04g/ml); with a similar but insignificant decline in carvacrol concentration from 7.00E-05g/ml (morning) to 3.91E-05g/ml. The daily thymol/carvacrol ratio was consistent at 17.3 ± 2.9 . Solutions of thymol, carvacrol, linalool, and p-cymene were prepared equal to their average morning concentration as determined by GC/MS analysis. Antibiotic competence of the chemicals was tested singularly and in combination against MRSA by Kirby Bauer analysis to determine which compounds produced greatest synergism.

09:45 GENETIC STRUCTURE OF SMALLMOUTH BASS ACROSS NORTH AMERICA: PATTERNS FROM TWO GENOMES. Susanne I. Karsiotis, susanne.karsiotis@rockets.utoledo.edu, Carol A. Stepien, carol.stepien@utoledo.edu, Great Lakes Genetics Laboratory, Lake Erie Center and Department of Environmental Sciences, The University of Toledo, 6200 Bayshore Road, Toledo OH 43616.

Analysis of extant population genetic relationships reveals the signatures of ongoing processes such as spawning behavior and migration, as well as those of historical events including vicariance and climate change. This study provides a dual genome analysis of the population genetic patterns of 666 smallmouth bass (*Micropterus dolomieu*) across 28 locations of their native range – including the Great Lakes and the Mississippi, Ohio, St. Lawrence, and Hudson rivers' drainages – using eight nuclear microsatellite loci and mitochondrial DNA cytochrome *b* sequences. Null hypotheses are (i) genetic variation is not significantly partitioned among watersheds, lakes, rivers, and basins and (ii) there is not a significant difference

between mitochondrial and nuclear DNA patterns. We discern marked genetic differences across the range, as well as surprisingly high divergences among closely spaced riverine sites (θ_{ST} : mean = 0.24, range: 0.11-0.45), with the latter also having higher mtDNA diversity (riverine sites: mean = 0.71, lake sites: mean = 0.48). Microsatellite results do not fit an isolation by geographical distance prediction for fine-scale genetic patterns, but show weak correspondence across large geographical scales (10.1148 +0.1425 (ln km), $p = 0.0002$, $R^2 = 0.201$). Genetic relationships thus illustrate (1) divergent origins through vicariance in glacial refugia, (2) unique colonization pathways establishing modern-day Great Lakes populations, and (3) maintenance through behavioral site fidelity.

10:00 DOES ARTIFICIAL FEED ENHANCE AGE-0 CHANNEL CATFISH GROWTH? Jesse E. Filbrun, filbrun.8@osu.edu, David A. Culver, culver.3@osu.edu, Stuart A. Ludsin, ludsin.1@osu.edu, The Ohio State University, 1315 Kinnear Rd., Columbus OH, 43212.

Current culture methods for age-0 channel catfish (*Ictalurus punctatus*) assume that artificial feed must be added to earthen ponds to support fish growth during the early weeks post-stocking. However, the importance of feed versus natural prey to catfish growth remains unknown. To quantify the importance of feeding for catfish production, we established feeding rate treatments of 0%, 1%, or 3% body-weight/day (BW/d; $N = 3$ ponds/treatment) for 12 weeks at the Hebron State Fish Hatchery, Ohio, during 2010. We used $\delta^{15}N$ and $\delta^{13}C$ measurements of fish muscle tissue, artificial feed, and natural prey ($N = 673$) to quantify the contribution of feed versus natural prey to tissue growth. Otoliths ($N = 742$) and fish body measurements ($N = 1,911$) were used to determine growth rates for each feeding treatment. Fish tissue $\delta^{15}N$ and $\delta^{13}C$ values changed similarly across feeding treatments during the first 3 weeks in ponds (ANOVAs; $F_{2,101} < 1.4$, $p > 0.24$) then diverged thereafter; fish in the 1% and 3% BW/d treatments had 1.2 and 2.7% higher $\delta^{15}N$ and $\delta^{13}C$ values, respectively, than the 0% BW/d treatment ($F_{2,190} > 27.7$, $p < 0.001$), indicating artificial feed supplemented tissue growth only after week 3. Fish growth rates only differed ($F_{2,763} > 5.4$, $p < 0.005$) once fish relied on artificial feed post week 3 (growth rates = 2.2, 2.1, and 3.1% BW/d in 0%, 1%, and 3% feeding treatments, respectively). Because artificial feed only enhanced catfish growth after week 3, providing artificial feed before this time seems unnecessary.

10:15 MAPPING 3C-LIKE PROTEASE CLEAVAGE SITES IN THE R78 REGION OF MAIZE CHLOROTIC DWARF VIRUS, Yujing Zhao, yzhao12@wooster.edu, College of Wooster, C-3131, 1189 Beall Avenue, Wooster, OH, 44691, (Lucy R. Stewart) USDA-ARS Ohio Agricultural Research and Development Center. 1680 Madison Ave. Wooster, OH 44691.

Maize chlorotic dwarf virus (MCDV) causes severe stunting, chlorosis of tertiary veins and leaf tearing in corn. It is prevalent in the southeastern US and is considered the second major corn virus disease in the USA and thus understanding the genome of MCDV remains an important task. The major Open Reading Frame (ORF) in the single stranded RNA genome of MCDV codes for a 389 kDa polyprotein which is cleaved into smaller functional proteins by the virus-encoded 3C-like protease. The polyprotein is processed into a 78 kDa protein from the N-terminus (R78). Previous studies have suggested that in MCDV-Severe strain (MCDV-S), R78 is processed further, with one possible autocatalytic cleavage site (R78 self-cleavage) and a site cleaved by the 3C-like protease (not part of R78). It is hypothesized that after *in vitro* translation of R78, its autocatalytic proteolytic activity will cleave itself into P60 and P15, and that after co-translation of R78 and protease, the P60 region will be further cleaved into P35 and P25. Lower ratios of R78:protease and longer incubation times may facilitate cleavage. In this study, the *in vitro* system testing the cleavage sites within R78 used were the TnT® SP6 High-Yield Wheat Germ Protein Expres-

sion System and the TnT® SP6 Coupled Reticulocyte Ly-sate System. The systems were optimized by adjusting the Western Blot protocol to reduce the background. Current results show that increasing Tween-20 concentration can reduce the background in Western Blot and lower ratios of R78:protease introduces more effective cleavage. This study will contribute to the better determination of R78 proteolytic sites and explore the MCDV genome in ways that have not been studied before.

10:30 A CHORD LEFT UNRESOLVED: MANDATED MUSIC PROGRAMS AND STATE STANDARDIZED TEST SCORES IN RICHLAND COUNTY, OHIO. Kathleen A. Williams (williams.2982@osu.edu) (2755 Lexington Avenue, Apartment B-21, Lexington, OH, 44904) & Rachel J. Sommers (rsommers0@gmail.com) Christian Winterbottom, Ph. D. (winterbottom.4@osu.edu) (1760 University Drive, Mansfield, OH, 44906)

School reform efforts and related emphasis on tougher standards and accountability have significantly influenced teachers' approaches to teaching and learning in our nations' music classroom environments. The goals of this research were twofold; First, determine if there has been an impact on state standardized math and reading scores in third, fourth, and fifth grades in public elementary schools in Richland County, Ohio. Second, examine perceptions of administrators towards music programs. Data from 2007-2010 were used to determine the impact on the standardized scores. Test scores were analyzed in over 50 elementary programs using crosstabulation analysis in SPSS to determine if the scores increased or decreased in each of the aforementioned years. Research, which has focused on students who participate in music education confirms that students do better than their peers on many measures of academic achievement such as grade-point averages and standardized tests music programs. Therefore, the hypothesis was that school districts that eliminated music programs from their schools and where administrators had low perceptions towards music programs would score low on standardized tests. Analysis of third grade data indicated that reading scores increased from 2007 through 2011; third grade math scores dropped dramatically from 2009-2010, but increased in 2011. Fourth grade scores remained did not increase/decrease between 2007-2011. However, reading scores for fifth grade decreased dramatically from 2009-2010, but increased in 2011. Moreover, fifth grade math scores have increased greatly.

10:45 SEASONAL CHANGE IN ANTI-PREDATOR BEHAVIOR OF DAPHNIA Patricia A. Saunders (psaunders@ashland.edu), Dept. of Biology and Environmental Science Program, Ashland University, 401 College Ave., Ashland, OH 44805, Rachael E. Glover (rglover14@jcu.edu), Dept. of Biology, John Carroll University, University Heights, OH.

Lake studies have found zooplankton using spatial refuges benefit from reduced exposure to predators. In many systems, such a refuge is at deeper, darker depths, where they are less visible during the day (diel vertical migration, DVM). In shallow lakes that lack a deep refuge, vulnerable zooplankton species may move into or out of plant-rich edge habitat during the day (diel horizontal migration, DHM). Sites Lake is a small, eutrophic, kettle lake (Richland Co., OH). Despite it being relatively deep ($Z_{max} \sim 12.5$ m), mature individuals of the larger cladoceran species (*Daphnia dentifera*) leave the lake center during the day and return at night, and there was no evidence of diel vertical migration. It was found that DHM does not occur in spring, but is consistently observed in late summer-fall months (Jul-Oct). This seasonal change in behavior may indicate a seasonal change in environment. It was hypothesized that seasonal decrease in oxygen levels (< 1 mg/L) reduces the effective value of mid-water column habitat. Samples from Apr-Oct were used to identify the timing of DHM onset in 2008. These data were compared to environmental profiles covering the same time-frame

(temperature, °C; water clarity, m; dissolved oxygen, mg/L). This analysis found that in the time frame when this *Daphnia* population switched to significant DHM ($>75\%$ increase in abundance at night, $P < 0.05$), habitat volume between the thermocline and anoxic depths decreased by 50%. Altogether, these data are consistent with the predator-avoidance hypothesis to explain diel migration behaviors.

Individual Podium Session # 2

Schar Room 172

T.B.A. – Presiding

09:00 INVESTIGATION OF THE FORMATION OF ORAL BIOFILMS. Lauren Young¹ (lmy5@zips.uakron.edu), J. Kyle Miller² (jkm29@uakron.edu), Hope Badawy¹ (hope.badawy@gmail.com), Amy Milsted^{1,2} (milsted@uakron.edu). University of Akron, 302 Buchtel Commons, Akron OH 44325. ¹ Department of Biology, University of Akron. ² Program in Integrated Bioscience, University of Akron

An oral biofilm is a community of more than 800 species of bacteria in a matrix of extracellular DNA, proteins, and polysaccharides, forming a structure called plaque on surfaces in the mouth. The objective of this research was to establish laboratory conditions that allowed the study of how oral biofilms form. Bacteria investigated were *Streptococcus mutans* and *Lactobacillus rhamnosus*. *S. mutans* is reportedly involved in early stages of biofilm formation and *L. rhamnosus* in more mature biofilms. Static cultures of each species, as well as a mixed culture, were grown on glass coverslips. Through image analysis on a scanning laser confocal microscope using a LIVE/DEAD staining kit, seeding order of bacteria was observed. For the three experimental groups, an average cell density was obtained after analysis using a quartile-based nonparametric test, using only non-outlier data. Average cell density for *S. mutans* was 41.3 ± 2.8 cells/mm², *L. rhamnosus* was 15.4 ± 4.3 cells/mm², and the mixed culture was 41.0 ± 8.3 cells/mm². Through analysis of scanning laser confocal microscope images, it was found that in the laboratory, *S. mutans* grows in a pattern similar to that in the mouth. They adhered first to the clean coverslip and more cells adhered in a given time period. *L. rhamnosus* showed less adhesion of cells and preferentially adhered to surfaces where *S. mutans* were already seeded. These results established that the laboratory conditions were appropriate for studying the growth and development of oral biofilms and their responses to antimicrobial treatments.

09:15 Sry GENE EXPRESSION IN TGR(mRen2)27 RATS. Fabiana Alves¹, alves.bio@gmail.com, Robson Augusto Souza Santos¹, marrob@dedalus.lcc.ufmg.br, Amy Milsted², milsted@uakron.edu, Helen Lima DelPuerto¹, helendelpuerto@hotmail.com, Jeremy Prokop², jwp7@zips.uakron.edu, Francisco Oliveira Vieira¹, chicobrant@gmail.com, Sarah Fonseca Martins¹, sarahebreia@yahoo.com.br, Deborah Ribeiro Nascimento¹, deborahrn18@yahoo.com.br, Rita de Cássia Oliveira¹, ritaa01@yahoo.com.br, Almir Sousa Martins¹, alisbetermster@gmail.com, Av. Antônio Carlos, 6627 Pampulha, Belo Horizonte, MG, Brazil, 31270901. ¹Department of Physiology and Biophysics, Institute of Biological Sciences, Federal University of Minas Gerais, Brazil. ²University of Akron, Akron, OH 44325.

Sry locus on Y chromosome encodes a transcription factor involved in the regulation of blood pressure. Other genes are involved in control mechanisms of the cardiovascular system. Well defined experimental models are needed to clarify the role of each gene. TGR(mRen2)27 is a transgenic hypertensive rat expressing renin and a model to study *Sry* role in the pathophysiology of hypertension. The objective of this study was to analyze *Sry* gene expression in adrenal gland, kidney, atrium, testis and brain cortex from six normotensive Sprague Dawley (SD) rats and six

TGR rats to determine whether *Sry* was influenced by the presence of the transgene. *Sry* expression was analyzed by real-time PCR. Higher expression of *Sry* was observed in brain cortex ($p=0.011$) and atrium ($p=0.033$) of TGR compared to SD. Tissue distribution of *Sry* showed higher expression in brain cortex compared to adrenal gland, kidney and testis ($p=0.035$) in TGR rats but no differences in SD rats. The results indicate that the transgene has an effect on *Sry* expression. *Sry* expression here, in both strains, is likely to exert its effects on BP at the levels of tyrosine hydroxylase(Th) and renin-angiotensin system(RAS) genes. Atrium overexpression of *Sry* in TGR may account for upregulation of heart RAS, leading to increased cardiac output consequences in hypertension. Whether *Sry* in the TGR brain cortex or atrium acts by modulating expression of either Th system or by increasing local RAS activity that results in more Ang II has yet to be explored in this model.

09:30 HIND III DIGESTION OF HYALELLA DNA FOR SEX AND GENOMIC DIFFERENTIATIONS. Sarah Fonseca Martins¹, sarahebreia@yahoo.com.br, Alessandra Angélica de Pádua Bueno¹, alebueno@dbi.ufla.br, Fabiana Alves², alves.bio@gmail.com, Deborah Ribeiro Nascimento², deborahrn18@yahoo.com.br, Helen Lima Del Puerto², helendelpuerto@hotmail.com, Almir Sousa Martins², alisbetermster@gmail.com, ¹Universidade Federal de Lavras, Depart of Biology, Lavras, MG, Brazil 37200000 and, ²Universidade Federal de Minas Gerais, Depart of Fisiology and Biophysics, Belo Horizonte, Brazil 31270901.

Hyaella belongs to the Amphipoda order of freshwater and humid soils inhabitants of the Americas. There are three complexes *H. azteca*, *H. patagonica* and *H. curvispina*, morphologically separated with adaptive differences to several habitats. Genomic differences are consequences of their isolation and specialization. Morphological and molecular approaches aim for better identification of cryptic species and the understanding of their multivariable complex morphotaxonomy. This work reports the use of a simple method of genomic DNA extraction combined with DNA restriction digestion by *Hind III*, for sex identification and genome differentiation of six *Hyaella* species. DNA from 188 specimens were extracted using 3 different methods. All methods yielded the same amount of DNA. The mean \pm SD of total DNA $\mu\text{g}/\mu\text{L}$ were: 1,606 \pm 2,113; 15,704 \pm 8,601; 9,664 \pm 13,716; 0,088 \pm 0,035; 1,667 \pm 0,620 and 18,241 \pm 35,042 for *Hyaella* sp 1, *H. curvispina*, *H. warming*, *H. pampeana*, *H. castroi* and *H. montenegrinae*, respectively. Restriction fragments were visualized through comparative polyacrylamide gel electrophoresis after staining in silver nitrate. *Hind III* were clearly visualized for each species after digestion. A fragment of approximately 500 bp was present only in females and could be used for sex determination. Genomic DNA digestion results showed differences among *Hyaella* from two different regions of Brazil. This method represents a promising tool for future sex and species differentiation studies.

09:45 SHORELINE RECOVERY AND THE NEARSHORE FISH COMMUNITY Kristen M. Woodling kristen.woodling@utoledo.edu, Jason E. Ross Jason.ross@utoledo.edu, Christine M. Mayer christine.mayer@utoledo.edu, University of Toledo Dept of Environmental Science and Lake Erie Center, 6200 Bayshore Rd, Oregon OH, 43616.

Human activity has substantially altered Great Lakes' shorelines; these changes including rip-rap, bulkhead, managed beach, interfere with natural ecosystem processes. The purpose of this study was to determine the effect of shoreline alteration on the near shore (0-2 m depth) fish community in western Lake Erie. The hypotheses of this study were that highly altered shorelines would have 1) relatively less fish biomass, 2) more non-indigenous species and 3) lower fish diversity. 500 meters of shoreline were electrofished by boat during day and night (May-August 2011) at 20 sites along the southern shoreline of the western basin of Lake Erie. Sites were categorized as altered if they had bulkheads, rip-rap with no vegetation, or

were a managed beach ($n=10$). Sites were called recovering if they had vegetation over rip rap or other structures, large woody debris, or were unmanaged beaches ($n=8$). Sites were unaltered if there was no human alteration ($n=2$), both were cliff faces. Statistical comparisons of fish biomass and number of species at unaltered sites were not made because of the small number of sites. Altered sites were compared to those in the process of recovery using a t-test that did not assume equal variance. The number of species was significantly higher at recovering sites (altered mean=9.9 species, 1SD=4.65; recovering mean=18.88 species, 1SD=2.43; t-test $p=0.0004$). However, fish biomass did not differ (altered mean=2,648g per site, 1SD=1,943; recovering mean=3,933g, 1SD=2,081; t-test $p=0.077$). Factors other than shoreline condition, such as bottom structure and food availability, may influence fish biomass.

10:00 CHANGES IN THE LARVAL FISH COMMUNITY OF THE MAUMEE RIVER LACUSTUARY. Robert Mapes, Robert. mapes@rockets.utoledo.edu, Jeremy Pritt Jeremy.pritt@rockets.utoledo.edu, Mark Dufour mrdufour@yahoo.com, Chris Mayer christine.mayer@utoledo.edu 2024 Liliias Dr. Oregon, OH 43616.

The Maumee River lacustrary is an important spawning and nursery habitat for migratory Lake Erie fishes. Abundance and diversity of larval fish exported to the lake in the years 2010 and 2011 were compared to data from similar studies conducted in 1976 and 1977. An increase in the overall density and diversity of larval fish was expected because of improved water quality in the lacustrary since enactment of the Clean Water Act of 1972. Larval fish were collected from the mouth of the Maumee River during spring and summer (April-June) of 2010 and 2011 by towing paired ichthyoplankton nets. Fish were counted and identified to the lowest possible taxon with all samples identified to the family level. No significant changes were observed in the total density of larval fish (ANOVA, $P = 0.3404$) or weekly family diversity using the Simpson Index (ANOVA, $P = 0.3644$). Examination at the family level showed a significant increase in the density of the Percidae family (ANOVA, $P = 0.01692$) in the current study years. Family richness increased from six to ten taxon and percent family composition differed (Chi-squared, $P < 0.0001$) with the Sciaenidae family (freshwater drum, *Aplodinotus grunniens*) representing a larger proportion of the community. The hypothesis that improved water quality will result in higher densities of fish was not supported. However an increase in Percidae family abundance and overall family richness in addition to a change in the composition of the community was observed.

10:15 A GENETIC HISTORY OF WALLEYE (SANDER VITREUS) SPAWNING IN CATTARAUGUS CREEK OF THE SENECA NATION: A COMPARISON OF TWO GENOMES. Hillary A. Dean, hillary.dean@rockets.utoledo.edu, Amanda E. Haponski, amanda.haponski@rockets.utoledo.edu, Carol A. Stepien, carol.stepien@utoledo.edu University of Toledo, Great Lakes Genetics Laboratory, Lake Erie Center and Dept of Environmental Sciences, Toledo OH 43616.

A historic walleye group spawns each spring in Cattaraugus Creek, New York, a tributary in eastern Lake Erie, located in the Seneca Nation. The New York State Department of Environmental Conservation supplemented Cattaraugus Creek from 1995-2000 annually with 2.2 million walleye fry and 44,000 fingerlings from a hatchery (parents from the western Lake Erie Maumee River) because they believed the site to have suitable habitat but unpopulated. The artificial stocking posed a potential threat to the genetic structure of the native spawning run through potential hybridization. The hypotheses of this study were to test if the genetic composition and diversity of the native spawning group was affected by the stocked fry, and whether differences occurred among annual runs, between age cohorts and sexes. Nine nuclear DNA microsatellite

loci and mitochondrial DNA control region sequences were analyzed for a total of 219 spawning walleye from eight years (1999, 01, 03, 05, 09-11), representing age cohorts born before stocking (1984, 86, 93, 94) vs. after stocking (1995-99) and 10 stocked fingerlings (1999). Analyses included heterozygosity (diversity) comparisons, and pairwise divergences. Multiple comparisons were corrected using sequential Bonferroni. Observed heterozygosity was 0.71-0.77 and was similar to other Lake Erie walleye runs. Pairwise comparisons indicated no significant differences between annual walleye runs. No differences were found between the sexes or among age cohorts before vs. after stocking. Thus, a genetically consistent and divergent stock of walleye spawns in Cattaraugus Creek.

10:30 TRIBUTARY IMPACTS ON THE WESTERN LAKE ERIE SHORELINE FISH COMMUNITY. Anne T. Doerr, anne.doerr@utoledo.edu, Jason E. Ross, Jason.Ross2@rockets.utoledo.edu, Christine M. Mayer, christine.mayer@utoledo.edu. University of Toledo, Department of Environmental Sciences and Lake Erie Center, 6200 Bayshore Drive, Oregon OH 43616.

The purpose of this study was to assess how tributaries affect the western Lake Erie shoreline (0-2m depth) fish community. 500 meters of shoreline were electrofished by boat during day and night (May-August 2011) at 17 sites along the southern shoreline of the western basin of Lake Erie. At each transect, turbidity (TU), dissolved oxygen (DO), and temperature were measured with a YSI water quality probe, Secchi depth was also measured as an index of clarity. Secchi depth was estimated through nonlinear regression with TU in a few instances when Secchi could not be obtained due to weather and during night sampling. The hypotheses of this study were 1) clarity would increase and DO and temperature would decrease with distance from river mouth 2) fish biomass and diversity would be highest near tributary mouths 3) fish biomass and diversity would correlate positively with DO and negatively with clarity because low DO negatively affects many species and high clarity sites may be less productive and have lower food availability. Secchi was always lowest near tributary mouths (regressions $p < 0.05$) while DO did not differ with distance from river mouth (regressions $p > 0.05$). At two of three tributaries temperature changed with distance from river mouth (regressions $p < 0.05$), but the direction of change differed among the three tributaries. Fish biomass and richness were highest near tributary mouths (regressions $p < 0.05$). There were no significant relationships between fish biomass and DO, Secchi, or temperature.

10:45 HISTOPATHOLOGICAL ANALYSIS OF TADPOLE GROWTH DEFORMITIES ASSOCIATED WITH ATRAZINE®. Amanda L. Coleman, ac313910@ohio.edu, 340 Bent Tree Dr., Apt. 1B, Fairfield OH 45014, Southern Ohio University, Dept. of Biology, Ironton, OH 45638.

Atrazine® is the most widely used herbicide in the US. In the Ohio River Valley Watershed, Atrazine® is applied to tobacco and corn, economically important crops. Scientific investigations suggest that its application has detrimental effects on reproductive development in amphibians and humans. Therefore, deciphering the mechanisms through which Atrazine® is implicated in sexual malformation and decreasing amphibian populations became of interest to the OUS biology group. Previous studies show Atrazine® alters amphibian development, transforming genotypic males to phenotypic females and hermaphrodites. In these studies, aromatase enzyme has been shown to convert testosterone to estrogen, which led to de-masculinization in male frogs. This research examines Atrazine® effects on *Rana pipens* in a laboratory setting and proposes that higher concentrations will lead to increasing incidences of abnormalities in tadpoles. The objective of this investigation is to answer two questions: Is there evidence for Atrazine® involvement in tadpole's growth defects under controlled conditions? and Do increasing levels of Atrazine® correlate with pathological indicators? The first

goal was developing protocols to establish a controlled environment and experimental parameters. Tadpoles were grown in one of four tanks: three levels with Atrazine® (0.5, 5, and 50 ppb ($n=50$) and one control ($n=25$) without Atrazine®. At pre-determined time points, euthanized tadpoles ($n=6$) were weighed and measured, exhibiting a variable range of growth in all tanks. The mean tadpole length was 4.756 cm (range 2.1-6.0, st. dev 1.324). The mean treated tadpole testes were as follows: right teste 1.209mm, 0.695 std; left teste mean 0.751mm, 0.529 std; with 50% of treated tadpoles (all concentrations) having no presence of testes; and no abnormalities (retarded or absent growth) observed in the control tank. Although the sample size was too small to report statistical significance over the size range observed, a trend with increasing Atrazine® concentrations indicate alterations in tadpole development and corresponding behavioral patterns (observation and dissection). Most interesting was the presence of gallbladder pathology of the treated specimens, not observed in the controls, which were enlarged and lacked blood or bile. Blocked reproductive tissues and organs (testes/kidney, gallbladder/liver) from male and female *R. pipens* test specimens have been prepared for pathological analysis and immunohistochemistry (IHC). Our current mechanistic study focuses on examining expression patterns of aromatase enzyme by IHC in blocked tissues.

Individual Podium Session # 3
Schar Room 171
T.B.A. – Presiding

09:00 PRESENCE AND PERSISTENCE OF ESCHERICHIA COLI IN SOIL FROM TWO CIVIL WAR LATRINES. Allison R. Willis awillis@heidelberg.edu Heidelberg University Berg Box 0500, 44 Greenfield Street, Tiffin, OH 44883 (Dr. Susan Carty)

Much is known about *Escherichia coli* in water systems in relation to fecal contamination. However, there is much less information about *E. coli*'s presence and persistence in a terrestrial environment. The hypothesis is that *E. coli* would not persist in a sample of dry soil for over a week, or be present in soil samples from a Civil War era latrine. To test *E. coli*'s persistence, sterile soil was inoculated with approximately 10 ml of a liquid culture of *E. coli*. During the course of the experiment, the soil was kept at room temperature in an unlit lab drawer. The soil was tested by rehydrating two grams of the soil in approximately 10 ml of nutrient broth and water, one gram of soil in each. The suspension was then incubated for 24 hours. One ml of this rehydration was then plated on a Levine EMB agar plate. This was let incubate for 24 hours and then check for *E. coli*. After the preliminary test, four soil samples from two Civil War latrines on Johnson's Island, F40 and F124, were tested in the same manner as the preliminary test for the presence of *E. coli*. *E. coli* was present in the inoculated soil for five weeks, and was found in one soil sample from each latrine. Both samples were retested as they were before, and *E. coli* was found in one of the samples again, the sample from F124. *E. coli* persisted much longer than was expected, and its presence in the Johnson's Island latrines could be due to different factors such as a sustained population or contamination from groundwater and animals.

09:15 COMPARATIVE ANALYSIS OF SRY PROMOTER SEQUENCES ON THE HUMAN AND RAT Y CHROMOSOME. Christina R. Friedl, crf5@zips.uakron.edu, Jeremy W. Prokop, jwp7@zips.uakron.edu, Amy Milsted, milsted@uakron.edu, University of Akron, Dept of Biology, 302 Buchtel Commons, Akron OH 44325.

The Y chromosome gene *Sry* has been identified as a candidate gene for hypertension. Analysis of its promoter will help in understanding the regulation of this gene. The *Sry* gene was compared in the multiple rat copies and between these copies and human to identify conserved blocks of sequences and conserved transcription factor

binding sites. Evolutionary Conserved Regions (ECRs) are usually conserved because of their biological significance in gene expression. ECR's were identified through a program called Mulan, while conserved transcription factor binding sites (TFBSs) were identified through MultiTF. Six ECRs and 177 transcription factor binding sites (TFBSs) were found on both human *SRY* and 7 different copies of rat *Sry*. The rat *Sry* loci contains 5 ECRs with 99 TFBSs. A comparison of the human *SRY* and rat *Sry2* identified 12 ECRs with 139 TFBSs in common. The relevance of these TFs is indicated by how frequent and common a TF is found within these conserved regions. The most frequent transcription factors to recognize the conserved sequences were CDXA, CAP, SRY, STAT, AREB6 (ZEB), HFH3, and HNF. Transcription factor binding sites in common as well as unique to each *Sry* loci could help explain the function and expression patterns of each copy. These results increase our knowledge of potential regulatory motifs in *Sry* promoters and are informative for better understanding how difference in promoter regions can be reflected in different patterns of expression of the genes.

09:30 THE ORIGIN OF COYOTE POPULATIONS IN THE CUYAHOGA VALLEY NATIONAL RECREATION AREA. Brittney T. Riordan, btr3@zips.uakron.edu, Greg Smith gasmith@uakron.edu, (R. Joel Duff, rjduff@uakron.edu), 124 Seifert Ct NW, Massillon OH 44646.

Wolves and coyotes are known to have interbred and the timing of this interbreeding and location is thought to be important in explaining the current geographical distributions of these species. Prior to European settlement, Ohio was well populated with wolves. More recently, coyotes (*Canis latrans*) have migrated into the state and are now the dominant canine predator. To test the hypothesis that coyotes in northeast Ohio are related to populations of coyotes from the northeast US, we obtained blood samples from 33 assumed coyotes from the Cuyahoga Valley National Recreational Area (CVNRA) between Cleveland and Akron, Ohio. DNA was extracted from all individuals and a 369 bp portion of the mitochondrial control region was amplified. Twelve sequences were generated and aligned, using the software package MEGA5, with 250 coyote and wolf sequences from the Eastern US downloaded from GenBank (NCBI). Distance analysis was performed and a distance tree used to assess the similarities of these new sequences with those of prior studies. Of these, seven samples have a coyote specific haplotype that have been identified from WI, OH, NC and PA. One sample has a different coyote specific haplotype that is identical with a coyote from NC. Three samples have the "Great Lakes Wolf" haplotype found in the northeast US that represents descendants of a presumed past hybridization of wolves and coyotes. These results strongly suggest that present day coyotes in the CVNRA may have been introduced into the park from multiple source populations.

09:45 EFFICACY OF THE BILLINGS METHOD IN PREDICTING ONSET OF MENSES IN COLLEGE WOMEN. Keira A. Corbett, k-corbett@onu.edu, [Catherine L. E. Young, c-young.1@onu.edu, Vicki Abrams Motz, v-motz@onu.edu] 124 West Lincoln Ave. Ada, OH 45810

The Billings Method, a means of tracking a woman's menstrual cycle, uses mucus characteristics and the sensation of the skin around the vagina to predict the onset of menstruation and a woman's peak fertility. The focus of this ongoing study is to assess the efficacy of the Billings Method as a predictor of onset of menses in 25 college women 18-23 years of age, and furthermore compare its efficacy against the calendar method of predicting menses. The hypothesis is that there will be a difference between the Billings and the calendar prediction methods, and that Billings Method predictions will increase in accuracy in subsequent cycles. In the beginning of this study, recruited participants attended a presentation about the menstrual cycle, how the Billings Method works as a predictor, and agreed to requirements for the study. To collect data,

subjects email the researcher twice per cycle for 3 cycles; once after they assess peak fertility to predict the date of onset of menstruation and again to confirm actual onset of menses. A paired t-test was used to compare the deviations between the Billings Method predicted and calendar predicted dates to the dates of actual menses onset. For cycle one, the calendar predictions were an average of 3.24 days off while the Billings Method predictions averaged 2.00 days off actual onset. This however was not statistically significant at $\alpha=.05$, though there was a statistical difference in the second cycle with a paired t-test value of .01. The third cycle is in progress.

10:00 CRUSTAL UPLIFT AND CENOZOIC EXTENSIONAL TECTONICS OF PELAGONIA IN NORTHERN GREECE. Katie C. Lehmann, lehmannk@muohio.edu, John J. Brockman, brockmj3@muohio.edu, (Yildirim Dilek) dileky@muohio.edu, Dept. of Geology and Environmental Earth Science, Miami University, Oxford, OH 45056.

This study investigates the crustal uplift and exhumation of Pelagonia, a NW-trending ribbon continent with Gondwana affinity in west-central Greece. The Pelagonian microcontinent constitutes the westernmost segment of the Internal Hellenide mountain belt, and its crystalline basement consists mainly of granites, gneisses, and metavolcanic rocks that range in age from late Proterozoic to Permo-Carboniferous. The goal of this project is to determine the mode and nature of the punctuated Cenozoic exhumation and uplift history of Pelagonia. The hypothesis of this experiment is the Pelagonian microcontinent represents a metamorphic core complex, developed in a dextral transtensional stress regime in the Balkan Peninsula during the late Cenozoic. Structural measurements of shear zones, schistosity/foliation planes, fault plants, and mineral and stretching lineations were recorded along 6 ~NE-SW-directed traverses. Stereoplots were constructed from the data as well as a geodynamic model of the tectonic history of the region. Rock samples collected along these traverses will undergo geochemical analysis, providing greater precision of the timing and rates of uplift and exhumation. The structural analyses and geochronology derived from this study will be essential to the reconstruction of the tectonic history of Pelagonia.

10:15 SYNTHESIS AND TESTING OF NOVEL ANTIBACTERIAL GLUCOSAMINE DERIVATIVES ON *S. AUREUS*. Joy L. Sizemore¹, sizemorej@findlay.edu, Brianne N. Kuns², kunsb@findlay.edu, Rahul Khupse², khupse@findlay.edu, Matthew J. Hoostal¹, hoostal@findlay.edu, ¹University of Findlay, College of Science, Findlay OH 45840 and ²University of Findlay, College of Pharmacy, Findlay OH 45840.

Antibiotic-resistant bacteria and few new antibiotics are increasingly prevalent problems in both human and veterinary medicine. For example, the prevalence of Methicillin-resistant *Staphylococcus aureus* (MRSA) among *S. aureus* isolates cultured from patients in intensive care units within United States hospitals increased from 35.9% to 64.4% between 1992 and 2003. In addition, among the fifteen largest pharmaceutical companies, only 1.6% of drugs in development in 2004 were antibiotics. To address the shortage of novel antibacterials, this project involves the characterization and testing of three glucosamine derivatives as novel antibacterial compounds synthesized by linking an experimental moiety to glucosamine via a nucleophilic substitution reaction. As glucosamine is essential in the generation of peptidoglycan, structural analogs of glucosamine may initiate a loss of bacterial osmoregulation, a key function of the bacterial cell wall. Mass and nuclear magnetic resonance spectroscopy were utilized to characterize the synthesized glucosamine derivatives. Three synthesized glucosamine derivatives have decreased the growth of laboratory cultures of drug-sensitive *S. aureus* by approximately 20%. To substantiate the potential mechanism of action, *S. aureus* was inoculated with sodium chloride (0.6M, 0.9M, and 1.1M) and a glucosamine derivative, as well as

treatment controls inoculated only with sodium chloride (0.6M, 0.9M, and 1.1M). Bacteria treated with 1 mg/mL glucosamine derivatives plus sodium chloride grew about 20% less than treatment controls. During growth curve assays, each glucosamine derivative inhibited *S. aureus* by approximately 25% compared to unamended controls ($P > 0.05$). Specifically, *S. aureus* were inhibited during exponential (log) growth, suggesting the glucosamine derivatives inhibit cell wall synthesis.

10:30 AN ATTEMPT TO REFINE THE DATE OF THE SERPENT MOUND IMPACT EVENT Emily Williams (ewillia5@ashland.edu) Box 1325, 401 College Ave, Ashland, Ohio 44805, Nigel Brush (nbrush@ashland.edu) Ashland University, and Jeff Dilyard (dilyard@embarqmail.com).

The Serpent Mound Impact Structure is located at the junction of Adams, Highland, and Pike Counties in southern Ohio. The documentation of classic impact indicators (including shocked quartz, coesite, shatter cones, and iridium) from Cambrian, Ordovician and Silurian period rocks within this structure clearly established that it was created by a bolide impact. The date of the impact event, however, is still being debated and various time-ranges have been previously suggested: post-Middle Silurian to pre-Late Devonian, after the Late Devonian-Early Mississippian, Early Mississippian-Late Permian, or Late Pennsylvanian-Late Permian. It is hypothesized that the Serpent Mound Structure dates to the Late Devonian Period because a dozen other impact craters around the world date to this time period. The recent discovery of shatter cones in either Upper Devonian or Lower Mississippian-age black shale within the crater provides the opportunity to test this hypothesis. Conodonts in this black shale will be microscopically analyzed in an attempt to biostratigraphically determine the age of this shale. However, even if this shale proves to be Late Devonian, there may be younger strata within the crater that also contain evidence of impact. Since the Berea Sandstone lies above the black shale, six thin sections of this sandstone will be prepared and microscopically analyzed for evidence of shocked quartz. If the Berea Sandstone contains no evidence of shock metamorphism – and the conodonts date the shale to Late Devonian – this will support the hypothesis that the impact occurred in the Late Devonian. However, if the Berea Sandstone contains shocked quartz, then the impact event is likely post-Devonian.

10:45 AN ATTEMPT TO IDENTIFY THE GENUS AND STRATIGRAPHIC POSITION OF PETRIFIED WOOD SPECIMENS FROM HOLMES AND COSHOCTON COUNTIES, OHIO. Mitchell Ramsey (mramsey1@ashland.edu) Box 1182, 401 College Ave, Ashland, Ohio 44805, and Nigel Brush (nbrush@ashland.edu) Ashland University.

The Petrified Forest in Arizona dates to the Triassic Period (225 ma.) and is one of the most famous fossilized wood sites in the United States. Petrified wood, however, has also been collected in many of the other 50 states. In Ohio, petrified wood is most commonly recovered from the unglaciated portion of the Allegheny Plateau in the southeastern part of the state – from Muskingum County to Lawrence County. Most of these samples have been dated to the Pennsylvanian Period (318-299 ma.) and occur within the Conemaugh Group. Many of these specimens represent the seed-fern genus *Psaronius*. Less commonly, petrified wood has also been found in the glaciated and unglaciated Allegheny Plateau in northeastern Ohio. Four petrified wood sites were identified in Holmes County and four sites in Coshocton County. Although these petrified wood samples from northeastern Ohio have all been located in the upper part of the Pennsylvanian-age Pottsville Group, it is hypothesized that the genus of these specimens will also be *Psaronius* – as in southeastern Ohio. In order to test this hypothesis, 20 samples of petrified wood from these eight sites in Holmes and Coshocton County will be cut and polished so that the cell structure of each specimen can be microscopically analyzed and the

genus determined. Continued fieldwork at these sites will also attempt to use well-known sandstone and limestone units in the upper Pottsville to bracket the unit(s) containing the petrified wood. This research should result in a clearer understanding of the types of trees growing in northeastern Ohio during the Early Pennsylvanian Period, as well as their stratigraphic position.

Individual Podium Session # 4
Schar Room 135
T.B.A. – Presiding

09:00 EVALUATION OF BIOSAND FILTER MODIFIED WITH BRASS DISINFECTION LAYER FOR HOUSEHOLD TREATMENT OF DRINKING WATER. Jennifer Huang, jjh123@case.edu, Maeve Goede, mkg39@case.edu, Henry Spradley hjs43@case.edu, Banu Sizirici Yildiz, bsy3@case.edu, Case Western Reserve University, Civil Engineering Department, Bingham Building #216, 2104 Adelbert Road, Cleveland OH 44106-7201.

Biosand filtration (BSF) is currently a sufficient and low-cost method used in underdeveloped countries for pathogen and particle removal in drinking water. The aim of this project is to evaluate the pathogen reduction potential of a modified BSF (MBSF) with a disinfectant layer of granulated brass to determine if brass enables additional purification and foreign particle reduction. There are several reasons for choosing granulated brass for the disinfectant layer. Metallic oxides are good sorbents of microorganisms and turbidity. Historically, copper has been used for the treatment of diseases because of its ability to remediate algicide and parasites. In addition, brass is an alloy of copper and zinc that is easily accessible around the globe. Based on previous medical applications of brass, the MBSF should produce better results in water quality than the conventional BSF design. In the experiment, the unmodified BSF was filled with gravel, pea gravel, coarse sand, and fine sand, while the MBSF was constructed with an additional granulated brass layer in the fine sand media. The filters were run twice a day with 4 liters of water collected from Doan Brook in Cleveland, Ohio. Physical and biological tests including flow rate, turbidity, pH, dissolved oxygen, total and fecal coliform tests were conducted from 12 August 2011 to 25 October 2011. The conventional BSF (control) achieved a 90.47% reduction in total coliform, 96.59% reduction in fecal coliform and 88.5% reduction in turbidity, while the MBSF performed an 89.32% reduction in total coliform, 68.85% reduction in fecal coliform, and 88.3% reduction in turbidity. Based on the test results, the MBSF made no contributions to the improvement of the quality of water. The poor performance of brass, however, may be a result of not integrating the disinfection layer into a depth that would optimize the performance of brass. Therefore, more research is necessary to develop the study on MBSF with brass.

09:15 CARRYOVER EFFECTS OF LARVAL DIGESTIVE PLASTICITY POST-METAMORPHOSIS IN RED-EYED TREEFROGS Chelsea R. Jenney¹, Sarah S. Bouchard¹ (sbouchard@otterbein.edu) and Karen M. Warkentin² (kwarken@bu.edu) 1512 Electra Street, Columbus, OH 43240.

Larval environment has a profound effect on post-metamorphic nutrition in red-eyed treefrogs. Small froglets emerging from high density larval environments feed sooner and grow at a faster rate than large froglets from low density environments. Additionally, froglet insect intake does not scale with body size despite large differences in froglet mass. These patterns could be attributed to effects of larval plasticity that carry over post-metamorphosis. It was hypothesized that larvae from high densities would increase gut length (increasing digestive efficiency) and reduce liver size (fat storage) in response to lower per capita food resources. We reared larvae at three densities (5, 25 and 45 individuals per 400 L tank), and euthanized 10 size-matched larvae and 10 froglets from each density. Guts, livers, and fat bodies of all individuals

were dissected and weighed. Guts were uncoiled and photographed, and gut length and area were assessed using ImageJ software. As predicted, guts of high- and medium-density larvae were 23% longer than that of low-density larvae, and livers and fat bodies were significantly smaller. Low-density froglets were three times heavier than high-density froglets (0.93 vs. 0.39 g). Despite this extreme size difference, gut length did not vary with density, although high- and medium-density guts were lighter and thinner than low-density guts. High- and medium-density froglets also had proportionately smaller livers and fat bodies than low-density froglets. These results confirm carryover effects of larval plasticity post-metamorphosis.

09:30 METABOLIC RATES IN POSTMETAMORPHIC RED-EYED TREEFROGS. Lindsay J. Wargelin, lindsay.wargelin@otterbein.edu, Sarah S. Bouchard, sbouchard@otterbein.edu, Karen M. Warkentin, kwarken@bu.edu; 50 W. Lincoln Street, Westerville OH 43081.

Resource availability has a strong effect on growth and development of red-eyed treefrogs. High larval densities reduce larval growth rates, delay metamorphosis, and decrease froglet size. Additionally, small froglets from high larval densities consume insects at a similar rate to large froglets from low larval densities. The lack of a scaling relationship between intake and body size suggests that larval environment could also impact metabolism and nutrition post-metamorphosis. It was hypothesized that larval density would influence the scaling relationship between body size and metabolic rate. Larvae were reared in mesocosms at low, medium, and high densities with a constant food level, such that per capita food resources varied with density. Larval growth rates were measured by photographing larvae at two time points and assessing larval length with ImageJ software. Once metamorphosis was complete, metabolic rates were determined by measuring oxygen consumption with a PreSens Microx TX2 oxygen sensor. Larvae from the low-density habitats grew four times faster and began emerging two weeks sooner than larvae from the high density habitat. Froglets from low-density environments were three times heavier than those from high-density environments. Oxygen consumption was measured in individuals ranging in size from 0.33 – 0.99 g; metabolic rate scaled with body mass with an allometric slope of 0.97. Therefore, intake and metabolic rate vary differently with body size, suggesting factors other than metabolism influence intake.

09:45 SYNTHESIS AND CHARACTERIZATION OF EIGHT-ARMED CALIXARENE-CORE POLYLACTIDE STAR POLYMERS. Anna C. Falls, afalls@ashland.edu, Perry S. Corbin, pcorbin@ashland.edu, Ashland University, Department of Chemistry/Geology/Physics, 401 College Ave., Ashland, OH 44805.

Poly(lactide) (PLA) and related polyesters have been employed in biomedical applications and are becoming more prominently used in commercial packaging materials. One potential method of expanding the physical properties of this class of renewable, biodegradable plastics is to prepare PLAs with varied molecular architectures. To address this issue, eight-armed calixarene-core PLA star polymers were synthesized. These polymers have a central macrocyclic core with eight projecting chains. The synthesis was accomplished by first preparing a calixarene initiator with eight alcohol functional groups. Polymers with varying numbers of repeat units per arm were then synthesized in solution by Sn(II)-catalyzed ring-opening polymerizations of DL- and L-lactide using the aforementioned macrocyclic initiator. The star-shaped PLAs were characterized by gel-permeation chromatography (GPC) and proton nuclear magnetic resonance (¹H NMR) spectroscopy and were found to have number average molecular weights (ranging from ~10-30 kDa) that were close to those targeted based upon the monomer to initiator ratios. The polydispersity indices of the polymers were also low (< 1.2). Moreover, end-group analysis by ¹H NMR spectroscopy supported star polymer production. The thermal properties of the

PLAs were, in turn, investigated by differential scanning calorimetry (DSC). These DSC studies have revealed that the crystallization rates of lower molecular weight eight-armed calixarene-core PLAs are slower than their linear counterparts and that the percent crystallinity can be adjusted by varying annealing time. This will potentially affect and allow for controlled degradation of the synthesized star PLAs because the degradation rate of linear PLAs typically increases as crystallinity increases. Star PLAs with controllable degradation rates are important for their basic value and their potential use in biomedical applications, including drug-delivery.

10:00 SYNTHESIS AND CHARACTERIZATION OF SIX-ARMED CALIXARENE-CORE POLYLACTIDE STAR POLYMERS. Mei Li, mli1@ashland.edu, Perry S. Corbin, pcorbin@ashland.edu, Ashland University, Department of Chemistry/Geology/Physics, 401 College Ave., Ashland, OH 44805.

Calixarenes and related macrocycles have been exploited as hosts in supramolecular chemistry, as catalysts, and as initiators for polymerizing isobutylene, acrylates, and styrene. Because the synthesis of calixarenes is well-established and a variety of functional groups can be linked to the macrocycles, calixarenes are viewed as excellent platforms for producing varied poly(lactide) (PLA) star polymers. To diversify the molecular architecture of PLA (and potentially impact its material properties), six-armed calixarene-core PLA star polymers have been synthesized. The star PLAs were synthesized by first preparing an appropriate hexa-functional calixarene initiator in two steps. The macrocyclic initiator was dissolved in *m*-xylene and reacted with varying quantities of DL and L-lactide in Sn(II)-catalyzed ring-opening polymerizations. The reactions yielded polymers with low polydispersity indices (≤1.2) and with number average molecular weights close to those targeted based upon monomer loading, as determined by gel-permeation chromatography (GPC) and nuclear magnetic resonance (NMR) spectroscopy. ¹H NMR spectroscopic analysis of the star polymers also suggests that the macrocyclic, calixarene core of the polymers exists in multiple conformations, as evidenced by the presence of more than one set signals for the core. Differential scanning calorimetry (DSC) was, subsequently, used to analyze the thermal properties of the PLAs. In contrast to linear PLAs, DSC studies indicated that the percent crystallinity of the star PLAs could be steadily varied from 0 to ~30% by increasing annealing time. The biodegradable/biocompatible star PLAs reported have the potential to be used in a variety of applications (e.g., drug-delivery).

10:15 THE CRAWFORD SITE: A NEWLY EXCAVATED WELLSBURG PHASE SITE NEAR THE WALHONDING RIVER IN COSHOCTON COUNTY, OHIO Nigel Brush (nbrush@ashland.edu) Department of Chemistry, Geology & Physics, Ashland University, Ashland, OH 44805, Jarrod Burks (jarrodburks@ovacitd.com) Ohio Valley Archaeology, Inc., Jim Morton (james.f.morton@gmail.com), and Jeff Dilyard (dilyard@embarqmail.com)

The Crawford Site is located on a fluvial terrace near the Walhonding River in central Coshocton County, Ohio. This four-acre site was identified during an ongoing program of survey and excavation of Late Prehistoric sites in the Walhonding Valley by members of the Ashland/Wooster/Columbus Archaeological Consortium in order to study changes in settlement and subsistence systems in the Walhonding Valley between the Medieval Warm Period (A.D. 800-1300) and the Little Ice Age (A.D. 1300-1850). In August, 2011, a magnetometer survey of the Crawford Site identified 46 magnetic anomalies. During the fall of 2011, ten of these anomalies were excavated and subsequently identified as storage/refuse pits. These features contained a variety of cultural materials including: 45 flint tools, 5 stone tools and 354 pottery shards. Chronological diagnostic artifacts date the site to the Wellsburg Phase (A.D. 1500-1700) and include: Fort Ancient, Madison, Nodena and Fresno points; bifacial endscrapers; and

Wellsburg pottery. This artifact assemblage, however, is relatively impoverished compared to the Cullison Site - another Wellsburg Phase site along the Walhonding River about five miles upstream and northwest of the Crawford Site. Ten storage/refuse pits were excavated at the four and one-half acre Cullison Site by members of the Consortium in 1995. These storage/refuse pits contained 105 flint tools, 26 stone tools and 1,454 pottery shards. The disparities between these two sites suggest that the Crawford Site may have served as a transitory agricultural site where crops were grown and stored, but other cultural activities were rather limited.

10:30 WHAT FISH EYE LENSES CAN TELL US ABOUT SMALL HEAT SHOCK PROTEIN FUNCTION AND EVOLUTION. Mason Posner (mposner@ashland.edu). Ashland University, Department of Biology/Toxicology, 401 College Avenue, Ashland, OH 44805.

Vertebrate alpha crystallins are small heat shock proteins (sHSPs) that help maintain lens homeostasis and transparency. They are also expressed throughout the body and play a role in the prevention and etiology of multiple extraocular diseases. Alpha crystallins inhibit harmful protein aggregation by interacting with denaturing proteins through the exposure of hydrophobic residues. Numerous studies with mammalian species have attempted to identify amino acid variations that affect this protective chaperone-like activity, which is known to be sensitive to changes in temperature. Here we used recombinant protein of the lenticular sHSP alpha A-crystallin from six teleost fish species (*Cyprinodon variegatus*, *Danio rerio*, *Dissostichus mawsoni*, *Notothenia angustata*, *Oncorhynchus kisutch*, *Pimephales notatus*) environmentally adapted to temperatures ranging from -2°C to 40°C to identify correlations between physiological temperature, protein stability and chaperone-like activity. Computer analyses of the six protein sequences identified three specific amino acid substitutions differing in hydrophobicity that were predicted to increase chaperone-like activity. Site directed mutagenesis of these three residues in the zebrafish (V62T, C143S, T147V) confirmed that each impacts either protein stability or chaperone-like activity or both, with the V62T substitution having the greatest impact. Our results indicate a role for changing hydrophobicity in the thermal adaptation of aA-crystallin and suggest ways to produce sHsp variants with altered chaperone-like activity. These data also demonstrate that a comparative approach can provide new information about sHsp function and evolution.

**Multi-Disciplinary Poster Session
09:00 – 11:00 am
Schar 2nd Floor**

Schar Room 204

Poster Board No. 001 INVESTIGATIONS INTO THE BEHAVIOR OF THE CANIS LUPUS BAILEYI PACK AT THE CLEVELAND METROPARKS ZOO. Melissa A. Marmaduke, marmadukem@findlay.edu, (Jessica Wooten, wooten@findlay.edu) The University of Findlay Department of Natural Sciences, 1000 N. Main Street, Findlay OH 45840.

Hierarchical structure of pack animals has long been of interest, and wolf (*Canis lupus*) packs are frequently used as examples to describe behavioral relationships among members of social groups. Generally, pack animals exhibit a hierarchy with a dominant male and female (alpha individuals); these are the pack leaders. The opposite end of the hierarchy is the omega individual, and every other individual is a subordinate. The omega can be either male or female and is the scapegoat, serving as an outlet for aggression for the other wolves, which helps to maintain balance within the pack. Mexican wolves are currently protected by the Endangered Species Act because of declining populations throughout their native geographic range. The objectives of this study are to test whether captive Mexican wolves exhibit hierarchical

behavior patterns. The hypothesis is that this wolf pack will exhibit hierarchical behaviors and will further corroborate the existing literature on the social behavior of wolves in captivity. Data will be collected using scan- and all-occurrence sampling every two minutes on the wolf pack during 10 separate, 30-minute observations spaced in the morning, midday, and afternoon. Observations will occur weekly over five weeks. Due to difficulties identifying individuals, individual wolves will not be identified; rather, the number of wolves engaging in behaviors will be recorded. These methods are frequently used to investigate pack animal behavior. During each scan the number of wolves engaged in one of seven behavior categories (inactive, feed, locomotion, abnormal, social, active other, and not visible) will be recorded.

Poster Board No. 002 AGGRESSION IN AFRICAN CICHLIDS. Kamela D. Stamey, kstamey@falcon.bgsu.edu, Moira van Staaden, Robert Huber Bowling Green State University, Dept of Biology, Bowling Green OH, 43403.

The 2000+ fish species of the East African Great Lakes exhibit remarkable morphological and ecological differences. However, the mechanisms that led to this diversity are not well understood. Behaviors involved in intersexual selection have been intensely studied, but others, such as intrasexual fighting strategies, may also be important in driving speciation. In this study, fighting strategies in the Malawi cichlid *Melanochromis auratus* were explored utilizing mirror-image stimulation techniques. To determine whether opponent size influences fighting strategies, individual fish were simultaneously exposed to three mirrors: concave, convex, and flat, representing larger, smaller, and same-sized opponents, respectively. An increase in perceived opponent size was predicted to be positively correlated with mirror interaction time. Multiple linear regression analysis showed significant preferences (measured as time spent) for the larger image (concave mirror) ($P < 0.001$, $R^2 = 0.1028$) in both mature males ($N = 5$) and females ($N = 5$). Detailed descriptive analysis of six different behaviors that commonly occur within the context of these competitive interactions in three age and sex classes are included. Together, these findings have implications with respect to an individual's inherent aggressiveness, resource value, and risk assessment, all of which may influence gene flow and speciation.

Poster Board No. 003 DIFFERENTIAL GROWTH RATES OF JUVENILE WHITE BASS (*Morone chrysops*) UTILIZING SPATIALLY-DISTINCT NURSERY HABITATS IN LAKE ERIE. Andrew G. Steyer, asteyer@falcon.bgsu.edu, Jeremiah J. Davis, davisjj.bgsu.edu, Jeffrey G. Miner, jminer@bgsu.edu, John R. Farver, jfarver@bgsu.edu. Bowling Green State University, Dept of Biology, Bowling Green OH, 43404-0208

To allow better management of sport fish stocks and protect critical nursery habitats, it is useful to have an understanding of their productivity. This study attempts to evaluate nursery habitat quality in Lake Erie on a fine scale and provide reasons for observed differences. It is hypothesized that daily growth productivity of juvenile white bass utilizing Sandusky Bay as a nursery habitat will exceed that of white bass utilizing Maumee Bay. Available prey resources indicate a potential reason for differences in daily growth. Daily growth productivity is quantified by measuring differences in daily growth rates of white bass and available prey resources in spatially distinct nursery habitats of the Western Basin of Lake Erie. YOY white bass were collected from each bay and growth rates were quantified by comparing daily growth increments observed in otoliths, which provided direct measures of growth. Otolith analysis indicated that growth was 25% greater in Sandusky Bay than conspecifics of the same age utilizing Maumee Bay (t -test, $p < 0.01$). Available zooplankton biomass was examined in both habitats to explain differences in daily growth productivity. Available zooplankton prey resources were significantly greater in

Sandusky Bay (51.9mg/L) versus Maumee Bay (8.8 mg/L) through the mean of three replicates (t-test, $p < 0.05$). Preliminary findings suggest that Sandusky Bay exhibited greater early growth for white bass than Maumee Bay in 2011. Further recognizing and understanding these differences in nursery habitat quality in Lake Erie is an important step to fully integrate spatial, physical and climatic data with fisheries and their management.

Poster Board No. 004 MACROINVERTEBRATE COMMUNITY RESPONSE TO SPATE DISTURBANCE IN A THIRD ORDER STREAM. Julia K. Backus, j-backus@onu.edu, Dawn T. DeColibus, d-decolibus@onu.edu, Nicole M. Howard, n-howard@onu.edu, Leslie A. Riley, l-riley.1@onu.edu (advisor). Department of Biological and Allied Health Sciences, Ada, OH 45817.

Spates are a common disturbance in streams and can be an important factor in structuring macroinvertebrate assemblages. However, the magnitude of the effect of a spate disturbance on community structure can differ depending upon habitat type. This study tested whether a spate disturbance (22.5 times base flow conditions) influenced macroinvertebrate community composition and abundance in riffle and pool habitats within a third order stream (Kokosing River, Knox County, Ohio). Five pools and five riffles were sampled pre- and post-spate during the fall of 2011 for macroinvertebrates and physical characteristics (e.g. current velocity, stream width and depth). Preliminary analyses indicate that riffles had significantly faster current velocities than pools both pre- and post-spate (Two-way ANOVA, $p < 0.001$). However, both riffles and pools were deeper and faster after the spate disturbance (Two-way ANOVAs; $p = 0.02$ and $p = 0.029$, respectively). At four of five riffle sites, macroinvertebrate abundance decreased post-spate while pool macroinvertebrate density did not change. These preliminary results suggest that spate disturbances in the Kokosing River have the ability to reduce macroinvertebrate abundance in riffle habitats. Additional analyses will examine the effect of the spate disturbance on macroinvertebrate community characteristics including taxa richness, diversity and dominance using a combination of exploratory analyses (e.g., canonical correspondence analysis) and ANOVAs.

Poster Board No. 005 MACROINVERTEBRATE COMPOSITION OF TIP-UP POOLS IN AN INDIANA FLATWOODS FOREST. Elizabeth S. Fullerton, e-fullerton@onu.edu, Robert G. Verb, r-verb@onu.edu (advisor), Leslie A. Riley, l-riley.1@onu.edu (advisor). Department of Biological and Allied Health Sciences, Ada, OH 45817.

Tip-up pools are unique vernal habitats created from depressions left behind in the forest floor after a tree uproots. In areas with relatively flat topography, tip-up pools are a potentially important habitat for aquatic invertebrates, but little is known about the macroinvertebrate community composition of these pools. During the summer of 2010, nine tip-up pools in Tribbetts Woods (Jennings County, Indiana) were sampled for aquatic organisms (e.g., macroinvertebrates) and a variety of physical and chemical characteristics (e.g., depth, temperature, water chemistry). For the macroinvertebrates, a 2-L volume of the benthos was extracted at each tip-up pool, placed in plastic bags and preserved with 95% ethanol. Macroinvertebrates were sorted under a dissecting microscope, classified into appropriate taxonomic groups (e.g., family) and enumerated. Preliminary results indicate that the most dominant macroinvertebrates were chironomids. Chironomids were found in all nine tip-up pools and comprised $> 50\%$ of the total abundance at each location. The second most common inhabitants were introduced Asian clams (*Corbicula fluminea*), which were found in four of the nine tip-up pools sampled. In those four pools, Asian clams ranged from 1% - 25% of macroinvertebrate abundance. Additional analyses will investigate the influence of physical and chemical

characteristics on macroinvertebrate community structure including diversity, taxa richness, and dominance.

Poster Board No. 006 DIETARY VARIATION OF THE GOLDEN REDHORSE (MOXOSTOMA ERYTHRURUM RAFINESQUE) IN TWO STREAMS OF VARYING WATER QUALITY. Chad M. Carroll, c-carroll@onu.edu, Joshua A. Ryan, j-ryan.5@onu.edu, Terry D. Keiser, t-keiser@onu.edu (advisor), Department of Biological and Allied Health Sciences, Ada, OH 45810

Golden Redhorses (*Moxostoma erythrurum* Rafinesque) are found throughout lotic systems in the eastern United States and are a member of the Catostomidae family. These fish are found in various types of water flow and benthic conditions, but prefer small silts and sands which are associated with slower moving water. They are generalistic feeders preferring invertebrates; however algae and detritus are also consumed during feeding. The two primary objectives of this investigation were to determine 1) if the diets of golden redhorses differ in streams that are of varying water quality and 2) if the recovered gut contents can be used to determine water quality of the streams by using the biotic indices of the invertebrates identified in the guts of each fish. Two stream sites were selected: the Kokosing River (Knox County, OH) of relative good water quality and White Eyes Creek (Coshocton County, OH) of poor water quality from agricultural and rail road impacts that have altered the riparian zone and sped up erosion leading to excessive sedimentation. At each of the two sites a 150-m stream segment was electroshocked using the "rollerbeast" and seining to collect 11 golden redhorses from White Eyes Creek and 8 from the Kokosing River. Measurements of length and weight were taken and then the specimens were stored in 15% formalin. The gut contents were extracted by dissecting the fish and were also stored in 15% formalin. Comparisons between the gut contents of the two populations will be examined using exploratory analyses (e.g. Kruskal Wallace, t-test) to determine water quality and diet variations of the golden redhorses in various streams.

Poster Board No. 007 THE EFFECTS OF CANOPY COVER AND TREE LEAF LITTER SPECIES ON INVERTEBRATE DIVERSITY IN VERNAL POOLS. Michael A. Plenzler, maplenz@bgsu.edu, Helen J. Michaels, hmichae@bgsu.edu, Department of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.

Vernal pools provide critical habitats for amphibians, invertebrates, and plants because seasonal drying prevents the establishment of predatory fish. Hundreds of invertebrate species use vernal pools and are important predators, prey, and nutrient cyclers. Invertebrate diversity can be affected by canopy cover, which limits primary productivity, and leaf litter that subsidizes wetland nutrients. We tested how leaf litter species and canopy cover affect invertebrate diversity in mesocosm wetlands. The mesocosms contained known invertebrate communities and were assigned to a high or low light (30% & 73% canopy) treatment with silver maple, pin oak, or a mixture of the leaf species. These litters were chosen because they were the most common from a previous study of 15 NW Ohio vernal pools. Water quality, algal and plankton communities, invertebrate and family abundance, and Shannon diversity were measured monthly from June to August 2011. Leaf litter impacted light availability, as seasonal average light measurements in the maple, oak/ maple, and oak treatments were $193\mu\text{E}/\text{m}^2/\text{sec}$, $337\mu\text{E}/\text{m}^2/\text{sec}$, and $702\mu\text{E}/\text{m}^2/\text{sec}$, respectively (rmANOVA, $F_{5,12}=45.5$, $p < 0.0001$). Seasonal average invertebrate abundance varied, as high light-oak treatments had 185 invertebrates, low light-oak had 95, and all other treatments had fewer than 53 (rmANOVA, $F_{5,12}=24.3$, $p < 0.0001$). Similarly, high-light oak had an average of 9.6 families, while all other treatments had fewer than 7 (rmANOVA, $F_{5,12}=12.6$, $p = 0.0002$). Our results suggest terrestrial habitat affects invertebrate communities through bottom-up pathways, as canopy limits how much light reaches a wetland, while

dissolved organic carbon from litter further restricts light availability for primary producers in the water.

Poster Board No. 008 TETRACYCLINE RESISTANCE EXPRESSION IN COLIFORMS. Lindsay Dahl, dahl@findlay.edu, (Bethany Henderson-Dean). The University of Findlay, 1000 N. Main St., Findlay OH 45840.

Tetracycline resistance in bacterial coliforms has been a prevalent problem in agricultural settings. To date there are over 39 *tet* genes and three main modes of resistance known. A single bacterium may have more than one *tet* gene conveying resistance. The hypothesis of this study is that transcriptional expression of the tetracycline genes will increase with an increasing concentration of tetracycline. Additionally, environmental tetracycline resistance isolates will be screened through RT-PCR analysis to determine if they contain multiple *tet* genes and how expression patterns vary based on tetracycline concentrations from their natural environments in the Blanchard River.

Poster Board No. 009 THE IMPACT OF SEPTIC SYSTEMS ON COLIFORM DIVERSITY IN RIVER SEDIMENT. Catherine D. Herman, herman@findlay.edu, Kelly E. Fortney, (Bethany Henderson-Dean, Matthew Hoostal), The University of Findlay, 1000 N. Main St. Findlay, OH 45840.

Surface sediment samples from sites in the Blanchard River were collected between October and November of 2011. Total bacterial DNA will be isolated from surface sediments, and coliform bacteria will be identified through PCR amplification of 16S ribosomal DNA. These amplified products will be sent to the University of Chicago's DNA sequencing facility. DNA sequences will be assessed utilizing the Ribosomal Database Project (RDP) Sequence Classifier, which classifies 16S ribosomal DNA sequences within general taxonomic ranks. This project will address the amount and types of coliform bacteria associated with improperly maintained septic systems compared to pristine water sources to determine if septic systems are altering microbial communities.

Poster Board No. 010 CONDITIONED DISCRIMINATION OF MAGNETIC INCLINATION CUES BY HOMING PIGEONS IN A NOVEL EXPERIMENTAL PARADIGM. Merissa Acerbi, macerbi@falcon.bgsu.edu, Lindsey Cunningham, cunnin@falcon.bgsu.edu, Verner P. Bingman, vbngma@bgsu.edu, Cordula V. Mora, cmora@bgsu.edu, Bowling Green State University, Dept of Psychology, Bowling Green OH 43403-0001.

Homing pigeons, like migratory birds, possess an innate magnetic compass to determine direction during navigation. Unlike the type of magnetic compass used by humans, it is an inclination compass that measures the angle between the magnetic field vector and the Earth's surface. The objective of this study was to develop a novel conditioning paradigm that required pigeons to solve a spatial task based on magnetic inclination cues and to investigate the sensory mechanisms underlying the magnetic compass in this species. Pigeons, walking inside a circular arena whilst attached to a horizontal tracker arm, were required to choose between four feeders associated with magnetic inclination values of either 0 or 90 degrees as generated by a large 3-axis magnetic coil system. The mean discrimination performance of the pigeons tested ($n=4$) resided above chance level (50%) for 26 consecutive sessions, but fell in control sessions to around 50% during control sessions when the magnetic coils were turned off. Therefore, homing pigeons are able to discriminate inclination cues in this experimental paradigm. Ongoing research is currently testing whether pigeons have a light-mediated and/or iron-based magnetoreceptor and whether there is an equivalent area to the Cluster N in this species' forebrain as it has been found in migratory birds.

Poster Board No. 011 ANALYSIS OF CROSS SEX FRIENDSHIPS Arlie A. Ray Jr.; 2856 Shrine Rd., Springfield, OH 45502 - Clark

State Community College. Morgan Howell, ; Cody Curtis, codyn.curtis@gmail.com; Kristin Howell, ; Ryan Mundy, ; (Dee Malcuit malcuitd@clarkstate.edu)

Cross sex friendships are common in today's society as men and women interact in professional and social environments. The intent of this research is to explore attitudes and beliefs toward Cross Sex Friendships (CSF). Collectively, Introduction to Sociology student authors created a survey incorporating qualitative and quantitative components. The hypothesis stated males and females, single, between ages 18-25 are supportive of cross sex friendships. Academic basis of the hypothesis evolved from student deliberations on the research topic, examination of relevant literature through written assignments, classroom dialogue assessing comparative perspectives of diverse generations, and personal experiences. Participants surveyed ($N=100$) were selected from Clark State Community College campus and surrounding areas. Participants defined CSF, stating their opinions in reference to development and sustainability of such relationships. Variables included: gender (men, $N=50$; women, $N=50$), age ($N=25$ for each age group as follows: 18-25, 26-35, 36-45, 46+), and relationship status (married, $N=31$; single, $N=58$; other, $N=11$). Student researchers, Arlie Ray Jr., Morgan Howell, Kristin Howell, Ryan Mundy and Cody Curtis analyzed the quantitative survey data (6 questions – Excel) to discover the results support the hypothesis by a narrow margin, significance has not been determined: (1-10 scale) males ranked 1% higher than females; 18-25 year olds 1% higher than 26-45 and 2% higher than 46+; single participants ranked 4% higher than married in support of CSF. The authors recommend broadening the participant group and geographical boundaries, adding the following variables: sexual orientation and religion, thus gaining a clearer understanding of Cross Sex Friendships

Poster Board No. 012 THE EFFECT OF THE ANTIOXIDANT VITAMIN E ON LIPID PEROXIDATION IN DLPC MODEL MEMBRANE SYSTEM. Brittany A. Balser (BrittanyBalser@walsh.edu, 1154 Waterbury Dr., Medina, Ohio 44256) and (Nisreen A. Nusair) (nnusair@walsh.edu).

Vitamin E is a lipid-soluble antioxidant. It performs this antioxidant function in the cell membrane and protects phospholipids from lipid peroxidation. Lipid peroxidation in membranes plays a central role in many pathologic processes, including cancer and Alzheimer's disease. Lipid peroxidation is of great importance because it modifies the structural and dynamic properties of the membranes, which in turn, influences the membrane's function. In this study, the model membrane system consists of 1,2-dilinoleoyl-3-sn-glycerophosphatidylcholine (DLPC) phospholipid bilayers. The DLPC phospholipid bilayer samples are subjected to autooxidation. Then, the degree of lipid peroxidation in DLPC membrane system is examined using UV-VIS Spectroscopy. The results show that the absorbance increases as the degree of lipid peroxidation increases in the DLPC membrane system. One remarkable feature of all biological membranes is their dynamic properties or flexibility (fluidity). This study investigates the dynamic properties of the peroxidized DLPC membrane system and how vitamin E affects the degree of lipid peroxidation utilizing Fluorescence Polarization (FP) Spectroscopy. Therefore, different concentrations of vitamin E (0 mol%, 2.5 mol%, 5 mol%, and 10 mol%) are incorporated into the DLPC phospholipid bilayers. It is proposed that vitamin E increases the fluidity of the system by decreasing the degree of lipid peroxidation. It is observed that as the degree of lipid peroxidation decreases in the DLPC membrane system, the FP value decreases. A decrease in the FP value indicates an increase in the fluidity of the DLPC membrane system.

Poster Board No. 013 THE EFFECTS OF CHOLESTEROL AND BUPIVACAINE ON THE DEGREE OF LIPID PEROXIDATION IN DLPC MODEL MEMBRANE SYSTEM. Stewart C. Gruely,

(StewartGruey@walsh.edu . P.O. Box 410 . Walsh University . 2020 E. Maple St. . N. Canton, Ohio 44720) and (Nisreen A. Nusair) . (nnusair@walsh.edu).

Membranes, in the form of phospholipid bilayers, are vital part of all forms of life. Lipid peroxidation in membranes plays a central role in many pathologic processes, including cancer, Alzheimer's disease, atherosclerosis, and diabetes. Lipid peroxidation is of great importance because it modifies the structural and dynamic properties of the membranes, which in turn, influences the membrane's functions. One remarkable feature of all biological membranes is their dynamic properties or flexibility (fluidity). This study examines the dynamic properties of model membrane system, as well as, peroxidized model membrane system utilizing Fluorescence Polarization (FP) Spectroscopy. The model membrane system consists of 1,2-dilinoleoyl-3-sn-glycerophosphatidylcholine (DLPC) phospholipid bilayers. The research work discusses the effects of lipid peroxidation on the dynamic properties of cell membrane. It is observed that lipid peroxidation increases the fluorescence polarization value. Therefore, it decreases the fluidity of the DLPC membrane system. Different concentrations of cholesterol are incorporated into the DLPC phospholipid bilayers to examine how cholesterol influences the lipid peroxidation process. The attained results suggest that the degree of lipid peroxidation decreases approximately 10% as the cholesterol concentration increases from 0 mol%, 10 mol%, 20 mol%, to 30 mol%, respectively. The interaction of the local anesthetic, Bupivacaine, with the DLPC phospholipid bilayers is also investigated. Bupivacaine absorbs into the DLPC phospholipid bilayers and increases the fluidity of the cell membrane. The study shows that the degree of absorption Bupivacaine into the peroxidized cell membrane is decreased approximately 6% if compared to that in the intact cell membrane.

Poster Board No. 014 DEVELOPMENT OF A SOFTWARE PACKAGE TO ANALYZE PROTEIN INTRINSIC DISORDER. Mitchell D Culbert culbertm@findlay.edu, Charles Koch, kochc@findlay.edu, Ryan Spathr@findlay.edu, (Helen Schneider schneider@findlay.edu), (Xu Lu lu@findlay.edu). 301 Howard St, Findlay, OH 45840. College of Sciences, the University of Findlay, Findlay, OH 45840

Proteins play essential roles in cellular metabolism. It was traditionally believed that proteins could only perform their functions after they had folded properly. However, recent studies indicate that many protein domains do not have pre-formed structures in the cell, yet deliver important functions. This phenomenon is called protein intrinsic disorder and an increasing amount of evidence suggests that this phenomenon plays a critical role in the function of many proteins. Overall, an intrinsically disordered domain (IDD) on a protein typically contains disproportional percentages of amino acid residues with hydrophilic side chains. However, the exact amino acid compositions probably differ in different type of IDDs and this is our hypothesis. For example, a small and a big IDDs may have different amino acid compositions. The purpose of this project is to design a software package to analyze intrinsically disordered domains, particularly their amino acid compositions. By querying the public database of a published, representative set of proteins with known structures, the program delivers statistics of the disordered domains of these proteins, if there are any, analyzes the results and tests our hypothesis

Poster Board No. 015 THE EFFECT OF DIAPAUSE ON STRESS TOLERANCE IN MIGRATORY MILKWEED BUGS, ONCOPELTUS FACIATUS. Charles A. E. Dean, charlesdean09@gmail.com. Nicholas M. Teets, teets.23@osu.edu. David L. Denlinger, denlinger.1@osu.edu. Department of Entomology 300 Aronoff Laboratory 318 West 12th Avenue Columbus OH 43210.

In response to shorter days and low food availability in the fall, the large milkweed bug, *Oncopeltus fasciatus*, enters a

reproductive diapause. Diapause in large milkweed bugs is unique in that these insects are one of the only temperate species that migrates long distances during diapause. Thus, it is uncertain whether increased environmental stress tolerance is a component of the diapause program, since migration may allow milkweed bugs to avoid stressful conditions. Our overall objective in this study is to determine: 1) whether diapause increases environmental stress tolerance, 2) whether photoperiod or food shortage is the primary driver of increased stress tolerance during diapause, and 3) whether heat shock proteins are upregulated during diapause to enhance stress tolerance. Our preliminary experiments showed that diapausing milkweed bugs deprived of food exhibited significantly increased survival at both high and low temperatures (ANOVA, FDR, N=4-6, p<0.05). Future experiments will determine whether diapause also increases resilience to dehydration by examining the ability of milkweed bugs to survive in the absence of water. Finally, in many insect species, heat shock proteins (Hsps) are responsible for enhanced stress tolerance during diapause, so using qPCR we will measure hsp expression at different time points throughout diapause. We have cloned fragments of ten different Hsp transcripts from five different families, and a preliminary qPCR test revealed that four Hsp transcripts are significantly upregulated during heat stress (ANOVA, FDR, N=6, p<0.05), making them good candidate genes for conferring stress tolerance during diapause.

Poster Board No. 016 2D GEL ELECTROPHORESIS PROFILE OF CYANOGEN BROMIDE CLEAVED BOVINE SERUM ALBUMIN AS A 2-D GEL ELECTROPHORESIS STANDARD. Joshua A. Pastor, japastor@student.yosu.edu, 2635 State Route 43, Mogadore OH 44260. (Johanna Krontiris-Litowitz, jkrontirislitowitz@ysu.edu), Youngstown State University, One University Plaza, Youngstown OH 44555.

In many proteomic studies a protein standard is essential to validate the molecular weight (MW) and isoelectric focus (IEF) of unknown proteins visualized via 2-D gel electrophoresis (2-DE); however, commercially available standards are relatively costly. This problem might be circumvented by using cyanogen bromide (CNBr) digestion to cleave bovine serum albumin (BSA) at its Methionine residues to generate defined fragments. The resulting CNBr BSA should make an ideal candidate for a 2-D gel standard. Our objective is to characterize the CNBr BSA 2-DE profile so it can be used as a standard for future 2-DE gels. Varying concentrations of CNBr BSA were loaded onto IEF strips (pH 3-10) and a 2-DE performed. All gels were stained with Coomassie blue then imaged and analyzed for MW and isoelectric points (PI) using REDFIN software and commercially available 2-DE standards for comparison. Eight distinct spots and a triplet cluster were visible on each gel. All of these were consistent with observations in the literature. The density of the spots was directly proportional to the concentration of BSA at 3, 5, 7, and 10 µg, and higher concentrations of BSA correlated to denser bands. Specific MW and PI of CNBr BSA fragments have yet to be determined, but this protein profile demonstrates a strong potential for use as an inexpensive and reliable standard for 2-DE.

Schar Room 203

Poster Board No. 017 HABITAT FRAGMENTATION AND ITS EFFECTS ON THE DISTRIBUTION AND ABUNDANCE OF SALAMANDER SPECIES ON A RECLAIMED SURFACE MINE. John C. Bourne jbourne@muskingum.edu, Danny J. Ingold, ingold@muskingum.edu; Biology Dept., Muskingum College, 163 Stormont St., New Concord, OH 43762.

Many recent studies have focused on habitat fragmentation as a result of agriculture and its impacts on salamander diversity. However, relatively little is known about the effects of habitat fragmentation on salamander diversity on a reclaimed surface mine. The objective of this research was to survey the fragmented landscape of The

Wilds, a reclaimed surface mine in Southeastern Ohio for salamander diversity. Forest fragments ranging from 34.6-9 hectares were surveyed in an effort to understand the impacts of woodlot size and edge-to-area ratio on the diversity and abundance of salamander species. Ninety individuals of six species were found in the six fragments of forest surveyed. The six species include the red spotted newt (*Notophthalmus viridescens*), northern dusky (*Desmognathus fuscus*), northern two-lined (*Eurycea bislineata*), Jefferson (*Ambystoma jeffersonianum*), slimy (*Plethodon glutinosus*), and the red-backed salamanders (*Plethodon cinereus*). Woodlot size and edge-to-area ratio were calculated using GPS coordinates and the program ArcMap10. As expected there was greater species abundance (82% of all individuals found in large, 16% in medium, 2% in small fragments), but not diversity in the larger fragments. The two largest fragments included the greatest number of individuals (all species); in terms of species diversity however, one large plot included only two species, while the other included six species. This disparity in diversity may be due to the differing amounts of disturbance these forests underwent in the process of strip-mining. The results of this study provide some insights into amphibian habitat associations in a landscape fragmented by surface mining.

Poster Board No. 018 THE EFFECTS OF N-ACETYL-D-GLUCOSAMINE AND A NOVEL N-ACETYL-D-GLUCOSAMINE DERIVATIVE SUPPLEMENTATION ON THE IN VITRO PRODUCTION OF PIG OOCYTES. Elise Gerken¹, gerkene@findlay.edu, Lauren E. Elessa¹, elseal@findlay.edu, Kaitlyn Lemon¹, lemonk@findlay.edu, Rahul S. Khupse², khupse@findlay.edu, (Brian D. Whitaker¹), whitaker@findlay.edu, ¹College of Sciences, The University of Findlay, 1000 North Main Street, Findlay OH 45840 and ²College of Pharmacy, The University of Findlay.

The perivitelline space which surrounds oocytes is composed of N-acetyl-D-glucosamine (GlcNAc) and glucuronic acid, and is a critical component during *in vitro* fertilization (IVF). Objectives were to determine the effects of GlcNAc and a GlcNAc derivative on IVF and embryo development of porcine oocytes. Either GlcNAc or GlcNAc-derivative were added (2.5, 5.0 mM) during oocyte maturation. Oocytes (n = 460) were evaluated for zona pellucida and perivitelline space thickness, intracellular levels of glutathione and fertilization success rates. Embryos (n = 132) were evaluated for cleavage and blastocyst formation at 48 h and 144 h after IVF. Oocytes supplemented with GlcNAc-derivative had significantly thicker (P < 0.05) zona pellucida (13.29 ± 0.38 μm) than those supplemented with GlcNAc (10.77 ± 0.27 μm). Oocytes not supplemented had a significantly thinner (P < 0.05) perivitelline space (8.91 ± 0.41 μm) compared to GlcNAc (12.06 ± 0.45 μm) and GlcNAc-derivative (11.82 ± 0.67 μm) and there were no differences of intracellular glutathione concentration. The 5.0 mM GlcNAc-derivative supplemented oocytes were significantly less (P < 0.05) penetrated (64.0 ± 6.3%) than all other treatments but the non-supplemented oocytes had significantly less (P < 0.05) incidence of polyspermic penetration (30.0 ± 11.9%). The 5.0 mM GlcNAc-derivative had significantly fewer (P < 0.05) oocytes with male nuclear formation (24.0 ± 9.6%) than all other treatments. Non-supplemented oocytes had a significantly higher (P < 0.05) percentage of embryos cleaved (63.8 ± 8.3%) by 48 h and blastocysts (14.3 ± 2.3%) by 144 h after IVF, compared to the supplemented oocytes. These findings suggest that the GlcNAc-derivative supplementation may increase the zona pellucida thickness during maturation but supplementation of GlcNAc or GlcNAc-derivative are not effective in blocking polyspermic penetration or increasing the success of embryo development, despite increasing the perivitelline space thickness.

Poster Board No. 019 THE EFFECTS OF GLUCURONIC ACID AND N-ACETYL-D-GLUCOSAMINE SUPPLEMENTATION ON THE IN VITRO PRODUCTION OF PORCINE OOCYTES. Taylor M. Donley, donleyt@findlay.edu, Allison L. Buck, bucka@findlay.

edu, Austin R. Clark, clarka1@findlay.edu, (Brian D. Whitaker), whitaker@findlay.edu, College of Sciences, The University of Findlay, 1000 North Main Street, Findlay OH 45840.

The *in vitro* production of pig embryos is not effective due to high levels of polyspermic penetration. The objective was to assess the *in vitro* fertilization (IVF) and embryo development of pig oocytes supplemented with perivitelline space components. Glucuronic acid or N-acetyl-D-glucosamine (GlcNAc) were supplemented (2.5, 5.0 mM) to the media during the last 24 h of oocyte maturation. At the end of maturation, oocytes (n = 491) were evaluated for zona pellucida and perivitelline space thickness, intracellular levels of glutathione, and fertilization kinetics. Embryos were cultured and evaluated for cleavage and blastocyst formation at 48 h and 144 h after IVF. Oocytes (n = 491) not supplemented had significantly thicker (P < 0.05) zona pellucida and significantly thinner (P < 0.05) perivitelline space compared to the other treatments. The zona pellucida of the glucuronic acid supplementation were significantly thicker (P < 0.05) than the GlcNAc supplementation. The treatments resulted in no differences in intracellular glutathione concentrations, sperm penetration, or male pronuclear formation. Supplementation of GlcNAc significantly increased (P < 0.05) polyspermic penetration compared to the other groups. No supplementation and glucuronic acid supplemented oocytes had a significantly higher (P < 0.05) percentage of embryos cleaved by 48 h and blastocysts by 144 h after IVF, compared to the GlcNAc supplemented oocytes. Results indicate that glucuronic acid supplementation during oocyte maturation increases perivitelline space thickness and embryonic development, and reduces polyspermic penetration compared to GlcNAc supplementation; suggesting that glucuronic acid is involved in the successful block of polyspermic penetration.

Poster Board No. 020 THE EFFECT OF TEMPERATURE ON MORTALITY AND GROWTH OF JUVENILE SEAHORSES (HIPPOCAMPUS KUDA) Jennifer Trumbo, jtrumbo@capital.edu, Biological and Environmental Sciences Dept, Capital University, 1 College and Main, Columbus, Ohio 43209

Seahorses (*Hippocampus* spp.) are important inhabitants of marine ecosystems, and also popular fish for curios, aquariums, and medicinal uses. To support these three distinctive uses in society, aquaculture has emerged as a prominent economic provider and environmental protector. Little is known about the population dynamics and responses of seahorses to environmental parameters like temperature, in both wild and captive-bred populations. As climate change becomes a greater influence on global water temperatures, we must re-evaluate our treatment of the environment and discover new ways to assess the effect on those species that depend on stable habitats. Many of these effects are hypothesized to be negative. This study was aimed at strengthening knowledge of seahorse population dynamics and supporting development of consistent seahorse aquaculture practices. The connection between three temperature treatments (26 °C, 29 °C, and 32 °C), growth rate, and mortality rate among 360 *H. kuda* juveniles was monitored during a twelve day period in aquaculture. Three replicates containing 40 individuals each were established per temperature treatment. A possible correlation was found between average growth rate of juvenile *H. kuda* and the temperature of their environment. The mean growth of *H. kuda* between three temperature treatments was found to be significant using ANOVA, with a p value of 2.30544E-38 at a significance level of < 0.05. Also, the lowest mortality was found in juveniles in the 32 °C treatment at 15% less than the 26 °C treatment.

Poster Board No. 021 USING POLYPHENOLS TO INHIBIT THE AROMATASE ENZYME TO FIGHT BREAST CANCER. Michael Burgess, mburgess@capital.edu (Kerry Cheesman, kchessma@capital.edu), Biological & Environmental Sciences Dept, Capital University, 1 College and Main, Columbus, OH 43209

The aromatase enzyme has been one of the targets studied in an effort to fight breast cancer and is also of interest to athletes and bodybuilders in a quest to optimize testosterone in the body. This enzyme can be competitively inhibited by either steroidal or non-steroidal inhibitors. Recent studies have shown that various foods and alcohol contain polyphenols that can inhibit aromatase activity. The goal of this research is to find a polyphenol that will inhibit the aromatase enzyme that is better than a steroidal one. To do this, ELISA test are being used to compare several polyphenol families and to find the polyphenol family that inhibits aromatase the best. Next is to compare level of inhibition with each derivative within its own polyphenol family (i.e. Flavone: Chrysin, Apigenin, Acacetin, ect.). These results will be compared with foods and beverages that are known to contain variable concentrations of each polyphenol. This will define what is the food and beverage to consume to inhibit the aromatase enzyme naturally. The last step is to look into the stereochemistry of the polyphenols to see how varying the size, polarity, and orientation of each might affect the inhibition of the enzyme. Using these findings will produce a polyphenol synthetically that can be used to help treat breast cancer and also be used by bodybuilders and athletes.

Poster Board No. 022 THE MULTISENSORY PERCEPTION OF FLAVOR: THE INFLUENCE OF ALTERED COLORATION OF FOOD ON FLAVOR DISCRIMINATION. Moriah Plattner, mplattn@capital.edu, (Kimberly Heym and Kerry Cheesman), Biological & Environmental Sciences Dept, Capital University, 1 College and Main, Columbus OH 43209

Visual and olfactory stimuli influence human perception of food prior to gustatory stimuli. Olfactory signals arrive to the brain milliseconds prior to visual signals, allowing for the smell of foods and drinks to be recognized and more directly correlated to taste than visual stimuli. However, visual cues may strengthen or weaken the perception of the flavors intensity. This study seeks to determine how dyeing drinks blue influences taste perception. Blue coloration is not a coloration of food found in nature; nevertheless, marketing enterprises for food industries are presenting people with foods that have been altered with dyes to a blue coloration (eg: blue M&Ms and blue sports drinks). College students ($n > 100$) are being asked to taste three drinks of different flavors (lime, strawberry and plum) where the color of the liquid has been dissociated from the base flavor (eg: strawberry flavor and blue color of the drink). Each flavor and each color (green, red and blue) will appear once randomly within the trial samples. Data regarding the ability to discriminate flavor and whether or not those perceptions are altered when a food or drink's color is changed are being gathered in an effort to determine which – if any – of the visual stimuli are more influential in taste perception.

Poster Board No. 023 CREATING ANTIBODIES TO S. AUREUS BY FUSION OF MYELOMAS WITH MOUSE SPLEEN CELLS AND CLONING BY LIMITING DILUTION: Dawn M. Helterbran (DMHelterbran@student.yzu.edu), Victoria M. Lesniak (VMLesniak@student.yzu.edu), Diana L. Fagan (dlfagan@ysu.edu), 146 E. Second St. Girard, OH. 44420

Staphylococcus aureus is an important pathogen that can be difficult to treat, as it can be resistant to many commonly used antibiotics. Creating antibody producing cells is a technique that has been practiced and modified for nearly 40 years. The purpose of the study is to create antibodies against *Staphylococcus aureus* that could be used to diagnose or treat staphylococcus infections. Fusion was conducted by other researchers, and subcloning was performed in this study. MRC-5 fibroblast cells were used as feeder cells. These cells provide growth factors for the P3X hybridoma clones that were added by limiting dilution to a sterile 96-well plate. These cells were incubated in RPMI media containing 20% FCS for four days. The wells were then examined for single clones. Single clones were fed three times a week until two-thirds confluent in a T25

flask. These clones were tested for antibody production using an ELISA. Four ELISAs were performed against the antigens *Staphylococcus aureus* T3 and *Staphylococcus aureus* T8. Of 69 subclones, three produced antibodies that reacted with T8 *S. Aureus*. These antibodies were not type specific, as they also reacted with T3 *S. Aureus*. Two clones reacted with T3 *S. Aureus* and appear to be type specific, as they did not react with T8. These results could be applied to further diagnosis or treatment.

Poster Board No. 024 THE ABUNDANCE OF WINTER RAPTORS ON A RECLAIMED SURFACE MINE IN SOUTHEAST OHIO. Elizabeth M. Bullard ebullard@muskingum.edu, (Danny J. Ingold, ingold@muskingum.edu); Biology Dept., Muskingum University, 163 Stormont St., New Concord, OH 43762.

Over the past 30 years, grassland birds have declined more than any other bird group in the Midwest. This decline is mostly the result of anthropogenic influences such as habitat degradation and fragmentation. The results of several recent studies suggest that reclaimed surface mines provide suitable nesting and wintering habitat for a variety of obligate grassland birds. These studies have focused mainly on the nesting success of grassland songbirds with little research being done on fall and winter raptors. The objective of this research is to use a driving transect to survey different species of fall and winter raptors, as well as to examine their perch and habitat preferences on a reclaimed surface mine in southeastern Ohio (the Wilds). Transect data will be collected from early November 2011, through late February 2012, and compared to the results that Ingold reported along the same transect route from January through April 2009. Common species of migrant raptors in this region include rough-legged hawks (*Buteo lagopus*), northern harriers (*Circus cyaneus*), and short-eared owls (*Asio flammeus*) while resident raptors include American kestrels (*Falco sparverius*), red-tailed hawks (*Buteo jamaicensis*), red shoulder-hawks (*Buteo lineatus*), and Coopers hawks (*Accipiter cooperii*). By monitoring the raptors on this reclaimed surface mine and comparing the findings to a recent study on this site, it may be possible to determine whether there are differences in raptor abundances in the fall and early winter versus late winter and spring. In addition, it will be interesting to note whether short-eared owls show up at this location during this study (they were absent from this site in 2009).

Poster Board No. 025 EFFECTS OF CAFFEINE ON CANCER CELL GROWTH. Thomas Pierson¹ pierson1@findlay.edu, James Hummel¹ hummelj@findlay.edu, Tess van Kan² vankant@findlay.edu, Mark Frilling² frillingm@findlay.edu, Xiaodi Hu³ hu.350@buckeyemail.osu.edu, (Xu Lu² lu@findlay.edu), Box 0973 1000 N. Main St., Findlay OH 45840. ¹University of Findlay College of Pharmacy, Findlay OH 45840 and ²The University of Findlay College of Sciences, Findlay OH 45850, and ³The Ohio State University, Columbus OH 43210.

It has long been known that caffeine can inhibit cancer cell growth. However, the exact cellular mechanisms affected remain undetermined. The purpose of the project is to define the effects of caffeine on cell growth at specific conditions in vitro, as well as determining what molecular machinery that is inhibited or destroyed due to the application of the drug. The hypothesis is that the addition of caffeine during cell growth will significantly decrease the growth rate of cells tested. The human prostate adenocarcinoma (PC-3), colorectal carcinoma (HCT-116), and acute T cell leukemia (Jurkat E6-1) cell lines were tested to investigate the effects of caffeine on cell growth. PC-3 and HCT-116 cells were cultured adherently on a well plates in DMEM + 10% FBS medium with 0–4 mmol concentrations of caffeine. Cells were grown in a 37°C + 5% CO₂ environment. Jurkat E6-1 cells were cultured suspended in RPMI-1640 + 10% FBS medium with identical caffeine and environmental conditions. Cells were counted every 24 hours for three days using a hemocytometer and light microscope. As expected, growth inhibition of all cell lines occurred with the addition of caffeine. In 1mmol caffeine concentration, PC-3

and HCT-116 cell growth decreased by approximately 50% per day. Jurkat E6-1 growth rate inhibition is still being determined. The exact molecular mechanism(s) of such inhibitory effects on all cell lines are under investigation.

Poster Board No. 026 THERMAL ANALYSIS OF MALARIAL RHOPTRY PEPTIDES Alicia Irizarry¹; Alicia.Irizarry001@acad.tri-c.edu; 4388 Park West Oval Cleveland, OH 44135; Tobili Y. Sam-Yellowe, Ph.D.²; Alan Riga, Ph.D.³; ¹Cuyahoga Community College, Cleveland OH; ²Cleveland State University, Department of BGES, Cleveland, OH; ³Cleveland State University, Department of Chemistry, Cleveland, OH.

Diagnosing malaria today remains difficult because the infrastructure of the areas where malaria is endemic is usually inadequate and the trained individuals needed to interpret test results are often far away. The goal of this research is to identify signature properties of three malarial peptides derived from the rhoptry organelle using thermal analysis. The rhoptry organelle is associated with the blood stage and invasion of the malaria parasite. Signature properties which were observed were phase transitions, thermal conductivity, and mass loss due to temperature changes. Malarial peptides were synthesized as multiple antigenic peptides (MAPS) containing 10 amino acids. Three types of thermal analytical techniques were used; dielectric thermal analysis (DEA), thermogravimetric analysis (TGA), and differential scanning calorimetry (DSC). DEA determines the thermal conductivity of a sample as a function of temperature; TGA determines the mass loss due to temperature changes; and DSC observes phase transitions of a sample. Three peptides were observed: 05-154, 05-157, and 05-175. DEA proved peptide 05-175 was most thermally conductive of the three observed. TGA showed peptide 05-175 retained the most moisture of the three; however, the mass loss occurred in 35 minutes. Peptides 05-154 and 05-157 lost the most moisture but the mass loss occurred in 40-43 minutes. The DSC plots indicated that peptide 05-175 crystallized and melted before peptides 05-154 and 05-157. The DSC plots for peptides 05-154 and 05-157 were difficult to interpret because the phase transitions did not follow a observable pattern. Properties of the peptides were identified however; the results indicated that further analysis is needed.

Poster Board No. 027 DETERMINATION OF SUBCELLULAR DISTRIBUTION OF HUMAN SRY PROTEINS IN TRANSIENTLY TRANSFECTED CHINESE HAMSTER OVARY CELLS. Rachael L. Sciplin, rachaelsciplin@walsh.edu, Adam C. Underwood, aunderwood@walsh.edu, Walsh University, 2020 East Maple St. NE, North Canton OH 44720.

The sex determining region of the Y chromosome, *SRY*, is a transcription factor encoding an 80 amino acid (aa) high mobility group (HMG) box DNA binding domain that is flanked by a nuclear localization signal (NLS) at the N (nNLS) and C (cNLS) terminus. In rat *Sry2*, the nNLS contains a histidine rather than an arginine at aa 21, which is shown to reduce nuclear import. The objective of this study was to determine if aa 76 (aa 21 in rat) in human *SRY* (h*SRY*) modulates nuclear import in a similar manner given the architectural differences between human and rat proteins. The hypothesis tested was; h*SRY*, mutated to encode a H at aa 76 will exhibit reduced nuclear accumulation. This hypothesis was tested by transfecting Chinese hamster ovary cells with either pEF1/h*SRY* or pEF1/h*SRY*(H76) constructs encoding native or mutated proteins respectively. *SRY* distribution was determined through immunocytochemistry using a goat anti-Myc primary antibody (1:400) and donkey anti-goat IgG-DyLight[®] 550 conjugate (1:800) (Bethyl Laboratories, Inc.). SlowFade[®] Gold mounting medium with DAPI (Invitrogen) was applied and images were captured (from three replicates of 12 cells/treatment) on an Olympus IX51 with a DP71 digital camera. From these images it was determined that h*SRY*(H76) exhibits both cytoplasmic and nuclear accumulation, while native h*SRY* localizes only to the nucleus. These data from human *SRY* corroborate

localization data from the rat, indicating architectural differences between human and rat proteins outside the HMG do not enhance or reduce nuclear accumulation directed by aa 76/21 in the nNLS.

Poster Board No. 028 A CROSS-FOSTERING ANALYSIS OF THE EFFECT OF PCB ON BEHAVIORAL DEVELOPMENT OF SPRAGUE-DAWLEY RATS. David E. Mankin¹, dmankin@bgsu.edu, Zhi M. Wang², wangzhi.mary@gmail.com, Ellen N. Dover³, edover@wakehealth.edu, Howard C. Cromwell¹, hcc@bgsu.edu, Lee A. Meserve¹, lmeserv@bgsu.edu, ¹Bowling Green State University, Departments of Biological Sciences and Psychology, Bowling Green OH 43403, ²Washington University, and ³Wake Forest University.

The overall aim of this project is to compare the effects of polychlorinated biphenyl (PCB) exposure in young rats during the prenatal period versus exposure to altered maternal care from a parent that has been exposed to these compounds. Prenatal PCB exposure has been found to alter motor, sensory, and psychological functions in various experimental models and wild populations. One major way that this occurs is by altering thyroid hormone synthesis, circulation, and feedback mechanisms. In the current study, 32 female Sprague-Dawley rats were used, and once pregnant, either placed on a diet containing equal amounts of two PCB congeners (47/77, 25ppm total) or left on a control diet. After birth, all dams were once again placed on control diets and each litter was either cross-fostered to a dam of the opposing diet or left with their birth dam. On the following postnatal days (PNDs), behavioral measures including ultrasonic vocalization (USV) emissions following isolation (PND 10), conditioned odor preference (PNDs 12 - 14), grooming syntax (PNDs 15 - 17), and open field behavior (PNDs 15 - 16) were monitored between the different conditions to reveal any deficits that the PCB exposure may have caused. In the PCB animals USV number and locomotor activities were increased (69% and 122%, respectively), and grooming syntax was altered compared to controls. Plasma concentrations of the thyroid hormone thyroxine were subnormal in PCB animals. These findings support the notion that relatively minor and variable exposure to PCB can alter the development of typical behavioral activities.

Poster Board No. 029 EFFECT OF COLLAGEN ON MODULAR POLY(ETHYLENE GLYCOL) SCAFFOLD STIFFNESS. Michael J. Majcher, mjm183@zips.uakron.edu, (Rebecca Kuntz Willits, Ph.D, willits@uakron.edu), The University of Akron, OLRC 301, Department of Biomedical Engineering, Akron, OH 44325-0302.

The purpose of the experiment is to analyze the structure of modular poly(ethylene glycol) scaffolds formed via compaction of PEG microgels and collagen I. A previous study by Scott *et al*, 2011 described the design and fabrication of these scaffolds as a part of an overall goal to produce a modular scaffold in which stiffness remains constant as the chemical properties change. For the next phase of the project, it was hypothesized that (i) the modugels will not have changes in stiffness with degradation of collagen, (ii) the 100 µg/mL modular scaffolds will release all added collagen I within the five days tested, and (iii) the 0 µg/mL gels will reveal no collagen release. First, PEG microgels were formed via salt precipitation of PEG-diacrylate and UV crosslinking and then compacted with collagen and 4-arm PEG-amine to form a scaffold. Next, degradation of collagen upon exposure to collagenase was investigated utilizing a standard curve for degraded collagen. The standard curve was used to convert relative fluorescence intensity to mass of collagen at various time points. The final step will be to examine the stiffness of the scaffold after exposure to collagenase. PEG microgels were characterized by average diameter (1.60 ± 0.25 µm), swelling ratio by mass (15.10 ± 0.49), swelling ratio by volume (16.79 ± 0.55), polydispersity index (1.27), mesh size (15.97 ± 0.08 nm), and storage modulus (2.00 ± 0.01 MPa). Overall, the scaffolds show an average percent release of

40% of the total 20 μg of collagen added per scaffold, which degraded within 48 ± 2 hours after fabrication. Stiffness measurements are still to be collected at time points of 0, 1, 2, 3, and 4 days and will be correlated to the amount of collagen remaining in the scaffold. After future work is completed, the results will allow further investigations of cell behavior in 3D scaffolds with varying mechanical and chemical properties.

Poster Board No. 030 PROJECTING THE AMNIOSEROSA INTO TWO DIMENSIONS. Eric A. Copenhaver¹, eac48@zips.uakron.edu, David Mashburn², david.n.mashburn@gmail.com, M. Shane Hutson², shane.hutson@vanderbilt.edu, ¹Department of Physics, Ayer Hall, The University of Akron, Akron OH 44325-4001, and ²Department of Physics and Astronomy, Vanderbilt University, 6301 Stevenson Center, VU Station B #351807, Nashville TN 37235.

Morphogenesis, the development of an organism's form, is governed by both genetics and mechanical processes driving cells' movements. To understand these cell-level mechanics, it is possible to probe morphogenetic processes in systems that grant experimental access, such as germ-band retraction in *Drosophila melanogaster* embryos, during which an epithelial group of cells called the amnioserosa undergoes vast morphological changes. Intercellular forces driving such changes can be detailed using new techniques: SeedWater Segmenter developed by Mashburn at Vanderbilt University and Video Force Microscopy developed by Brodland at Waterloo University. These techniques require a time-lapse series of two-dimensional images; however, the amnioserosa is wrapped around the surface of the embryo in three dimensions. This research aims to present a new algorithm to flatten three-dimensional image data of the amnioserosa into two dimensions. Image data is taken on a spinning disk confocal microscope. This algorithm is written in Java as a plugin for the National Institute of Health's ImageJ software. The surface is transformed into cylindrical coordinates. Then, the variance in pixel intensities is used to determine where the surface lies, as the variance is high at the surface. The algorithm was applied to one data series consisting of 124 time steps. The technique shows a qualitative improvement over previous techniques such as average or maximum intensity projections.

Poster Board No. 031 SEASONAL AND LUNAR CYCLIC VARIATIONS IN ESSENTIAL OIL COMPOSITION OF THYMUS VULGARIS AND VARIATION BETWEEN CONSTITUENT COMPOSITION WITHIN STEM AND LEAF PORTIONS OF THE AERIAL PORTION OF THE PLANT. Elizabeth Cherry (e-cherry@onu.edu) . [Vicki A. Motz (v-motz@onu.edu); Linda M. Young (l-young@onu.edu); Christopher Bowers (c-bowers@onu.edu)]402 West College Ave. Ada, OH 45810

Anecdotal evidence favors harvest of thyme plants in the morning after flowering. Seasonal and lunar variations in thymol content of *Thymus vulgaris* have been noted. To determine prime harvest time, this study examines essential oil composition in *Thymus vulgaris* plants through a growing season encompassing 5 lunar cycles. Thymol, the predominant phenolic component of *Thymus vulgaris* has been used in hospitals as an antimicrobial agent. The constituents: carvacrol, linalool, and p-cymene have been suggested as possible antimicrobial synergists. Aerial portions of 24 two year old *Thymus vulgaris* plants grown organically in full sun, with natural rainfall, were harvested throughout the growing season, at 8am on days corresponding to $\frac{1}{4}$, full, $\frac{3}{4}$ and new moon states. A minimum of 6 plants was used for each sample to avoid individual plant variation. Plants were dried, and leaf and stem segments were extracted in 95% ethanol, reconstituted to 1.000 g thyme/mL ethanol and analyzed utilizing gas chromatography/mass spectrophotometry to identify constituent levels. Thyme concentration was lowest in April (1.21E-04gm thymol/gm plant) and rose irregularly throughout the growing season. No correlation to lunar cycle was seen. Thymol content was ten times greater in leaves than in stems ($p < .05$); however, when

two lots of plants; one flowering, one preflowering; both were harvested on the same day, there was no significant difference in phenol content. Antibiotic competence will be tested against Methicillin-resistant *Staphylococcus aureus* using Kirby Bauer analysis to determine whether antibiotic competence was an effect of constituent composition or whether location of phenolic compounds /reproductive state were contributing factors.

Poster Board No. 032 CAN INCREASED AMOUNTS OF CARBON DIOXIDE INCREASE THE GROWTH OF SOYBEAN PLANTS WHILE TAKING THE EXTRA CARBON DIOXIDE OUT OF THE AIR? Bethany G. Cox, coxbe45@alliancecityschools.org 300 W. Bayton Street, Alliance OH, 44601 (Alliance High School)

There is a growing worldwide concern of CO_2 in the atmosphere, feeding a growing population, and an interest in soybean biofuels. The hypothesis is that increasing levels of CO_2 increases soybean growth while taking the CO_2 out of the air. Materials include soybean seeds, peat pots, plant covers, CO_2 tank, CO_2 regulator, CO_2 test kit, grow light, ruler, distilled water, measuring cup, notebook, pen, and camera. Two groups of 15 plants received 80ml of water and 12 hours of light for 29 days. One group received 4,000 cc of CO_2 every 12 hours. Plants had covers to control CO_2 . 20 ml of air was putted into a CO_2 syringe and paper test kit to determine amounts of CO_2 . Every second day plants were measured for stem height, number of leaves, leaf widths, and leaf lengths. The control group showed an average total growth in stem height of 466 cm, an average total leaf width of 14.25 cm, an average total leaf length of 18 cm and the average total number of leaves was 23. The group with 4,000cc of additional CO_2 showed an average total growth in stem height of 519.4 cm, an average total leaf width of 35 cm, an average total leaf length of 35.52 cm and average total number of leaves was 23. The CO_2 enhanced group grew 5.43% more in stem height, 42.13% more in leaf width, 32.74% more in leaf length and 30.30% more in the number of leaves. The results support the hypothesis.

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Poster Board No. 033 EFFECTS OF POLLEN QUANTITY AND QUALITY ON DECEPTIVE ORCHID REPRODUCTION. Paige M. Arnold, arnoldp@bgsu.edu, Ryan P. Walsh, rpwalsh@bgsu.edu, and Helen J. Michaels, hmichae@bgsu.edu. Department of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.

The small white lady's slipper, *Cypripedium candidum*, is one of many orchids that does not provide pollinators with food, which should increase departures and reduce selfing. A field experiment was established at Castalia Prairie, Erie County, Ohio to determine: 1) Is reproduction limited by pollinator visitation? And 2) Do naturally pollinated and manually selfed and out-crossed flowers differ in fruit abortion and seed production? Thirty individuals with three flowers were selected along five evenly spaced 50m transects; each individual received all three of the following treatments on different flowers: self pollen, outcross pollen or natural pollination. Flowers receiving supplemental pollen were bagged to prevent addition pollination. Fruit set, abortion rates and seed set were scored throughout the spring 2011 growing season. Fruit set significantly differed among treatments (Kruskal-Wallis, $\text{prob} > \chi^2 = 0.0012$ with naturally pollinated flowers setting significantly (Tukey-Kramer, $p > 0.0005$) fewer fruits (16.7%) compared to hand self-pollinated flowers (63.3%), which were similar in fruit set to hand crossed-pollinated flowers (43.3%). Although, fruit abortion rates did not significantly differ between treatments (Kruskal-Wallis, $p = 0.06$), self-pollinated flowers experienced the highest abortion rates at 16.7%, followed by naturally pollinated plants with an abortion rate of 6.67%. Out-crossed flowers experienced the lowest abortion rates at 3.33%. This data indicates pollinator limitation of fruit set in *C. candidum*, suggesting that *C. candidum* reproduction relies heavily on attraction of

suitable pollinators, but that deceit pollination may be important to limit the trend of increased abortion rates associated with self-pollination events.

Poster Board No. 034 ALKYLATION INDUCED APOPTOSIS IN CADMIUM TREATED CELLS Lauren Timperman, (timpermanl@findlay.edu); Sara Kubera, (kubera@findlay.edu); (Michael A. Edelbrock, Ph.D.), The University of Findlay, 1000 North Main St., Findlay, OH 45840

Cadmium and cadmium containing compounds are known to be carcinogenic. However, the exact mechanism of cell transformation is not yet understood. Cadmium may interfere with DNA repair by interfering with protein expression or function. In particular a functional DNA repair system is important to induce apoptosis caused by alkylation treatment. This study seeks to determine whether cadmium treatment may delay or prevent apoptosis induced by the therapeutic, alkylating agent, Temozolomide (TMZ). HeLa (DNA repair competent) and HeLa-MR (DNA repair defective) cells were cultured in growth media supplemented with 10% fetal bovine serum. Cells were treated with 0uM, 1uM, and 5uM cadmium, and, within each concentration group, TMZ (50uM) at intervals of 0, 12, 24, 48, and 120 hours. The nuclear and cytosolic proteins were extracted and their total protein concentrations normalized after Bradford Analysis. Western Blot analysis was conducted to compare protein expression of cleaved caspase 3 as an indication of apoptosis over the time course. Preliminary results indicate that apoptosis is induced in HeLa (DNA repair proficient) cells after 48 hours, whereas evidence of induction is delayed to 120 hours in HeLa-MR (DNA repair defective) cells. Further investigations of the effects of cadmium on DNA repair protein expression and apoptosis induction are on-going. Differences in protein expression observed in treated versus untreated cells may provide evidence that cadmium is interfering with apoptosis induced by alkylation damage.

Poster Board No. 035 DEVELOPMENT OF AN EQUINE LYMPHOCYTE MODEL TO EVALUATE GENOTOXICITY. Sara Steward, (stewards@findlay.edu); Carolyn Lund; Kelley Black; (Michael Edelbrock, Ph.D.), The University of Findlay, Mail Stop 1051, 1000 North Main St., Findlay OH 45840.

This study examines chromosome damage in the presence of cadmium and oxidative stress. Our hypothesis is that animals could serve as useful models as genotoxic sensors to evaluate environmental stresses. Further, that biotin, an anti-oxidant B-vitamin complex present in equine nutritional supplements, could reverse the genotoxic effect. Horse blood was collected and lymphocytes stimulated to divide using phytohaemagglutinin (PHA). Treated cells were exposed to hydrogen peroxide, cadmium and/or dietary supplement. Controls groups were untreated. Cells were subsequently blocked from cytokinesis by addition of cytochalasin-B. The resulting multinucleated lymphocytes were isolated, fixed, and stained. The presence of chromosomal aberrations (micronuclei, blebs, and bridges) in bi-nucleated cells was used as an indicator that genotoxic stress occurred. Aberrations were scored and normalized based on their proliferation index (mean=1.27). Chromosomal aberration indices were conducted in triplicate using a minimum of 100 observations per treatment. A higher frequency of aberrations of hydrogen peroxide and cadmium treated cells, compared to that of control cells, is indicative of genotoxic stress. A reduction of aberrations in biotin treated cells indicates a protective effect. Hydrogen peroxide treated cells (0.2 uM H₂O₂) resulted in an increased chromosomal aberration index (0.553) compared to control samples (0.247). Further, treatment with biotin reduced baseline genotoxic damage as measured by an index of 0.137. Both comparisons are significantly different based on a student's t-test result of less than 0.05. Current studies are ongoing to investigate the effects of additional hydrogen peroxide

(0.05 to 0.20 uM) and cadmium (5 uM) treatments as well as the protective effects of biotin.

Poster Board No. 036 IDENTIFICATION OF NEURONAL INTERLEUKIN-16 INTERACTING PROTEINS BY AFFINITY PURIFICATION, Charles Davis (cdavis9@ashland.edu), Rebecca Corbin (rcorbin@ashland.edu), Steven D. Fenster (sfenster@ashland.edu), Department of Biology/Toxicology, Ashland University, 401 College Avenue, Ashland OH 44805

Neuronal Interleukin-16 (NIL-16) is a neuronal-specific protein with restricted expression to the hippocampus and cerebellum: two brain regions known to be involved in learning and memory but also vulnerable to neurodegeneration in diseases such as Alzheimer's disease. Structurally, NIL-16 is a multidomain protein capable of organizing synaptic signaling complexes in neurons, the major cell type of the brain. NIL-16 consists of five conserved regions called PDZ domains shown to be involved in synapse formation: a process required for efficient communication between neurons. Deciphering the molecular mechanisms involved in synapses formation is critical for understanding neuronal signaling and may contribute toward improved diagnosis and treatment of neurodevelopmental disorders. To identify proteins capable of interacting with the PDZ domains of NIL-16, we devised a purification strategy using a combination of affinity chromatography, SDS-PAGE, and MALDI-MS analysis. DNA plasmids were engineered to express the individual coding region for the five PDZ domains of NIL-16 fused to glutathione-S-transferase (GST) in *Escherichia coli*. GST-fusion proteins were affinity purified, separated by SDS- PAGE electrophoresis, and analyzed by MALDI-MS. Analysis of peptide digests profiles from two fusion proteins, GST-only and PDZ.2, revealed profiles of 59.6% and 67%. To optimize our affinity purification procedure, we generated a FLAG-epitope tagged version of HDAC3, a known NIL-16 binding partner, in COS-7 cells as a positive control for affinity purification. Current studies are focused on optimizing methodology for affinity purification of the known NIL-16 binding protein, HDAC3, and unknown binding partners from mouse brain extract.

Poster Board No. 037 PICCOLO (PCLO) IS DIFFERENTIALLY EXPRESSED DURING MOUSE BRAIN DEVELOPMENT. Lindsey Knapp (lknapp1@ashland.edu), Steven D. Fenster (advisor) (sfenster@ashland.edu), Department of Biology/Toxicology, Ashland University, 401 College Avenue, Ashland OH 44805

Piccolo is a multidomain protein with restricted expression at synapses. Synapses are specialized cellular structures that allow for efficient communication between neurons. During neuronal development proper formation and stabilization of synapses is critical. It is widely known that malfunctions in synaptic signaling can lead to disorders such as schizophrenia, bipolar disorders, and major depression. A recent genome-wide analysis of genes differentially expressed in the brains of patients with bipolar syndrome revealed that genetic variations in the human gene for Piccolo (*PCLO*) were strongly associated with major depressive disorder. Previous studies have shown that two alternatively spliced mRNA (messenger RNA) variants of *PCLO* (C2A and C2B) are expressed in both mouse and human brain. Analysis of *PCLO* mRNA expression during neuronal development will provide valuable clues about the role of Piccolo in orchestrating synapse formation. Using C57BL/6 mice (*Mus musculus*) as a model of mammalian brain, we sought to quantify expression of the C2A and C2B variants using mRNA purified from individual mouse brain at five development ages (embryonic day 18, postnatal day 1, postnatal day 7, postnatal day, and adult). Complementary DNA (cDNA) was reverse transcribed from mRNA. Real-time quantitative PCR (qPCR) revealed relatively equal expression levels of C2A compared with the C2B variant at all ages except for adult where the expression of the C2A variant was two-fold higher suggesting differential expression of Piccolo splice variants may play a role in

brain development. Future studies will focus on using a combination of qPCR and *in situ* hybridization to define temporal and spatial gene expression of *PCL0* splice variants during mouse brain development.

Poster Board No. 038 METHACRYLAMIDE CHITOSAN AIDS IN NEURONAL DIFFERENTIATION IN 2D AND 3D ENVIRONMENTS
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Mesenchymal stem cells (MSCs) are an attractive and readily available source for tissue engineering because of their ease of harvesting and ability to differentiate in multiple lineages. Currently, for nervous system injuries there is no easily accessible adult cell source for neural regenerative applications. In this study rat MSCs are harvested from bone marrow, then cultured and differentiated into neuronal cells via chemical and physical/scaffold cues. Two surface treatments, receiving two types of differentiation media, were tested to determine the conditions required to facilitate neuronal differentiation. Glass coverslips were coated with poly-D-Lysine or a soft methacrylamide chitosan (MAC) hydrogel, both groups were treated with laminin to promote cell adhesion. Cells were seeded at a density of 5,000 cells/cm² and maintained in chemically defined media (CDM) overnight. The next day one group received fresh CDM and the other group received CDM with 150 ng/mL interferon gamma (IFN- γ), a factor known to encourage neuron differentiation in other stem cells. Cells were observed for seven days then were fixed and stained for cell markers using histological stains and immunocytochemistry. Neuronal cells were identified using a class III β -tubulin stain. Cells were also stained using histological stains to identify any cell differentiation into bone, adipose and muscle cells. Preliminary results show that 80 \pm 8% of cells differentiated into neurons when subjected to IFN- γ on MAC coated surfaces where surfaces coated with Poly-D lysine and laminin displayed 27 \pm 11% neuronal differentiation. The next stages of the experiment include reproducing the 2-dimensional study as well as developing a 3-dimensional differentiation study using scaffolds developed from MAC.

Poster Board No. 039 ELECTRICAL STIMULATION TO ENHANCE NEURITE OUTGROWTH IN NEURAL STEM CELLS.
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Brain and spinal cord injuries affect over 2 million people in the US annually and are generally irreversible. Failure to heal injuries to the CNS is largely due to the inhibition of axon re-growth and interconnection past the site of injury. In previous studies from last summer, electrical stimulation has aided in increasing neuronal outgrowth of chick embryo dorsal root ganglia (DRG) *in vitro*. We hypothesize that neurite length of differentiating neural stem cells (NSCs) will increase after DC electrical stimulation following a step-rest pattern for 7 d; in addition, neurites will align parallel to the electrical field. NSCs were harvested from the subventricular zone of adult rat forebrain and expanded as neurospheres. The custom-built stimulation culture chamber consists of a rectangular frame made from nonconductive ulem with a clear adhered to the bottom and platinum plates (electrodes) at each end. The electrodes were attached to a DC electrical source. Culture surfaces were coated with poly-D-lysine and laminin to aid attachment. Cells were seeded at 40,000 cells/cm² in media supplemented with interferon- γ , a factor shown to encourage NSC differentiation into neurons. Cells were stimulated between 5-10 V for 10 min/d over 5 d in a controlled CO₂ environment. Initial observations showed that stimulation resulted in retraction of neurites, most likely due to sensitivity to these voltages in NSCs

as compared to DRGs. This is interesting since our lab has recently observed DRG neurite elongation in response to these same conditions. Ongoing work is focusing on determining the voltages and step-rest intervals that encourage NSC neurite extension in primary neurons. Previous studies have primarily used electrical stimulation to study axonal guidance and extension, our experiments focus on the effects of electrical fields during NSC differentiation into neurons.

Poster Board No. 040 ASSESSMENT OF SUGAR CANE BIO-ETHANOL DEHYDRATION PROCESS ALTERNATIVES. Michel E. Kahwaji Janho ⁽²⁾ Michel.Kahwaji@gmail.com, Fernando D. Mele ⁽¹⁾, María Rosa Hernández ⁽¹⁾, Mauricio A. Colombo ⁽¹⁾, and Jorge E. Gatica ^(1,2), ⁽¹⁾Departamento de Ingeniería de Procesos y Gestión Industrial, Universidad Nacional de Tucumán, Avda. Independencia 1800 San Miguel de Tucumán, Tucumán Argentina, ⁽²⁾ Department of Chemical and Biomedical Engineering, Cleveland State University, 2121 Euclid Avenue – SH455, Cleveland OH 44115 USA.

Environmental effects and health hazards posed by fossil-fuel based technologies complemented by changes in the global economy have further demanded the need for developing cleaner and more efficient technologies that rely on renewable resources. An alternative, commonly referred to as bio-fuels, has significantly matured and today's economy recognizes the significance of being able to produce ethanol from renewable resources such as biomass. Moreover, the potential of ethanol to be further converted to hydrogen makes it a very attractive alternative to replace or complement fossil fuels as sources of energy. Argentina has recently enacted legislation to promote the use of bio-fuels to ameliorate its ever increasing annual gasoline demand, currently approaching 4 billion liters. This new legislation (*Ley 26.093 de Promoción de Biocombustibles*) would result in a demand of over 200 million liters of dehydrated alcohol. Though many techniques for ethanol dehydration are known; adsorption, distillation, hybrid processes, and pervaporation, are the most common technologies in practice. Two alternative ethanol dehydration technologies are considered in this work. The first is based on the combination of distillation and azeotropic distillation, while the second relies on hybrid distillation and pervaporation processes. An Aspen Plus pervaporation module is first developed and both alternatives are simulated and their optimal design and operating parameters are identified by means of rigorous simulation (Aspen Plus). The developed module was tested against experimental data and was able to replicate the results with a 98% confidence interval. The module was then used to study various separation train schemes producing anhydrous ethanol and a hybrid Pervaporation-Distillation scheme was found to be the most energy efficient while recovering 92% of the alcohol fed.

Poster Board No. 041 CHARACTERIZATION OF THIN FILM DEPOSITION PROCESSES. Charles F Tillie, c.f.tillie1@gmail.com, Scott A Hug, s.a.hug@csuohio.edu, Andrew J Snell, a.j.snell@csuohio.edu, Jorge E Gatica, j.gatica@csuohio.edu, 1590 Wood Road, Cleveland Heights OH 44121

For many years, chromate-based coating processes have been used by industry to generate protective coatings on metallic surfaces to ensure the success of subsequent applications. These processes pose a threat to the environment and have been subject to strict regulations under the Clean Water Act. The purpose of this project is developing a practical alternative using tert-butylated triphenyl phosphate (TBTPP) to generate films on an aluminum substrate via chemical vapor deposition. This research focuses on characterizing the deposition reaction. It is hypothesized that the reaction can be modeled using power law kinetics of the form $r = k(T)C_s$, where r is the reaction rate, $k(T)$ is the temperature dependent reaction rate constant, C_s is the surface concentration of TBTPP, and n

is the order of reaction. A differential scanning calorimeter superheats a sample of TBTPP inside a sealed aluminum pan, vaporizing it and creating a coating inside the pan. Analysis of the results is performed to determine how well this reaction fits the proposed model.

Poster Board No. 042 SYNTHESIS AND CHARACTERIZATION OF PHASE SELECTIVE GELATORS USED TO SOLIDIFY OIL SPILLS. Jessica R. Ringlein, Jessica.Ringlein@students.lourdes.edu, (Barbara Stallman, Barbara.Stallman@Lourdes.edu), 3030 E. Lincolnshire, Toledo OH 43606.

The Gulf Oil Spill in the summer of 2010 raised awareness to the problems associated with removing oil from the waters without harming the environment. There are several means to remediate oil spills: burn the oil at the surface of the water, add chemical dispersants, apply solid sorbents that adsorb the oil, and use gelators that solidify the oil. The goal of this project is to synthesize, purify, plus examine the limitations and characteristics of phase selective gelators (PSGs). Other laboratories have been successful in synthesizing PSGs from naturally occurring sugar alcohols and fatty acid esters (e.g. vinyl butanoate and vinyl octanoate) to make dialkanoate derivatives of sugar alcohols. The PSGs synthesized from vinyl octanoate produced the best results by absorbing a greater variety of organic liquids and displaying lower minimum gelation concentrations. The hypothesis of this project is that PSGs synthesized from D-mannitol and vinyl decanoate and vinyl dodecanoate using Lipase B from *Candida antartica* as a catalyst will achieve greater gelation of organic solvents at lower concentrations due to their long carbon chains. Two new PSGs have been synthesized and characterized by thin layer chromatography, melting point, and infrared spectrometry. Further research is being performed to analyze the structures by nuclear magnetic resonance spectrometry (H-NMR) and mass spectrometry. Once the PSGs are characterized, minimum concentration gelation studies will be run using a 1:1 ratio of water/oil mixtures with 25 mg, 50 mg, and 100 mg PSG samples before reenacting an oil spill scenario in a multi-gallon apparatus.

Poster Board No. 043 THE ABILITY OF A COMMERCIAL FILTER TO REMOVE LEAD FROM ALKALINE WATER. Bradley M. Altier (Jacob White); bradleyaltier@yahoo.com; MSC 976 University of Rio Grande, P.O. Box 500, Rio Grande, OH 45674

Although well water has been a staple in Appalachian culture, studies have shown the potential for heavy metal contamination of well water in this region. Inexpensive carbon-based filters are commonly used to remove these metals from the water to make it safer for consumption. Experiments testing the ability of such filters to remove lead from acidic water have shown that acidity actually improves a carbon filter's ability to remove lead. However, research is lacking which describes any correlation between a filter's ability to remove lead and the alkalinity of the water. Because geologic conditions in the region can produce alkaline well water, such a study is warranted. The objective of this experiment is to determine if alkalinity influences the ability of a commercial drinking water filter to remove lead. A Perkin-Elmer Analyst 600 Atomic Absorption Spectrometer (AA) will be used to quantify lead in water before and after filtration. Standard lead solutions in de-ionized water will be prepared with varying levels of alkalinity and analyzed before and after filtration. In addition, studies using well water collected from Southeastern Ohio will be analyzed to determine any correlation between filtration ability and alkalinity.

Poster Board No. 044 DETERMINATION OF CALORIC CONTENT OF ARTIFICIAL SWEETENERS VIA BOMB CALORIMETRY Andrea D Merry (Tim Hall) s300615892@students.rio.edu University of Rio Grande 2421 Centerpoint Rd, Oak Hill OH, 45656

Calorimetry is the study of heat transfer during physical and chemical process. Calorimetry is traditionally incorporated within an undergraduate chemistry program in a freshman

level chemistry course where the students typically work with a styrofoam-cup calorimeter to measure the energy transferred as heat. It is then traditionally studied further in an upper-level physical chemistry course where the students learn of an alternative device to measure the change in enthalpy, the adiabatic or constant volume bomb calorimeter. The purpose of this project is to determine the caloric content of artificial sweeteners via bomb calorimetry. The general procedure will be to use a Parr oxygen bomb calorimeter to determine the energy content of a number of artificial sweeteners such as sucralose, saccharin, aspartame, and steviol. Because the body does not metabolize these sweeteners, they are advertised as "zero calorie." This may create a misconception that there is also zero enthalpy content based on bond energies. A literature search indicates that the determination of the caloric content of artificial sweeteners via bomb calorimetry has not been reported. A statistical analysis of the results will be performed comparing theoretical and experimental values of the thermodynamic data, where the theoretical data will be determined using estimated bond energies using the molecular structure of each sweetener.

Poster Board No. 045 PH EFFECTS ON THE RATE CONSTANT FOR THE REACTION OF Mb-CO WITH O₂. Sheri L. Marcum, s347085@students.rio.edu, (John Means, jmeans@rio.edu), University of Rio Grande, 19704 State Route 160, Vinton OH 45686.

Strict control of blood pH is necessary for vertebrate survival. Protein function and oxygen (O₂) binding rely heavily on such restrictions. Myoglobin (Mb), a small protein that is important for O₂ transport in vertebrates, reversibly binds molecular oxygen. Myoglobin not only binds to O₂, but it binds other molecules with greater affinity such as carbon monoxide (CO), which has a 60 times greater affinity for myoglobin than O₂. The objective of this analysis is to demonstrate both qualitatively and quantitatively the effects of pH on the O₂ displacement of CO from Mb. A recent literature search revealed that no such study had to date been conducted utilizing UV-VIS spectrophotometry. This analysis would further facilitate the understanding of pH effects on proteins and myoglobin's binding affinity of O₂ at various pH levels. The hypothesis is that, as the pH is adjusted beyond the optimal range of 7.2-7.4, the rate of O₂ exchange with Mb-CO will increase with increasing pH due to the Bohr Effect. Due to myoglobin's increased affinity for CO, the rate of the exchange reaction with O₂ will be slow enough to measure utilizing UV-VIS spectrophotometry over a pH range of 5.0-8.0. First-order rate constants will be determined at several pH values, and these rate constants will be plotted against pH to determine if a correlation exists.

Poster Board No. 046 CHARACTERIZATION OF THE TEMPERATURE-DEPENDENT NATURE OF THE PHOTOCATALYTIC DECOMPOSITION OF CONGO RED USING ZINC OXIDE. Whitney C. Smith, s300621532@students.rio.edu, (Jacob White, jwhite@rio.edu), University of Rio Grande, 3501 Factory Road Albany, Ohio 45710.

Weak regulation of the disposal of wastes from chemical manufacturing has led to widespread environmental damage. The unregulated disposal of textile dyes, such as Congo Red, has created a challenge for environmental chemists to determine effective, inexpensive treatment processes for remediating contaminated water. One such approach is the photocatalytic degradation of dyes using semiconducting materials. Fine suspensions of suitable semiconductors are added to waste waters and irradiated at wavelengths less than 380 nm, causing electron excitation within the semiconductors from the valence band to the conduction band. A series of subsequent electron transfer steps then ultimately lead to the degradation of the dye. Several studies have demonstrated the ability of zinc oxide to remediate water contaminated with Congo Red through this photocatalytic process, and that this process is pH-dependent and concentration-dependent. Properties, such

as the electric conductivity, of semiconductor systems have been shown to be temperature-dependent. However, no such studies have reported any temperature-dependent characteristics of the photocatalytic degradation. The objective of this study is to characterize any temperature-dependencies of the photocatalytic degradation of Congo Red using zinc oxide. Utilizing a Shimadzu UV-VIS 2550, the study will measure the absorbance maximum of Congo Red (498 nm) solutions over time. These solutions will be irradiated at wavelengths less than 380 nm with and without the presence of the semiconductor. The temperature of these experiments will be systematically varied and controlled to determine any temperature-dependent characteristics of the mechanism.

Poster Board No. 047 SOLVENT EXTRACTION OF SHED SNAKE SKINS TO IDENTIFY POTENTIAL ANTI-SHEARING AGENTS FOR PREVENTION TREATMENT OF BURN PATIENTS. Kimberly Klosz (kklosz09@students.ndc.edu) Notre Dame College, 4545 College Rd., South Euclid, OH 44121; (Alan T. Riga; John J. Moran)

Over 25,000 patients annually are admitted into specialized burn care facilities. There is an immediate need to identify potential anti-shearing agents to ease their suffering and help the healing process of patients with severe burns. It is hypothesized that anti-shearing agents can be extracted and recovered from a variety of shed snake skins. It is further hypothesized that these recovered agents can be used to help heal burned skin, plus to prevent and treat bed sores in long-term care patients. Shed snake skins contain a dispersant chemical or softening agent that can be extracted with acetone or a similar polar solvent blend. The physical properties of the shed skins upon solvent extraction change dramatically, with a hardening of the skin and an increase in glass transition temperature (T_g). Variables include changing the nature of the extracting solvent, extraction time, agitation, and the shed skins from several snake species. The extracted chemicals will be analyzed by FTIR spectroscopy and compared to confirm the relationship of the softening agents to the parent snake skin. Unprocessed skins will be further tested by Thermogravimetric Analysis to measure the mass loss from the shed skins as a function of temperature from (25-140°C). The physical properties of the skins will be monitored by Differential Scanning Calorimetry to determine the endothermic peak processes. The T_g will be verified by Thermomechanical Analysis. Individual components of extracts will further be isolated and analyzed using LC-MS. The extracts will be qualitatively identified and any structure-property relationships will be established.

Poster Board No. 048 NEWLY ADVANCED MECHANICAL ANALYZER DEFINES FORMULATED DRUG DISINTEGRATION PROPERTIES AND DELIVERY: MOUTH, STOMACH, OR INTESTINES Nethrie D. Idippily, nidippily09@students.ndc.edu, (Alan T. Riga, alanriga@hotmail.com), (John Moran, jmoran@ndc.edu), Notre Dame College, 4545 College Rd., South Euclid, OH 44121.

Formulated drug disintegration profiles can predict the site of disintegration (mouth, stomach, or intestines), but there is currently a fundamental lack of detailed information regarding the characterization of disintegration patterns of fully formulated pharmaceutical drugs, active ingredients, and excipients. Novel analytical methods are needed to bridge this informational gap, providing more detailed information regarding drug disintegration profiles as a function of time. It was hypothesized that Thermal Mechanical Analysis (TMA) can be used to provide more detailed information regarding the relative disintegration time for solid dose tablets, and to test formulated drug compactness, binding strength, and excipient effectiveness. Furthermore, measuring the disintegration rate (micrometers/min) by TMA can be a valuable tool in drug development, where specific drug disintegration times, release rates, and delivery of active ingredient

over time can be measured. In this study, TMA is used to measure the effect of temperature and pH on drug delivery. Commercially formulated tablets will be evaluated at physiologically relevant pH and temperature levels, and with selected excipients. Olanzapine (Zyprexa®), an orally disintegrating drug, is contrasted with Terazosin HCl (Hytrin®), and Aripiprazole (Abilify®), which are designed for uptake in the stomach and intestines, respectively. Experimental design of two variables at up to three levels (or 9 possible variations) with $N = 3$ trials each will assist in defining a statistically valid protocol. This study will determine which variables are significant and establish repeatability and reproducibility. Based on these results a new TMA test method for drug disintegration profiles will be developed.

Schar Room 265

Poster Board No. 049 CORRELATIONS BETWEEN SOLVENT PHYSICAL CONSTANTS, ORGANIC SOLUTE MOLECULAR STRUCTURE AND RETENTION FACTOR IN THIN-LAYER CHROMATOGRAPHY. Joey E. Romar, joeyromar@walsh.edu, (Michael J. Dunphy, mdunphy@walsh.edu) Walsh University, 2020 East Maple St., N. Canton, Ohio 44720.

Thin-Layer Chromatography (TLC) is a simple and versatile method used to separate and identify the components of a mixture. TLC is an ideal tool to introduce high school and college students to principles of chromatography and effects of inter-molecular forces in separation chemistry. The goal of this project was to develop a TLC lab experience suitable for first year college chemistry labs, focusing on structure-activity relationships (SAR). The hypothesis of this work is that identifiable trends might exist between solvent properties (dielectric constants, dipole moments and structure) and TLC retention factors (R_f) for selected phenols. Analyses were done using commercial silica gel TLC plates (250 mm coating, cut to 8 x 3 cm), spotting capillaries, a hot air source, long wave UV lamp and readily available chemicals/standards and lab equipment. Results to date indicate that structurally related phenols exhibit linear R_f values relative to solvent dielectric constant and dipole moment for methanol, acetone, dichloromethane, and acetonitrile. Other solvents including ethyl acetate, isobutyl alcohol, methyl tert-butyl ether, 2-butanol, 2-methoxyethyl acetate, and THF did not show this behavior. Phenol R_f s were also linear with temperature for any given solvent. In conclusion, and following further scrutiny, trends observed may serve as good teaching tools for presenting underlying principles of chromatography and SAR.

Poster Board No. 050 SEPARATION AND QUANTITATION OF NITROSYLCOBALAMIN BY HIGH PRESSURE LIQUID CHROMATOGRAPHY. Kristie N. Griffith (kristiegriffith@walsh.edu • P.O. Box 399 • Walsh University • 2020 E. Maple St. • N. Canton, Ohio 44720), (Michael J. Dunphy) (mdunphy@walsh.edu) and Joseph A. Bauer (jbauer@uakron.edu), Bauer Research Foundation.

Cobalamins are biologically active molecules with hydroxo-, methyl-, adenosyl- and cyanocobalamins being well known examples. Recently, nitrosylcobalamin (NOCBL) has been identified as an exogenous source of nitric oxide *in vivo* and as a potential anti-tumor agent. NOCBL is synthesized by a ligand exchange reaction between hydroxocobalamin and nitric oxide gas in dichloromethane. The need exists for a quantitative NOCBL procedure to monitor synthesis kinetics in the analysis of biological samples. A quantitative HPLC procedure for NOCBL analysis has been developed. The method uses a modified reversed-phase column and gradient elution at 35°C with an acetic acid/methanol mobile phase. NOCBL elutes within 15 minutes in this system and there is nearly complete separation from hydroxocobalamin and cyanocobalamin. The method was validated by carrying out within and between-day analyses on 50 and 100 µg/mL methanolic standards (%CV: 3.4 and 2.6 respectively) and establishing concentration dependent linearity for peak areas (slope

0.0085, $R^2=0.9932$) with a detection limit of 10 $\mu\text{g/mL}$. A solid phase extraction (C-18) procedure has been in development where elution of NOCBL from plasma samples occurs. The resulting compound is in a solubilized form that can be directly injected into the HPLC. Current work is focused on optimizing the solid phase extraction system to increase percent recovery and to determine a suitable internal standard for extraction and quantitation.

Poster Board No. 051 HUMAN FORESKIN FIBROBLASTS AND THEIR CELLULAR RESPONSE TO HEAVY METALS SUCH AS THALLIUM AND BARIUM David S. Liu davidliu@walsh.edu, Joseph A. Lupica, jlupica@walsh.edu, Joseph A. Bauer jbauer@noat.com, Amy J. Heston aheston@walsh.edu, Walsh University, 2020 East Maple Street, North Canton, OH 44720

Heavy metals such as barium and thallium are toxic. The effects of heavy metal compounds on normal Human Foreskin Fibroblasts (HFF) have been investigated. Potassium and sodium ions enter the cell via a specialized transmembrane receptor. Heavy metal ions with similar atomic radii to K^+ are predicted to enter the cell through the same Na^+/K^+ pump. The heavy metals ions, thallium (Tl^+) and barium (Ba^{2+}), have approximately the same ionic radii as K^+ . It is hypothesized that these ions may also enter the cell through this pump. Once inside the HFF cell, Tl^+ binds to riboflavin, potentially interfering with oxidative phosphorylation. The disruption of oxidative phosphorylation is predicted to result in mitochondrial membrane dysfunction, the release of Cytochrome C, and the activation of the intrinsic apoptotic pathway. HFF cells were treated with various concentrations of the aqueous heavy metal salts, Thallium acetate (TlCH_3COO) and Thallium nitrate (TlNO_3), at concentrations from 1- 100 μM . A Sulforhodamine B (SRB) assay monitored overall cytotoxicity. The results indicated that cell death generally occurs at concentrations of 100 μM for both TlCH_3COO and TlNO_3 . Studies with $\text{Ba}(\text{NO}_3)_2$ exhibited similar cellular growth inhibition. However, little or no antiproliferative effects were observed at 1 μM of either heavy metal, suggesting HFF cells are able to tolerate minimal concentrations of thallium and barium.

Poster Board No. 052 ANTIPROLIFERATIVE EFFECTS OF THALLIUM COMPOUNDS ON MCF-7 CELLS Lucille E. Zappitelli, lucillezappitelli@walsh.edu, Joseph A. Lupica, jlupica@walsh.edu, Joseph A. Bauer, jbauer@noat.com, Amy J. Heston, aheston@walsh.edu, Walsh University, 2020 East Maple Street, North Canton, OH 44720

Thallium, a heavy metal, has been found to be a toxin in both chemical and forensic sciences. This work investigated the effects of thallium salts on the human adenocarcinoma cell line MCF-7. MCF-7 cells are the most widely studied estrogen dependent cell line in breast cancer research. Thallium and potassium possess very similar atomic radii, resulting in the ability of Tl^+ to easily enter the cell via the Na^+/K^+ pump. Once inside the cell, Tl^+ binds to riboflavin and could potentially interfere with oxidative phosphorylation, causing disruption of the mitochondrial membrane potential. This disruption is predicted to result in mitochondrial membrane dysfunction and the release of Cytochrome C, an early initiating step of the intrinsic apoptotic pathway. Apoptosis is otherwise known as programmed cell death. In separate experiments, MCF-7 cells were treated with concentrations of 1-100 μM of Thallium acetate (TlCH_3COO) and Thallium nitrate (TlNO_3). Cytotoxicity was monitored utilizing a Sulforhodamine B (SRB) assay. The assay demonstrated cell death began to occur at 2 μM and 75 μM of TlCH_3COO and TlNO_3 respectively. Growth inhibition was observed in TlCH_3COO at 1 μM , however, further testing using 0.05 μM -1.0 μM TlCH_3COO indicated no cell death occurred. This demonstrated the antiproliferative effects of thallium, on MCF-7 cells, *in vitro*.

Poster Board No. 053 CELLULAR APOPTOSIS OF MALIGNANT MELANOMA CELLS UTILIZING THALLIUM ACETATE AND THALLIUM NITRATE Christine N. Stenger christinestenger@walsh.edu, Amy J. Heston aheston@walsh.edu, Joseph A.

Bauer jbauer@noat.com, Joseph A. Lupica, jlupica@walsh.edu Walsh University, 2020 East Maple Street, North Canton, OH 44720

Compounds containing heavy metals, such as thallium, are toxic to living systems. This project investigates the effects of thallium compounds on the malignant melanoma cell line, A375. Heavy metal ions of similar atomic radii to K^+ , such as Tl^+ , may enter the cell through the Na^+/K^+ pump. When thallium enters the cell, it binds to riboflavin, adversely affecting the oxidative phosphorylation pathway. The subsequent disruption of this pathway may result in cell death due to mitochondrial dysfunction, release of Cytochrome C, and initiation of the intrinsic apoptotic pathway. The A375 cells were treated with various concentrations of aqueous thallium salts, thallium acetate (TlCH_3COO) and thallium nitrate (TlNO_3). The cells were treated with measured concentrations of the salts that varied from 1-100 μM . Cytotoxicity was monitored utilizing the Sulforhodamine B (SRB) assay. Growth inhibition was not observed at 1 μM and, therefore, studies using lesser concentrations were not warranted. Anti-proliferative effects of these thallium compounds were evidenced through this assay and indicated cell death at concentrations of 75 μM TlNO_3 and 100 μM TlCH_3COO . The SRB assay indicates that the A375 cell line is able to tolerate thallium toxicity at 1 μM TlNO_3 for 118 hours and 5 μM TlCH_3COO for 114 hours.

Poster Board No. 054 SYNTHESIS AND CHARACTERIZATION OF METAL-ORGANIC FRAMEWORKS FROM AROMATIC CARBOXYLATES Paul Szalay^a, Seth Barrett^a, Matthias Zeller^b ^aDepartment of Chemistry, Muskingum University, New Concord, OH 43762 pszalay@muskingum.edu ^bDepartment of Chemistry, Youngstown State University.

The synthesis of novel metal-organic frameworks (MOFs) was investigated via simple room temperature solution methods, solvothermal approaches, and microwave techniques. Reaction products consisted of 1,1'-ferrocenedicarboxylic acid, 2-fluoroterephthalic acid, and terephthalic acid linkers with zinc, cobalt, copper, chromium, silver, and aluminum metal ions. Products were characterized using infrared spectroscopy (IR), powder X-ray diffraction (PXRD), and single crystal X-ray diffraction. The 1,1'-ferrocenedicarboxylic acid reaction products exhibited two colors, red-brown and yellow-gold, based upon reaction conditions. IR and PXRD confirmed that the products were not isostructural. Single crystals for the mixed linker reaction containing 2-fluoroterephthalic acid and terephthalic acid with Zn(II) exhibited the monoclinic C2 space group. In solution prior to reaction, the 2-fluoroterephthalic acid linker encompassed 38% of the linkers in the reaction. After the reaction, the 2-fluoroterephthalic acid linker encompassed 41% of the linkers in the crystalline product. Single crystals for the 2-fluoroterephthalic acid reaction with Zn(II) were also found to be monoclinic with a C2 space group. The unit cell data for both crystals was similar, with cell dimensions of 10.884(4), 16.423(6), 7.468(3), and 10.859(4), 16.133(5), 7.612(3) Å respectively. Cell volumes were found to be 1215.5 and 1223.78 Å³ respectively.

Poster Board No. 055 LIMNOLOGY OF CRYSTAL LAKE AND BOATING LAKE AT THE MUSKINGUM VALLEY SCOUT RESERVATION LOCATED ON RECLAIMED MINING LAND IN COSHOCTON COUNTY, OHIO. Zachery T. Beres, zacheryberes@walsh.edu, (Curtis C. Clevinger, cclevinger@walsh.edu and Jennifer A. Clevinger, jclevinger@walsh.edu), Walsh University, 2020 East Maple St. NE, North Canton OH 44720.

Improved understanding of aquatic ecosystem dynamics can lead to improved management techniques. Boating Lake and Crystal Lake, on the Muskingum Valley Scout Reservation in Coshocton County, Ohio, are both manmade lakes built upon reclaimed strip mining land. Boating Lake was formed through the damming of a natural stream while Crystal Lake formed in a pit from the land's previous mining use. The lack of Scout Reservation

baseline data on these lakes provides the opportunity to be the first to analyze what is occurring in the water columns. Aquatic tests and measurements over a seven week period from June to July 2011 including dissolved oxygen levels, Secchi depth, temperature, pH, and chlorophyll concentration were performed three times a week while biological oxygen demand, limiting nutrients, and nutrient levels, such as nitrate, SRP, ammonia, DOC, and DN, were performed once every week. Initial observations from data collected indicate Boating Lake is a eutrophic lake while Crystal Lake is an oligotrophic lake. Boating Lake was slightly basic (≈ 8.5 on average) and exhibited stratification resulting in a thermocline and supports a wide variety of aquatic life based on daily fishing observations. Crystal Lake exhibited low pH (≈ 3.0 on average), low nutrient content, and supports very little aquatic life based on limited observations of wildlife interactions with the water. Once data analysis is completed, this information will be used by the Scout Reservation to develop a better plan to maintain its aquatic ecosystems and will serve as the foundation for future research on these lakes.

Poster Board No. 056 EVALUATION OF BIOSAND FILTER MODIFIED WITH ZERO VALENT IRON DISINFECTION LAYER FOR HOUSEHOLD TREATMENT OF DRINKING WATER. Ajmeeta Sangtani, axs882@case.edu, Emma Cotter, emma.cotter@case.edu, (Banu Sizirici Yildiz, bsy3@case.edu), Case Western Reserve University, Civil Engineering Department, Bingham Building #216, 2104 Adelbert Road, Cleveland OH 44106-7201.

Current estimates indicate that nearly one billion people worldwide lack access to safe drinking water. Point-of-use (POU) drinking water treatment technology enables those people who have not access to safe drinking water to treat their water at home and to improve the water quality. Among the different POU technologies, biosand filters (BSF) has been used widely in developing countries as an efficient, inexpensive, and appropriate technology for removing microbial hazards in drinking water. Metallic oxides are good sorbents of microorganisms and turbidity. For the past decades zero valent iron (ZVI) has been used for groundwater remediation. ZVI/ metallic iron is universally available. The objective of this project is to evaluate the pathogen reduction potential of modified BSF with (ZVI) disinfectant layer, to determine whether additional disinfection is enabled with ZVI. The conventional BSF (control) was designed with layers of stone, pea gravel, coarse sand and fine sand. The modified BSF was designed in the same manner with ZVI disinfection layer between fine sands. The filters were run intermittently twice a day with 4 liters of water collected from the Doan Brook in Cleveland, OH. Filters were run for 78 days. Water samples were collected from each filter and tested for flow rate, turbidity, pH, dissolved oxygen, total and fecal coliform test. Test results showed that 90.4 % reduction in total coliform, 92 % reduction in fecal coliform and 88.5% reduction in turbidity for conventional BSF and the 96.6 % reduction in total coliform, 99.9% reduction in fecal coliform, and 91.3 % reduction in turbidity for modified BSF. Compared to the BSF, the MBSF with ZVI performed better by reducing more turbidity, fecal chloroform and total coliform counts. This study demonstrated ZVI's effectiveness in BSF providing potable drinking water. The results are encouraging and supporting the use of a MBSF over a BSF.

Poster Board No. 057 TWO NEW INVASIVE, EXOTIC INSECTS IDENTIFIED IN OHIO IN 2011. Curtis E. Young, young.2@cfaes.osu.edu, Amy K. Stone, stone.91@cfaes.osu.edu, Joseph Boggs, boggs.47@osu.edu, Cynthia M. Meyer, meyer.842@cfaes.osu.edu, and Kathy Smith, smith.81@osu.edu, Ohio State University Extension, Van Wert County, 1055 South Washington Street, Van Wert OH 45891.

Two very dissimilar, invasive, exotic insects were discovered in Ohio in 2011. An actively growing infestation of *Anoplophora glabripennis*, Asian longhorned beetle

(ALB), a hardwood tree threat, was identified in June 2011 near Bethel, Ohio. In September 2011, an infestation of *Drosophila suzukii*, spotted wing drosophila (SWD), a soft-skinned fruit pest, was uncovered near Ohio City, Ohio. These dissimilar types of insects, a beetle and fly, share four important similarities: 1) an Asian origin; 2) an unknown route to their end-point infestations in Ohio; 3) their presence in Ohio was brought to the attention of authorities by observant members of the public; and 4) both are major threats to Ohio's economy and ecology through destruction of host crops. Eradication efforts are being employed to stop the spread of ALB. More than 4,900 infested trees are being destroyed during the winter and spring of 2011-2012 to remove the ALB population. Until full eradication occurs, survey, regulatory activities and public outreach will continue. Management of SWD involves monitoring with traps and applying insecticide treatments to susceptible fruit crops when justified. Ohio State University Extension is leading the educational outreach effort to inform Ohioans of these threats to Ohio's natural resources and economy.

Poster Board No. 058 A COMPARISON OF RED-BACKED SALAMANDERS (PLETHODON CINEREUS) IN FOUR POPULATIONS ACROSS OHIO: IS THERE A DIFFERENCE IN THE LEAD-BACKED AND RED-BACKED PHASES? Eden A. Dulka, dulkae@findlay.edu, and Jessica A. Wooten, Ph. D. wooten@findlay.edu, The University of Findlay Department of Natural Sciences, 1000 N. Main St., Findlay Ohio 45840.

Plethodon cinereus (Red-backed Salamander) is a small woodland plethodontid salamander that is widely distributed throughout the northeastern United States and southeastern Canada. In Ohio, *P. cinereus* is known from 79 counties; the exceptions include the counties in eastern Ohio and the clay-rich plains. Two color morphs have been described, including a striped (red-backed) and a dark (i. e. , lead-backed); both of these were originally described as distinct species, but were later collapsed into the modern *P. cinereus*. The red-backed morph possesses a straight-edged reddish stripe, from the base of the head to the tail; whereas, the lead-backed morph is uniformly black with brassy flecks. It has been suggested that more than one pair of genes controls the epistatic color variation; however, little information is known about the behavior of the genes involved in this phenomenon. The main goals of this research are to: 1) find populations and collect tail-tips from lead- and red-backed morphs throughout northern Ohio where there is a documented high-prevalence of lead-backed morphs; 2) use population genetic techniques using quickly evolving genes to investigate any differences between individuals in the red- and lead-backed phases in four populations in northern Ohio; and 3) target the genes implicated in the lead-backed morph and compare findings between red-backed and lead-backed morphs for a total sample size of 43. Thus far, samples from four populations in northeast and northwest Ohio that contain both morphs have been collected. Currently, laboratory techniques and primers that will allow us to address the remaining objectives of this research are being developed.

Poster Board 059 PHYLOGEOGRAPHY OF THE BLACK-MOUNTAIN DUSKY SALAMANDER, DESMOGNATHUS WELTERI (CAUDATA: PLETHODONTIDAE) WITH A COMPARISON WITH THE BLACK-BELLID SALAMANDER, DESMOGNATHUS QUADRACULATUS Caitlin Amiot (amiotc@findlay.edu), Alicia Oberhaus (oberhaus@findlay.edu), Jessica A. Wooten, Ph.D. (wooten@findlay.edu), Carlos D. Camp, Ph.D. (ccamp@piedmont.edu), Piedmont College Demorest, GA), and Zachary I. Felix, Ph.D. (zif@reinhardt.edu; Reinhardt University Waleska, GA) The University of Findlay Department of Natural Sciences 1000 N. Main St. Findlay, OH 45840.

Phylogeography, morphology, and ecological niche modeling were combined to examine unique cryptic lineages and investigate factors that may limit the geographic distribution of the Black Mountain dusky salamander, *Desmognathus walteri* through out the known geographic

range in the Cumberland Plateau and Mountains. Sequences totaling approximately 1200 base pairs for the 12S valine transfer and cytochrome oxidase I portion of the mitochondrial genome were analyzed to delimit evolutionary relationships within this group. Maximum likelihood was used to reconstruct the phylogeny, and revealed a large polytomy with no phylogenetic structure and low statistical support on the nodes. These findings suggest that a recent bottleneck or founder effect may have impacted *D. weltersi* populations. There was no indication of distinguishable morphological characteristics detected among the individuals distributed across geography. Ecological niche modeling (i.e., current climate) showed that abiotic requirements of temperature and precipitation limit the geographic distribution of *D. weltersi*. However, paleo-niche (i.e., 21K years ago) modeling combined with a maximum likelihood estimate of ancestral origin revealed that *D. weltersi* may have originated in eastern Kentucky and then experienced a range expansion into regions of Virginia, Tennessee, and West Virginia. The Black-bellied Salamander, *Desmognathus quadramaculatus*, was used for phylogenetic comparison; there are at least four times more mutation in *D. quadramaculatus* when compared to *D. weltersi*. This suggests that *D. quadramaculatus* even though northern populations were largely without phylogenetic structure, has experienced stable population structure in southern populations, but experienced a recent range expansion, yielding the current phylogenetic structure.

Poster Board No. 060 THE SPECIES PROFILE OF LOTIC FISH COMMUNITIES AFFECTED BY LANDSCAPE LEVEL SURFACE MINING DEGRADATION. Jesse E. Hardval jhardval@muskingum.edu, (James L. Dooley Jr. jdooley@muskingum.edu), Jenise Bauman jbauman@thewilds.org. Muskingum University, 163 Stormont St, New Concord OH 43762.

Deforestation in riparian buffers has been shown to increase stream temperature. Water temperature increases alter metabolism, growth rates, inter-specific competition, susceptibility to disease and mortality of aquatic organisms. Deforestation can also change species profiles by increasing nutrient levels leading to increased algal production and loss of oxygen. In an area that has been surface mined and a significant percentage of trees have been removed, elevated temperature can be a driver of changes to the fish diversity patterns. The goal of this research is to develop a species profile at several sites and streams within The Wilds in Cumberland, Ohio. The Wilds is an area that has experienced deforestation due to landscape level surface mining occurring over 25 years ago. The Wilds is now a wildlife conservation center containing over nine thousand acres of degraded land. There are several streams on the property, and species profiles for the streams have never been completed. Specimens will be collected from stream sites by use of seine nets. Physical stream characteristics such as temperature, upstream riparian length, left and right bank riparian width, and reach length have also been recorded. Twelve seining events have occurred at four different sites. Suitable sites were characterized by a run or pool immediately downstream from a moderate to fast riffle. One hundred and twenty four specimens have been netted, with eight species being identified and six hybrid sunfish specimens. Site 1 with a mean temperature of 17.33 °C was dominated by minnow species (Cyprinidae), as was expected due to previous literature. All other sites were dominated by sunfish species particularly, green sunfish (*Lepomis cyanellus*) and bluegill (*Lepomis macrochirus*), at average temperatures of 18.67 °C, 16.33 °C, and 17.67 °C respectively.

Poster Board No. 061 VEGETATIVE RESPONSE TO ARCHEOLOGICAL DISTURBANCES IN A MIXED MESOPHYTIC FOREST IN EASTERN OHIO. Bethany J. Blakely, b-blakely.2@onu.edu, Magda M. Molnar, m-molnar@onu.edu, Emily A. Nebgen, e-nebgen@onu.edu, (Robert G. Verb, r-verb@onu.edu). Department of Biological and Allied Health Sciences, Ada, OH 45817.

Both anthropogenic and natural disturbances impact terrestrial plant communities. Often, these disturbance events lead to an increased rate of colonization by invasive plant species. Archeological investigations often yield insightful and beneficial information about the former inhabitants and cultures. However, the techniques employed in unearthing this information can disrupt and disturb a given habitat. This investigation examined the response of the herbaceous and woody plant communities to previous site disturbances in a mixed mesophytic woods in Tuscarawas County, Ohio. On September 9-10, 2011 a total of 62 sites (31 archaeologically disturbed, 21 naturally disturbed, 10 undisturbed) were analyzed. Point-centered quarter method sampling was employed to quantify the woody specimens in the vicinity of each site while a 1-m² plot was used to evaluate the understory vegetation. Comparisons between sites impacted by the archeology digs will be contrasted to those less disturbed locales through the use of exploratory analyses (e.g., correspondence analysis) and ANOVAs.

Poster Board No. 062 RHEOTACTIC BEHAVIOR OF GIANT DANIO, DEVARIO AEQUIPINNATUS, PERSISTS IN THE DARK. Rohan Bhimani rohanb@falcon.bgsu.edu, Joseph Coleman colemaj@falcon.bgsu.edu, Sheryl Coombs scoombs@falcon.bgsu.edu Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43402.

Rheotaxis - orientation with respect to an on-going current - has many proposed benefits, including energetic costs savings and enhanced interception of downstream planktonic drift. At low flow speeds (< 1 body length (BL)/s), the flow-sensing lateral line is thought to play a dominant role in this behavior. At higher flow speeds (>~ 1 BL/s), visual cues tend to dominate. Recent findings indicate that large schools (N>4) of giant danio exhibit enhanced rheotaxis compared to solitary fish. In this study, we investigate the sensory basis of this difference by testing solitary (N = 1) and grouped fish (N=8) at two flow speeds, one below and one above 1 BL/s, and in both light (vision enabled) and total darkness (vision disabled). Unlike solitary fish, which were randomly oriented, grouped fish exhibited positive rheotaxis (heading +/- 45° of upstream for > 60% of total test time) in the light at both low (0.8 BL/s) and high (2.0 BL/s) flow speeds. Group-size effects disappear in the dark, as both solitary and grouped fish exhibit similar levels of positive rheotaxis in the dark at both flow speeds. These results are consistent with the idea that when light is present, visual cues from neighboring schoolmates are important to the improved rheotactic performance of groups of fish, but that in the dark, the group-size effect fades as fish switch from visual to non-visual sensing modalities.

Poster Board No. 063 USING THE ZEBRAFISH (DANIO RERIO) TO EXAMINE GENE EXPRESSION REGULATION OF THE MOUSE SMALL HEAT SHOCK PROTEIN ALPHA B CRYSTALLIN. Zachary Haley (zhaley@ashland.edu), Mason Posner (mposner@ashland.edu). Ashland University, Department of Biology/ Toxicology, 401 College Avenue, Ashland, OH 44805.

Alpha B crystallin is a ubiquitously expressed vertebrate small heat shock protein that prevents the stress-induced aggregation of other cellular proteins. Its expression increases in neurological disorders and numerous cancers. The alpha B crystallin gene is highly expressed in mouse lens as well as many other places throughout the body. Previous studies in zebrafish have shown that deletions of upstream promoter elements of the alpha B crystallin gene decreased expression in muscle and nervous tissue without affecting eye lens expression. These studies have begun to identify tissue specific enhancing regions in the alpha B crystallin promoter. The project hypothesized that injection of modified mouse alpha B crystallin promoter constructs could be used to drive green fluorescent protein (GFP) expression in embryonic zebrafish, providing a fast throughput model system for investigating promoter

function. Mouse BAC clones were used to PCR amplify different lengths of the mouse alpha B crystallin promoter. These various promoter lengths (0.25, 0.8, 1.4, and 2 kb) were then ligated into the pAcGFP1-1 vector, transformed into competent *E. coli* cells and purified. Injection of plasmids containing the 0.25 and 1.4 kb promoter fragments into 1-cell zebrafish embryos produced mosaic GFP expression in skeletal muscle tissue. In addition, the 1.4 kb promoter fragment produced weak GFP expression in the lens. Additional injections of these promoter/GFP constructs into zebrafish embryos will test the hypothesis that regulation of alpha B crystallin expression is similar between the mouse and zebrafish.

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Poster Board No. 064 MULTIPLE APPROACHES TO IDENTIFYING UNIQUE LINEAGE DISTRIBUTIONS IN THE OCMULGEE SLIMY SALAMANDER, PLETHODON OCMULGEE (CAUDATA: PLETHODONTIDAE). Katie Kelley (kelleyk@findlay.edu), Ingrid Godfrey (godfreyi@findlay.edu), Carlos D. Camp, Ph.D. (Piedmont College, Demorest, Georgia), and Jessica A. Wooten, Ph.D. (wooten@findlay.edu) The University of Findlay Department of Natural Sciences 1000 N. Main St. Findlay, Ohio 45840

Plethodon ocmulgee (Ocmulgee Slimy Salamander) is a large slimy salamander in the Plethodontidae, which is the largest family of extant salamanders with over 350 described species. *Plethodon ocmulgee* was described in 1989 using allozyme data, and currently has a small distribution that extends from the upper coastal plain and adjacent piedmont physiographic provinces of central Georgia associated with the Ocmulgee River drainage. Phylogeography and ecological niche modeling (current and paleo) was combined to examine unique cryptic lineages and to estimate the abiotic and biotic factors that may limit the geographic distribution of the *P. ocmulgee* throughout the known geographic range. Sequences totaling approximately 1800 base pairs for the cytochrome b, 12S valine transfer, and NADH dehydrogenase 2 portions of the mitochondrial genome were analyzed to create a phylogenetic hypothesis to delimit evolutionary relationships within this group. Maximum likelihood and Bayesian methods were used to reconstruct the phylogeny. Preliminary analyses revealed three unique clades partitioned by geologic age; the clade with the shortest branch length includes individuals from regions of the youngest geologic age. These findings correspond to the varied geologic history of the coastal plain in Georgia. Additional sampling is needed to tease out fine-scale population structure, and is taking place during the late fall / early winter 2011. Ecological niche modeling, using presence-only data, showed that abiotic requirements of temperature and precipitation limit the geographic distribution of *P. ocmulgee*. Further sampling and sequencing may reveal additional unique evolutionary lineages within this group.

Poster Board No. 065 IDENTIFICATION OF COMPLEX STRUCTURAL REARRANGEMENTS OF HUMAN CHROMOSOMES 5, 17 AND 19. John Roby, (robj@findlay.edu); Jeremy Mascaro; (Michael Edelbrock, PhD), The University of Findlay, Mail Stop 1051, 1000 North Main St., Findlay OH 45840.

Complex structural rearrangements of chromosomes are seldom compatible with life. Individuals with complex rearrangements are diagnosed at a young age. The extent of the phenotypic disorder is correlated to the specific translocations, the genes impacted, and whether or not the rearrangement is balanced. Fluorescence in-situ hybridization (FISH) results of an individual with partial trisomy of chromosome 5 were obtained from previous records. These results show that a portion of chromosome 5 has been relocated to chromosome 19. Further, this part of chromosome 19 is fused to chromosome 17. FISH analysis is imprecise in the exact genetic sequence of the rearrangements. This study seeks to determine the

sequence location of the rearrangements. Our hypothesis is that inverted repeat (IR) sequences might be involved and would be present at the areas indicated by the FISH analysis. DNA sequences, containing two million nucleotides, centered on chromosomes 5p13.1, 19p13.13 and 17p13.2, were obtained from the National Center for Biotechnology Information (NCBI). A table was constructed using 200kb segments from each chromosome after conducting a BLAST alignment. Areas with the highest homology were obtained and further evaluated for the presence of IRs using predictive software. Results indicate that the same IR is present in each of the chromosomes investigated. Interestingly, this approach identified an intronic region between exons 20 and 21 of the Nipped-B homolog gene that is known to be transcribed during fetal development. Further characterization to verify that this IR was the site of the translocations is being conducted using polymerase chain reaction (PCR) on DNA collected from the individual.

Poster Board No. 066 MUTAGENIC EFFECTS OF CADMIUM ON MITOCHONDRIAL AND NUCLEAR DNA. Danielle Hoffman (hoffmand2@findlay.edu), Ashley Patton (pattona@findlay.edu), Jamie Siesel (sieselj@findlay.edu), (Michael A. Edelbrock), The University of Findlay Department of Natural Sciences 1000 N. Main Street Findlay, Ohio 45840

Epidemiological studies show that cadmium is associated with cancer. Cadmium has been classified as a co-carcinogen, however the direct mechanism is not yet known. Recent evidence suggests that the combination of cadmium with oxidative stress may interfere with DNA damage repair processes, resulting in mutations. The hypothesis of this investigation is that cadmium, in combination with an oxidative agent, will induce mutations in the human mitochondrial and nuclear genomes. Further, that the mutation frequencies between mitochondrial and nuclear genomes will differ. Human cell lines were grown in culture and treated with cadmium chloride (<10uM) for 24 hours. Subsequently, cells were treated with menadione (10uM), an oxidative agent, for various time increments (0-60 minutes). Cells were recovered and plated to allow for colony generation. Total genomic DNA was extracted from resulting colonies and PCR amplification of the cytochrome-B gene (mitochondria) and the MLH-1 promoter region (nucleus) were conducted. Sequence analyses of the amplified DNA products will determine relative mutation frequency of nuclear compared to mitochondrial DNA sequences in cadmium treated cells, cadmium and menadione treated cells, and non-treated cells. Preliminary data has been generated which suggests that the mitochondrial mutation frequency of HeLa cells increases with increasing cadmium concentration. A further increase in mutation frequency occurs in the presence of menadione treatment. An increase in mutation frequency also occurs in the mitochondria of melanoma cells (SK-Mel28) treated with cadmium when compared to non-treated cells. Further investigation of the number and types of mutations found in the nuclear genome are ongoing.

Poster Board No. 067 THE DISCOVERY AND PREVALENCE OF A RANAVIRUS SPECIES IN A NATURAL PRESERVE AND A RESTORED WETLAND IN NORTHERN OHIO Matthew Grisnik¹ (grisnikm@findlay.edu), Jonathon Combs¹ (combsj@findlay.edu), Krista Baldauf¹ (baldaufk@findlay.edu), Melissa Sigg¹ (siggm@findlay.edu), Tim Krynac² (tjk@clevelandmetroparks.com), Chris White¹ (white@findlay.edu), Terry D. Schwaner, Ph.D.¹ (schwanner@findlay.edu), and Jessica A. Wooten, Ph.D.¹ (wooten@findlay.edu) ¹The University of Findlay Department of Natural Sciences 1000 N. Main St. Findlay, Ohio 45840 and ²Cleveland Metroparks, Cleveland, Ohio.

Systemic infections in many animals have been attributed to large double-stranded DNA viruses of the family *Iridoviridae*. Amphibian *Ranavirus* (species FV3) is part of a larger ranavirus group (one of five groups in *Iridoviridae*) and an emerging pathogen of frogs,

salamanders, turtles and fish, with a global distribution and reported outbreaks in several countries and in at least 30 U.S. states. In frogs and salamanders, outbreaks are characterized by a rapid die-off, particularly of larva and recent metamorphs. Diagnosis requires amplification of the major capsid protein gene (~1500 base pairs) using polymerase chain reaction followed by sequencing and comparison to reference sequences in GenBank. Sudden die-offs of larval and metamorphosed American Bullfrogs (*Lithobates catesbeianus*) in a 1-ha man-made wetland in northwest Ohio, and of Wood Frogs (*Lithobates sylvaticus*) in a reserve pond at North Chagrin Nature Center near Cleveland, Ohio were reported. Samples were taken from 34 frogs and two turtles over the 26 September, the 11 and 12 October and 4, 6, and 9 November 2011. Diagnosis of the FV3 strain from skin swabs, liver, and kidney biopsies confirmed 17 *Ranavirus* cases in American Bullfrogs, and one occurrence in an Eastern Painted Turtle (*Chrysemys picta picta*) at the northwest Ohio site, and 12 cases (n = 17) in both adults and larva at the Cleveland site. This is the first published account of amphibian die-offs caused by FV3, and the first reported *Ranavirus* infection of a turtle, in Ohio.

Poster Board No. 068 THE EFFECTS OF CHLORPYRIFOS ON HIPPOCAMPAL GENE EXPRESSION IN MALE LONG-EVANS RATS AFTER MULTIPLE SUBCUTANEOUS EXPOSURES. Lynette Vana (lvana@ashland.edu), Mason Posner (mposner@ashland.edu). Ashland University, Department of Biology/ Toxicology, 401 College Avenue, Ashland, OH 44805.

Chlorpyrifos is an organophosphate insecticide that is used worldwide for crops and household purposes. It is sold under the trade names of Dursban and Lorsban. Chlorpyrifos functions as a cholinesterase inhibitor and is therefore a neurotoxin proposed to detrimentally affect organisms exposed to it. Organophosphates like chlorpyrifos have also been used as weapons in warfare because of their potent neurotoxicity to people; furthermore, detrimental developmental effects have been recorded for children who were exposed to this pesticide. Several studies have suggested a link between chlorpyrifos exposure and cognitive deficits, including effects on memory. A previous study found changes in the expression of over 3,000 genes in the rat forebrain after a single dosing of chlorpyrifos at 2mg/kg. Only a small number of these changes in expression were subsequently confirmed by real-time PCR, the genes of focus were not included in this confirmation. The purpose of this present study was to confirm the upregulation of two genes, *Rpl19* and *Synj1*, in a specific region of the rat brain, the hippocampus, to test the hypothesis that chlorpyrifos can cause gene regulatory changes in a region of brain related to memory. After animal dosing, hippocampal brain tissue samples were collected from the animals and preserved in RNAlater. RNA was then extracted from these hippocampus tissues for both control and dosed male Long Evans rats, and oligonucleotide primers were developed to amplify each gene. Reverse-transcriptase-polymerase chain reaction (RT-PCR) analysis of purified RNA will test the hypothesis that these two genes are greatly upregulated in the hippocampus after multiple subcutaneous exposures to chlorpyrifos.

Poster Board No. 069 THE PROTECTIVE EFFECTS OF THE VIOLACEIN PIGMENT AGAINST UV-C IRRADIATION IN CHROMOBACTERIUM VIOLACEUM. Andrew N. Abboud, andrew.abboud9@gmail.com, 748 Oak Lea Dr., Tipp City, OH 43071. (Tippicanoe High School and Central State University).

Chromobacterium violaceum is a Gram-negative bacteria found in tropical regions. *C. violaceum* has the distinct phenotypic characteristic of a deep violet pigment called violacein. Violacein has a high molar extinction in methanol, suggesting that it is protective against visible light. The purpose of this study was to establish the protective effects of violacein against UV-induced cellular

damage. It was hypothesized that violacein protects DNA and proteins (e.g. catalase) from UV-C induced damage. Wild-type (WT) *C. violaceum* was mutagenized with N-methyl-N'-nitro-N-nitrosoguanidine to produce mutants with varying amounts of violacein. Mutants *CV9*, *CV13*, and *CV14* (non-pigmented) produced less pigmentation than *WT* and retained colony morphology, while mutants *H19*, *H20*, and *H21* (hyper-producers) over-expressed violacein but had an altered petite morphology. UV-induced DNA damage was assayed through sub-culture post-irradiation at $6,000\mu\text{W}^*\text{s}^{-1}\text{cm}^{-2}$ at $\lambda=253.7\text{nm}$. Sub-cultures of *WT* and hyper-producers showed reduced viability after 48 hours; nonpigmented mutants showed no growth, suggesting violacein is protective against UV-induced DNA damage. UV-induced catalase damage was assayed pre and post irradiation. According to the paired t-test at the 5% significance level (tvalue ± 1.960), catalase activity in *WT*, *H19*, *H20* and *H21* significantly decreased post-irradiation and assumed the average negative t-values of 20.4058, -15.9284, -12.7082 and 11.1229, respectively; catalase activities of *CV9*, *CV13* and *CV14* significantly increased post-irradiation and assumed the average positive t-values of 16.2441, 27.0759 and 26.2194, respectively. Increased catalase activity in non-pigmented mutants can potentially be explained by the increased induction of catalase genes in response to elevated reactive oxidative species, presumably from lack of pigmentation. Taken together, these results support the hypothesis that violacein is protective against UV-induced cellular damage.

Poster Board No. 070 COMPARISON OF AN IMMUNOCHROMATOGRAPHIC RAPID TEST, A MICROPLATE ENZYME IMMUNOASSAY AND TRADITIONAL CULTURE METHODS FOR DETECTION OF CAMPYLOBACTER SPP. IN OUTPATIENT STOOL SAMPLES Karen Kruger, kak123@case.edu, Case Western Reserve University, Cleveland, OH.

Campylobacter spp. is a leading cause of bacterial gastroenteritis, affecting over 2.4 million persons annually. *Campylobacteriosis* infection is caused by consuming unpasteurized milk, contaminated food or water, or undercooked poultry. Food poisoning caused by *Campylobacter* spp. can be debilitating, resulting in diarrhea with varying severity from loose to bloody stools. An analytical review of recent publications suggests a problem with consistent detection of *Campylobacter* spp., therefore a comparison of antigen detection approaches versus culture methods needs to be conducted. The objectives were to compare antigen detection methods, to compare sensitivity for recovery of *Campylobacter* spp. using culture versus enzyme immunoassay, and to tabulate incidence of bacterial, parasitic, and viral pathogens. Three diagnostic methods were performed on 100 stool samples collected from outpatients. ProSpec™ EIA Test and ImmunoCard STAT! CAMPY® enzyme immunoassays detected *Campylobacter* spp. antigens. Traditional culture on *Campylobacter* spp. selective medium and filtration on blood agar was also performed. *Campylobacter* spp. is a seagull-shaped Gram negative bacilli, catalase positive, oxidase positive, hippurate positive, and motile. Disc diffusion susceptibility to nalidixic acid, cephalothin, and erythromycin further identified the species. Antigen detection tests recovered 7 positives, whereas culture methods recovered 3 positives. The gold standard was two-fold. When culture served as reference, sensitivity/specificity were high (both >65%); ImmunoSTAT! positive predictive value was 28%. When positive EIA or culture served as reference, ImmunoSTAT! sensitivity decreased, but positive predictive value increased. The highest incidence of enteric pathogens was *Campylobacter* spp. and *Clostridium difficile*. Consistently reliable identification of *Campylobacter* spp. is crucial for diagnosis of the leading cause of enteritis globally.

Poster Board No. 071 ADHESION TO AND INVASION OF EUKARYOTIC CELLS BY ISOLATED STAPHYLOCOCCUS AUREUS ISOLATES. Darlene G. Walro¹, dwalro@walsh.edu, Chris A.

Grasse², s12cgrasse@wittenberg.edu, ¹Walsh University, Dept. of Biology, 2020 East Maple St. North Canton OH 44720 and ²Wittenberg University, Dept. of Biology, Springfield OH45501.

Staphylococcus aureus causes many bone and joint infections. The treatment of these infections is challenging due to the ability of the bacteria to invade and survive within the host tissue. Initially, the bacteria adhere to the host cell membrane by means of surface adhesins collectively referred to as microbial surface components recognizing adhesive matrix molecules (MSCRAMMS) which enable the bacteria to bind to collagen, fibronectin, and fibrinogen as well as other host tissue proteins. Previous work in the laboratory focused on the collagen-binding protein of several *S. aureus* isolates and the ability of the isolates to bind to collagen-coated plates. The purpose of this study was to determine whether or not *S. aureus* isolates were able to bind to fibronectin-coated plates using a colorimetric assay and to determine whether or not the bacteria were internalized by Vero cells using the gentamicin protection assay. *S. aureus* strain 25923 and *S. epidermidis* strain 1228 served as positive and negative controls respectively. Seven isolates were recovered on mannitol salt agar from the anterior nares of otherwise healthy humans (N = 57) and confirmed as being *S. aureus* by the catalase and coagulase assay. Two of the isolates, F and KS, were then measured for their ability to bind in a time-dependent fashion to fibronectin-coated plates using a colorimetric assay which measured optical density (O.D.) at 570 nm. The isolates showed greater ability to bind to fibronectin-coated plates (F, O.D. = 0.22.; KS, O.D. = 0.20) when compared to the negative control (O.D. = 0.05) but did not bind as strongly as the positive control (O.D. = 0.75). Neither isolate appeared capable of invading Vero cells as determined by the gentamicin protection assay.

Poster Board No. 072 A COMPARATIVE ANALYSIS OF SYNONYMOUS CODON USAGE BIAS IN LASSA FEVER VIRUS AND BETWEEN RELATED OLD WORLD ARENAVIRUSES. Jonathon Combs, combsj@findlay.edu, Matt Hoostal, hoostal@findlay.edu, University of Findlay, 1000 North Main Street, Findlay OH 45840

Lassa fever virus (LFV) represents a considerable threat to public health in West Africa, as well as posing international concerns as a potential bioweapon. This study determined differences in the pattern of synonymous codon usage bias (SCUB) between LFV strains from Nigeria, Liberia, Serra Leone, Ghana, and Guinea, as well as differences between LFV and related Old World arenavirus (OWA) species. Studies of SCUB shed light on mutational constraints and factors effecting viral evolution not represented in phylogenetic studies. Whole genome sequences from 18 strains of LFV and 8 related OWA were downloaded from GenBank, representing 66 LFV genes and 32 genes from related OWA. A comparative study was performed using correspondence analysis (COA) of relative synonymous codon usage values. First and second COA axes were plotted to facilitate the visualization of SCUB patterns. Quantitative measures of SCUB and compositional constraints were also determined using open-source codon analysis software. Analyses indicated that SCUB in LFV is affected by GC3s content, length of amino acid, geographic distance, and gene function. Differential usage bias was observed between genes of the LFV genome with the zinc-binding protein gene demonstrating unique compositional constraints and higher usage bias relative to other genes within the LFV genome. It was also determined that LFV displayed similar patterns of SCUB as other members of the OWA complex. This information is important to determine key factors affecting inter-, as well as intragenomic usage bias, viral evolution, and diversity across spatial gradients.

Poster Board No. 073 OCCURANCE AND PREVALENCE OF PARASITES IN A CANINE ENVIRONMENT: IS YOUR DOG AT RISK? Ryan Gibson (gibsonr@findlay.edu) and Jessica A.

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Ascarids, *Ancylostoma*, and *Trichuris* are three common nematodes found in the digestive system of canines and are spread through the fecal – oral route as the parasites shed their eggs in the hosts' fecal matter. Dog parks in Hancock County are popular locations for pet owners to exercise and socialize their pets. It is the goal of this project to examine how many pets brought to the public park are a host for these parasitic nematodes. It is thought that a majority of pet owners take proper steps to insure proper health for their pets, but those who do not subject both their pets and other pets to these parasites and other diseases. The hypothesis of this experiment is that less than 10% of samples collected will contain one of the three nematodes. The eggs of these parasites are able to live in the environment for extended periods of time. In order to determine if host animals are being brought to Hancock County's dog park fecal samples are collected from animals as they defecated. Samples are then run through a fecal flotation test. The fecal flotation test will lift any eggs in the fecal matter to the top, by mixing fecal matter with Zinc Sulfate and then centrifugation. By applying a microscope slide to the top of the test tube the eggs can then be viewed through a microscope. Of 140 samples collected, 138 of them were negative, and 3 of them were positive for *Ascarids*. Positive results represented 2.1% of sample. These results indicate that nematodes are being defecated and left on the premises. To prevent spread owners should be encouraged to practice prevention against nematodes when bringing their pets to the park.

Poster Board No. 074 DIGESTIVE BREAKDOWN OF A FRUIT-BASED DIET IN THE YELLOW-BELLIED SLIDER TURTLE, TRACHEMYS SCRIPTA Heather M. Crather heather.crather@otterbein.edu SMC 10554 1. S. Grove St Westerville, Oh 43081 (Sarah Bouchard sbouchard@otterbein.edu) Department of Biology and Earth Science, Otterbein University

Turtles are hind-gut fermenters, meaning the fibrous part of their diet is broken down in the large intestine by microbial symbionts. Panamanian slider turtles thrive on fruit diets, which are generally high in sugar and low in fiber. Horses, a mammalian hind-gut fermenter, can die on such diets because because high sugar levels increase fermentation rates such that gut pH drops and microbes die. Since turtles fair much better on fruit diets they are not expected to have such elevated fermentation rates and such drastic drops in pH. This could be due to a longer gut transit time in turtles which could allow sugars to be digested earlier in the digestive tract before they reach the large intestine for fermentation. The purpose of this study was to examine digesta as it moves through the digestive tract to understand how fiber and sugar concentrations change. Eight yellow-bellied slider turtles were fed a high sugar diet of plums, *Prunus domestica*, for a minimum of two weeks. Turtles were then euthanized and dissected to collect gut contents from four sections: stomach, anterior small intestine, posterior small intestine and large intestine. An Ankom²⁰⁰ Fiber Analyzer will be used to determine concentration of fiber in the digesta, and a Gas Chromatography/Mass Spectrometry instrument will be used to determine fermentation rates in hind gut digesta. The Phenol Sulphuric Acid method will be used to determine digesta sugar concentration. Analysis of each digestive tract section for pH, fiber concentration and sugar concentration will help us understand how turtles can tolerate fruit diets, when mammalian hind-gut fermenters cannot.

Poster Board No. 075 EXAMINATION OF EFFECT OF DIET, PH, AND AGE ON CHITINASE ACTIVITY IN THE GUT OF THE YELLOW-BELLIED SLIDER TURTLE TRACHEMYS SCRIPTA Adrienne M. Garrett, annie.garrett@otterbein.edu; (Sarah S. Bouchard, sbouchard@otterbein.edu); John T. Tansey, jtansey@otterbein.edu; SMC 10744 One Otterbein University Westerville, OH 43081

The slider turtle, *Trachemys scripta*, undergoes an ontogenetic dietary shift during its life. This dietary change is from a carnivorous to herbaceous diet as the turtle matures. Digestive enzymes, like chitinase, are needed to help break down the exoskeleton of insects allowing access to the underlying nutrients. Five year old *T. scripta* are able to digest chitin with an endogenous enzyme. This work aimed to establish the existence and location of an endogenous chitinase and identify its optimal pH ranges in *T. scripta* hatchlings. It was hypothesized that hatchling chitinase activity levels would be higher in hatchlings fed insects than in hatchlings fed plants. The stomach, small intestine, and large intestine were collected from twenty hatchlings that were fed either a plant or insect diet for three months. To detect chitinase activity, a fluorescent tag of 4-methylumbelliferone was used on a chitin substrate. When chitinase digests the substrate, the fluorescent tag is cleaved and fluoresces, allowing us to quantify chitinase activity. Each segment of the gut will be tested at multiple pHs ranging from 2.1-12.0 to determine optimum conditions for enzyme activity. Once activity is determined in hatchling turtles and, activity levels will be compared with five year old turtles to assess chitinase activity among ages.

Poster Board No. 076 THE SYNTHESIS OF A RESORCINARENE-CORE, POLYLACTIDE/POLYETHYLENE GLYCOL STAR BLOCK COPOLYMER WITH CLEAVABLE ARMS. Julie Arko, jarko@ashland.edu, (Perry S. Corbin, pcorbin@ashland.edu), Ashland University, Department of Chemistry/Geology/Physics, 401 College Ave., Ashland OH 44805.

Amphiphilic block copolymers have the potential to self-organize into micelles in aqueous solution. The hydrophobic blocks of these copolymers form the core of the aggregate, and the hydrophilic blocks produce the outer corona. Along these lines, amphiphilic, four-armed calixarene- and resorcinarene-core PLA-PEG star block copolymers have been recently synthesized. These star block copolymers have the potential to be used as drug-delivery devices. Moreover, it is suspected that the copolymers will form aggregates with lower critical micelle concentrations than their linear counterparts. In some instances, the copolymers may function as uni-molecular micelles due to their compact star shape. The goal of the current study is to prepare an eight-armed resorcinarene-core star PLA/PEG that contains cleavable benzyl linkages between the resorcinarene-core and the PLA-PEG arms of the star block polymer. Cleavage of the arms from the core by hydrogenolysis should then allow the polymer arms to be characterized independently from the intact star polymer. To prepare the polymer, a resorcinarene initiator with eight benzyl alcohol initiating sites has been synthesized. This resorcinarene is, subsequently, being used in a lactide ring-opening polymerization to provide an eight-armed resorcinarene-core PLA star homo-polymer. Next, attempts will be made to attach a hydrophilic PEG to the PLA block by first activating the star PLA chain ends and then reacting the activated star homo-polymer with a nucleophilic, amino-PEG. The degree of coupling will be analyzed by gel-permeation chromatography (GPC), ¹H nuclear magnetic resonance (NMR) spectroscopy, and may also be assessed by cleaving the polymer arms by hydrogenolysis.

Poster Board No. 077 DEGRADATION OF CALIXARENE-CORE POLYLACTIDE STAR POLYMERS. MaryKate E. Casper, mcasper1@ashland.edu, (Perry S. Corbin, pcorbin@ashland.edu), Ashland University, Department of Chemistry/Geology/Physics, 401 College Ave., Ashland, OH 44805.

Polylactides (PLAs) are bio-compatible polymers that that have been used in a range of applications, such as dissolvable sutures, in implantable drug-delivery devices, and in scaffolds for tissue engineering. The use of PLA in these applications relies upon the fact that PLA will undergo aqueous and enzymatic degradation (hydrolysis) over time. The further development of PLAs with wider-

ranging physical and chemical properties and with varying degradation rates is of particular interest because the precursor monomer used to prepare PLAs, lactide, is prepared from lactic acid. Lactic acid may be derived from renewable resources. In an attempt to diversify the architectures and properties of PLAs, the synthesis and characterization of calixarene- and resorcinarene-core star polymers is being investigated. In the current study, a four-armed calixarene-core star PLA has been prepared by tin(II) catalyzed ring-opening polymerization of L-lactide. The crystallization rate of this lower number average molecular weight star PLA (~12 kDa) is slow. Moreover, its degree of crystallinity increases with annealing time, as revealed by differential scanning calorimetry (DSC). The degradation of the star PLA is currently being investigated by preparing thin films of the polymers and then exposing the films to a solution of aqueous base—conditions which allow a rapid analysis of degradation rate. Degradation of the polymers will be monitored by mass loss from the films, gel-permeation chromatography (GPC), and ¹H nuclear magnetic resonance (NMR) spectroscopy. It is hypothesized that the calixarene-core star PLA will have a degradation rate that decreases with increasing crystallinity and that differs from a linear PLA analog with similar number average molecular weight.

Poster Board No. 078 SPACE ELEVATORS IN THE SATURNIAN SYSTEM. Francis Graham francisgraham@rocketmail.com Kent State University, East Liverpool Regional Campus, 400 East 4th Street, East Liverpool, OH 43920

The system of Saturn has > 60 moons. Two, Dione and Tethys, each have a pair of moonlets at their L4 and L5 Lagrangian points, preceding and trailing 60° behind the larger moon. For Tethys, these two *Trojan moons* are Telesto and Calypso; for Dione, they are Helene and Polydeuces. All six of these related moons are tidally locked in their rotation to Saturn, each with a nearside and farside. Hypothetically it is theoretically possible to construct a *space elevator* system between the moons of each trio without a disconnect of any terminus, and diamond fibers or carbon nanotubes would suffice for construction. Calculations indicate that in spite of the long lengths of the connecting cables the majority of tensile forces come from the gravitational forces of the larger moons, and these do not exceed 1000 megapascals. In future centuries when such a space elevator system might be constructed, diamond fibers might provide such a material for the cables with a tensile strength of 3500 megapascals, a concept suggested for space elevators before. Small polycrystalline diamond fibers are now manufactured, and Jones and Wang (2000) have patented a process that can transform diamond fibers to a single crystal. Alternatively, carbon nanotubes can be used. Although there is no terminus disconnect, small ellipticities of the orbits would require variable length cables, which might be accommodated by some process of large storage spooling at the terminus. This variation is greatest in the Dione-Polydeuces system, where it is about 10,000 km., which may be prohibitive. The Tethys-Telesto-Calypso system is the better option with a variation of less than 350 km.

Poster Board No. 079 COMPARISON OF MOLECULAR AND SEROLOGIC METHODS FOR FELINE IMMUNODEFICIENCY VIRUS DIAGNOSIS. Deborah R. Nascimento¹, deborahn18@yahoo.com.br, Fabiana Alves^{1,3}, alves.bio@gmail.com, Carlos Mazur², carlosmazur@hotmail.com, Daniela de S. Rajão³, danirajao@gmail.com, Gissandra Farias Braz³, gissa_braz@yahoo.com.br, Helen L. Del Puerto¹, helendelpuerto@hotmail.com, Francisco de O. Vieira¹, chicobrant@gmail.com, Sarah F. Martins^{1,4}, sarahebreia@yahoo.com.br, Almir de S. Martins¹, alisbetermster@gmail.com, Rômulo C. Leite³, romulocleite@ufmg.br, Jenner K. P. dos Reis³, jenner@ufmg.br, Av. Antônio Carlos, 6627 Pampulha, Belo Horizonte, MG, Brazil, 31270901. ¹Department of Biophysics Physiology, Biology Institute, Universidade Federal de Minas Gerais, Brazil. ²Department

of Veterinary Microbiology and Immunology, Universidade Federal do Rio de Janeiro, Brazil. ³Department of Preventive Veterinary Medicine, Veterinary School, Universidade Federal de Minas Gerais, Brazil. ⁴Department of Biology, Universidade Federal de Lavras, Brazil.

The feline immunodeficiency virus is a retrovirus belonging to the genus *Lentivirus* that infects domestic and wild cats and causes feline immunodeficiency, highly infectious and contagious disease that can be diagnosed by serological and molecular methods. The objective of this study was to evaluate and compare the techniques of Western blot and PCR for diagnosis of feline immunodeficiency virus. Blood samples from 150 cats diagnosed from the SNAP Combo Plus were used. As positive and negative controls for the feline immunodeficiency virus were used blood samples from cats tested by SNAP Combo Plus, PCR and Western blot. The Western blot had a sensitivity of 100% and a specificity of 97%, while PCR showed a sensitivity of 91% and a specificity of 97%. The Western blot showed a higher sensitivity and specificity when compared to PCR, which shows that the Western blot test is the most accurate method for diagnosis of the immunodeficiency virus. Accurate diagnosis is extremely important for the control of feline immunodeficiency virus and studies on the epidemiology of this disease.

Poster Board No. 080 THE SUBCLONING AND IDENTIFICATION OF MONOCLONAL ANTIBODIES FORMED FROM VIRAL PROTEIN R (Vpr) IMMUNIZED MICE. Poornima Oruganti, poruganti@student.yu.edu, Ester Hutchinson, Ganesaratnam K. Balendiran, Diana L. Fagan (D.L. Fagan), Youngstown State University, Department of Biology, One University Plaza, Youngstown OH 44555.

Viral Protein R (Vpr), is a protein that directs the nuclear import of the Human Immunodeficiency Virus pre-integration complex. Recent research has suggested that Vpr can act as an anti-cancer agent by overcoming the apoptotic resistance, or resistance to programmed cell death, displayed by some cancer cells and by holding cancer cells in the G2 phase of the cell cycle (LeRouzic and Benichou, 2005). In this study, monoclonal antibodies formed from Vpr immunized mice were subcloned and tested for specificity. Hybridomas were cloned using limiting dilution with MRC-5 feeder cells. The multi-well plates were examined microscopically to identify the wells with single clones. Supernatants were collected from wells that showed healthy, monoclonal cells and tested for antibodies that bind to Vpr. An ELISA was performed with purified Vpr as the antigen. Mouse antiserum against Vpr was used as a positive control. The absorbance was read using a 450-nanometer wavelength to determine antibody binding. Subcloning of the three different hybridomas (DF.VPR.G4, EH.VPR.A2, and DF.VPR.C4) was performed using limiting dilution analysis. In the first subcloning, DF.VPR.G4.B11 was weakly positive. Two additional hybridoma supernatants, EH.VPR.A2.G3 and DF.VPR.C4.E11, tested positive for antibody against Vpr. The antibodies produced in these studies will be purified and used to identify Vpr in Western Blots. Using these antibodies, molecules that regulate Vpr production in host cells will be identified.

Pre-College Poster Session
1:30pm – 4:00pm
Schar 2nd Floor

Schar Room 204

Poster Board No. 001 THE EFFECTS OF COMMON DOMESTIC ANIMAL MANURES ON SOYBEANS. Michaela M. Dean: mdean43015@gmail.com 282 N Washington St, Delaware OH 43015 (Rutherford B. Hayes High School)

This study was designed to determine which common domestic animal manure was the best fertilizer for soybeans. It was hypothesized that soybeans grown

using dairy cow manure tea would grow best. Soybeans were grown using sheep, chicken, horse, and dairy cow manure tea fertilizer. The control group was grown with water only. This experiment consisted of two trials with 50 soybeans grown in each trial, with a total of 20 plants per category. The soybeans were allowed to grow for four weeks, then harvested, placed in a forced air drying oven, and weighed to find the dry weight. The dry weight was the main factor used to determine the experimental outcome because it shows exactly how much organic matter was grown by the plants. In this experiment, values of dry weight, height, length of roots, number of leaves, length of longest leaf, width of widest leaf, percent germination, the Nitrogen levels, Phosphorous levels, Potassium levels and pH of the soil and manures were collected. The control group had the highest germination percentage at 90% and had the longest average root length at 19.9 cm; plants fertilized with chicken manure had the widest leaves at 1.78 cm, greatest number of leaves at 5 per plant, tallest stems at 13.6 cm; and plants fertilized with sheep manure had the longest leaves at 2.41cm. Plants fertilized with chicken manure also had the greatest stem dry weight at 0.17g and plants fertilized with cow manure had the greatest root dry weight at 0.11g. These results did support the hypothesis. The plants grown with cow manure tea as fertilizer were overall the healthiest and grew the best, likely because of the low nitrogen content in dairy cow manure, since soybeans are sensitive to excessive nitrogen in the soil. Possible errors and uncontrolled variables that could have influenced the data include the quality of seeds, temperature of water, height of the lights in the second trial, any medications or vaccines given to the animals (affecting the composition of the manure), and age of the manure. If this experiment were repeated, seeds would be ordered in one batch, the water applied to the plants would be the same temperature and chemistry, and the schedule on the second trial would be strictly followed, and the manure would be aged longer than 2 weeks before it was made into tea. The experiment would also be repeated in spring or summer outside, rather than a makeshift greenhouse in a basement. In conclusion, this study will help to maximize the yield of an economically useful crop through organic means.

Poster Board No. 002 BIO FLOW OR NO GO: DOES SOY BIODIESEL VISCOSITY DIFFER FROM NO.2 PETRO DIESEL VISCOSITY AT VARYING TEMPERATURES? Morgan T. Kessler, flas2sox@aol.com, 18109 Delaware County Line Road, Ostrander, Ohio 43061, Bunsold Middle School.

Historically diesel engines have generally operated on petro fuels. Recently biofuels have gained attention as a more environmentally friendly fuel alternative. Petro fuels have been known for having complications in cold weather when the fuel becomes too viscous and the engine fails. Cold-flow additives lower the gel point of petro diesel, but are ineffective on soy biodiesel. The purpose of this study was to determine if there is a significant difference between No. 2 petro diesel viscosity and soy B20 biodiesel viscosity at 50°C, 0°C, and -20°C without cold flow additives. The hypothesis: Soy biodiesel viscosity differs significantly from No. 2 petro diesel viscosity in relation to changes in temperature. Three samples of soy biodiesel and No. 2 petro diesel were collected from different manufacturers. Flow rate was determined by measuring the amount of time 10 ml of each sample took to drain from a viscometer with a 2mm diameter drain tube 2cm long at the various temperatures. This procedure was repeated three times for each sample at each temperature and flow rate means were calculated. An independent samples t-test was performed at a 95% confidence level. It was found that there was not a significant difference at 50°C (t=0.156). However, at 0°C (t=2.366) and -20°C (t=8.741) there was a significant difference. At 0°C soy biodiesel had a higher viscosity, and at -20°C No.2 petro diesel had a higher viscosity.

Poster Board No. 003 SCENT AND SALES: THE EFFECT OF SCENT ON CLOTHING PURCHASES. Gillian M. Baker, zionkows@ohio.edu, 1318 Wheeling Rd., Lancaster OH 43130. (St. Mary Catholic School)

Retail merchandizing has recently focused on intensifying the sensory experiences of consumers. This project is designed to identify the relationship between scent and consumers' willingness to purchase an item of clothing. The hypothesis is that consumers will be more likely to purchase pleasantly scented clothing than unscented merchandise. Several influences on consumer behavior were examined, including general scent preference and scents marketed specifically to male or female consumers. The fragrances chosen for testing included Pink® "Soft and Pure" (marketed to female adolescents), AXE® "Clix" (marketed to male adolescents), and a gender-neutral cinnamon water solution. In three separate trials, pairs of jeans were sprayed with Pink® "Soft and Pure," AXE® "Clix," or the cinnamon solution, while the other pair was left unscented. The test subjects, five boys and five girls twelve or thirteen years of age, were in private interviews presented with the scented and unscented pairs of jeans and asked to state which pair they would purchase. In each of the three trials, the majority of the test subjects indicated that they preferred the scented pair of jeans. Both the Pink® and the gender-neutral scent were selected by 80 percent of the test subjects, while 100 percent chose the AXE® scent. This research confirms that scent is effective in promoting the purchasing of merchandise and suggests scent is a determinant of consumer behavior, regardless of gender.

Poster Board No. 004 BEAUTY AND THE BEAST: A STUDY ON ATTRACTION. Lauren C. Thomas, Itsweetpea@hotmail.com, 7 Warwick Lane, Athens, OH 45701 (Athens High School).

The purpose of this study was to determine what teenagers find attractive in other human beings, and whether males view attractiveness differently than their female counterparts. A survey was created with ten pairs of two images: one a composite image made from different images of human beings, therefore being the more symmetrical of the two pairs in each image, and the other an individual image downloaded from FaceResearch.com. Each subject was instructed to circle the letter underneath the image that he or she found more attractive and to check the box next to their gender at the bottom of the survey. It was hypothesized that both males and females would choose the composite image as the more attractive one, regardless of gender, because humans are genetically programmed to find faces with average and symmetrical features more attractive as they are a sign of genetic perfection. One hundred and sixteen teenage subjects, 66 male and 50 female, took the survey anonymously. In order to analyze the data, each survey response was given a score out of 10--a point was given for each time a subject chose the composite image as the more attractive. Then the average of the scores for males was calculated, along with the female average and the overall average. The male average score was 8.70, the female average score was 8.56, and the overall average score was 8.63. When a subject chose the individual picture as the more attractive image, the number of the pair was recorded. The top three pairs in which the individual picture was chosen as the more attractive image were determined. In conclusion, the data supported the hypothesis.

Poster Board No. 005 ARE BOYS MORE RIGHT BRAINED THAN GIRLS? Mikhaila E. Duvall teehee1087@aol.com, 2320 Royal Creek Ct., Grove City OH 43123. (Our Lady of Perpetual Help)

The purpose of this test was to determine if boys were more "right brained" than girls. It was hypothesized that boys would be more "right brained than girls". The "left brain" is the center for speech, rational thinking and logic. The "right brain" is the center for random thinking, synthesizing, and looking at the whole. This was hypothesized when found what each side of the brain was performing. The materials used were assessments from the *Memory Bible* and a clock. Two types of tests were given: right and left brain quizzes. The tests evaluated whether the student was right or left brained. There were

28 girls and 14 boys who took the test. After passing out the tests to the students, it was explained that the test was to determine whether they were right or left brained. Subjects were given 45 minutes to complete the tests. All the subjects completed the test in that time period. Tests were collected and scored according to the guidelines of the *Memory Bible*. The tests were separated into gender piles and labeled L for "left brain" and R for "right brained". In a group of 14 males 21.43% are whole brained while females in a group of 28 are 39.39% whole brained. For "left brain" it was found that 35.71% of males are "left brained", while 28.57% of females are "left brained". Among males 42.86% of males are "right brained", while 32.14% of females are "right brained". The hypothesis was accepted.

Poster Board No. 006 LEARNING TO HEAR: DEVELOPING A DOUBLE PHONEME BOUNDARY WITH SECOND LANGUAGE LEARNING, Josephine G. Benson, josephinegbenson@gmail.com, 724 S. Summit St., Bowling Green, OH 43402

Researchers suggest mastering a second language requires learning to hear it as a native would. Languages categorize the same sounds differently. A sound English speakers perceive as /b/, Spanish speakers perceive as /p/. The same mouth movements produce these consonants; they differ only in voice onset time (VOT), ranging from -100 ms to 100 ms. English discriminates /b/ from /p/ at ~30 ms; Spanish at ~0 ms. This discrimination point is the phoneme boundary. Adult bilingual speakers have two phoneme boundaries, switching between them according to language context. However, researchers have not examined at what level of experience learners acquire this ability. This study compares 30 pre-college students taking Spanish IV, Spanish II, or No Spanish to identify when a boundary appears. Participants heard 78 synthesized sounds from the ambiguous 0-30 ms VOT range and identified them by selecting designated computer keys. It was hypothesized that Spanish IV students would identify a greater percentage of ambiguous sounds as /p/. 57.7% of Spanish IV students identified ambiguous phonemes as /p/, compared to 47.7% of Spanish II and No Spanish students. Spanish IV students had a mean reaction time of 466 ms as compared to 363 ms by Spanish II and No Spanish students. This reaction time difference was statistically significant, $t(8) = 3.132, p = .014$. These results suggest Spanish IV students, due to greater language experience, are beginning to develop a double phoneme boundary and to hear the same physical sound as two different speech phonemes depending upon language context.

Poster Board No. 007 DIGITALIS-LIKE FACTORS OUTSIDE THE FIGWORT FAMILY. Natalie J. Norman natalie.norman1@gmail.com, 3658 Rackacres Drive, Cincinnati OH (Walnut Hills High School) Judith Heiny, heinyja@ucmail.uc.edu, University of Cincinnati, Department of Physiology.

Digitalis, a class of compounds extracted from foxglove (*Digitalis*), a member of the figwort family, inhibits Na^+, K^+ ATPase and is clinically important in the treatment of congestive heart failure. Unfortunately, digitalis-like compounds have low therapeutic indexes. Identifying alternative digitalis-like factors may provide drugs with expanded therapeutic indexes. The goal of this study was to test the hypothesis that digitalis-like factors exist outside the figwort family. Water-soluble digitalis-like factors were extracted, using methanol, from the tissues of *Convallaria majalis*, a member of the figwort family, *Antirrhinum*, *Veronicastrum virginicum* and *Verbascum phlomodes*, species related to figworts. *Convallaria majalis*, as a member of the figwort family and known to contain digitalis-like factors, served as a positive control for the extraction procedure. Ouabain was used as a quantitative positive control for the enzyme activity assay. The concentration of digitalis-like factors in each plant extract was measured by their ability to inhibit Na^+, K^+ ATPase activity in vitro. This assay measures the rate of ATP hydrolysis by the formation of ADP. This is reflected by the formation of NADH^+ measured spectrophotometrically and quantified

by a comparison to a ouabain standard curve where the IC_{50} was 2.3 $\mu\text{g/ml}$. Comparison of the plant extracts with the ouabain standard curve showed that 1.73 g of *Convallaria majalis* and 2.16 g *Verbascum phlomoides* contained 1 mg of ouabain-like activity. The remaining extracts contained no detectable levels of ouabain-like activity. These results demonstrate digitalis-like factors are not restricted to the figwort family, although they are present at lower concentrations in related species.

Poster Board No. 008 ARTIFICIALLY-INDUCED OLIGODENDROCYTE APOPTOSIS AS A MODEL FOR MULTIPLE SCLEROSIS. Ingrid N. Zippe, ingridzippe@gmail.com, 17370 South Park Boulevard, Shaker Heights, Ohio 44120. (Hathaway Brown School)

Multiple sclerosis (MS) is an autoimmune disorder resulting from myelin degeneration in the central nervous system (CNS). A growing body of research suggests that an early stage of aberrant oligodendrocyte apoptosis precedes T-lymphocyte infiltration and myelin deterioration in MS. An experiment was designed to study the effects of oligodendrocyte apoptosis within the CNS. Caspase 9 is an enzyme that begins cellular apoptosis. A line of transgenic mice was engineered in which the MBP (myelin basic protein) promoter unique to oligodendrocytes promotes both an inducible version of Caspase 9 (iCP9) and a fluorescent marker (DsRed). Systemic exposure to an iCP9 cross-linking agent (CID) induces the oligodendrocyte apoptosis cascade. The dorsal column region surrounding the spinal cord of wild-type and transgenic mice were injected with either saline or CID at postnatal day-4. The animals were sacrificed, and the spinal cord tissue was fixed at postnatal day-7. Immunohistochemical staining in transgenic mice revealed co-labeling of MBP and DsRed, as well as exclusivity of DsRed and other neural cell markers, substantiating the oligo-specificity of the model. Staining for CC1, an oligodendrocyte marker, demonstrated a 43% decrease in CC1+ cells between wild-type and CID-injected transgenic mice, and staining for DsRed demonstrated an 80% decrease in DsRed+ cells between saline-injected transgenic mice and CID-injected transgenic mice. MBP and neurofilament staining of experimental tissue revealed scattered myelin sheaths and axons, similar the typical phenotype of late-stage MS tissue. We conclude that oligodendrocyte apoptosis may contribute to myelin disorganization and morphological change in axonal arrangement.

Poster Board No. 010 INVESTIGATION OF DEXAMETHASONE LOADING IN SYNTHETIC PLATELETS. Serena W. Chang, schang13@hb.edu, Ranti Ositelu, rositelu@gmail.com, Andrew Shoffstall, andrew.shoffstall@case.edu, Erin Lavik Sc.D., erin.lavik@case.edu, Case Western Reserve University, 3418 Thomson Circle, Rocky River OH 44116. (Hathaway Brown School)

Uncontrolled hemorrhage is a prevalent cause of death in military and civilian trauma patients. Synthetic platelets in the form of functionalized nanoparticles have been recently developed to help staunch internal hemorrhage. This project aims to extend these synthetic platelets' functionality even further by investigating their loading with the corticosteroid dexamethasone to address the subsequent inflammation that develops after trauma. Since the synthetic platelets collect at an injury site, they have the potential to address this secondary issue locally. Particle size is an important factor that determines the drug release profile as well as determines the safety for intravenous injection; particles must be larger than ~50 nm so as not to be filtered by the kidneys and substantially smaller than the ~5 micron capillaries through which they are proposed to circulate. This study investigated particle diameter after loading them with dexamethasone at 10%, 20%, and 40%, weight/weight. Size was characterized with dynamic light scattering and scanning electron microscopy and was distributed between 400 and 600 nanometers, with 20% loading having the smallest diameters. These results are important because they show that drug loading

with dexamethasone is possible and maintains a viable size distribution for intravenous injection.

Poster Board No. 011 COMBATING BIOTERRORISM: DETERMINATION OF MINIMUM PATHOGEN DNA TEMPLATE CONCENTRATION (MPC) FOR RAPID, ACCURATE, AND EFFICIENT DETECTION OF BIOTERROR AGENTS! Anamika Veeramani, malar44133@yahoo.com, 9388 Chesapeake Dr., North Royalton OH 44133. (Laurel School)

This project estimates Minimum Pathogen DNA template Concentration (MPC) for select pathogens to ascertain the feasibility of predetermining and publishing MPC data for bioterror agents. MPC is defined as the lowest concentration of the pathogen DNA template in the PCR assay that results in a clear gel band indicating the presence of the source pathogen. *pUC plasmid* extract and DNA extracts of *Escherichia coli*, and *Bacillus subtilis* were chosen as DNA templates. DNA template concentrations were prepared using serial dilution method. Illustra puReTaq Ready-To-Go™ PCR beads were used with primers, Eub16S1 and Eub16S2 for *E.coli*, and *B.subtilis*, and primers M13F and M13R for *pUC plasmid* PCR assays. Agarose gel electrophoresis molecular technique was used to detect the presence of source pathogens and establish MPC. Presence of gel bands on computer-generated PCR gel images was visually inspected to identify the presence of source pathogen. PCR assays were prepared for *E.coli*(65 $\mu\text{g}/\mu\text{l}$, 6.5 $\mu\text{g}/\mu\text{l}$), *B. subtilis*(10 $\mu\text{g}/\mu\text{l}$, 1 $\mu\text{g}/\mu\text{l}$), and *pUC*(30 $\mu\text{g}/\mu\text{l}$, 3 $\mu\text{g}/\mu\text{l}$) at two different DNA template concentrations and PCR cycles were carried out. Gel run was conducted for each of the assays. Separate negative controls for the bacterial DNA extracts and *pUC* were included in the gel run, along with 1KB ladder DNA standard size marker and *Lambda Hind III* standard molecular weight marker. The concentration for which the gel band was clearly visible was recorded for each of the pathogen DNA templates. Another gel run of the PCR assays for *E.coli* (6.5 $\mu\text{g}/\mu\text{l}$, 0.65 $\mu\text{g}/\mu\text{l}$, 0.065 $\mu\text{g}/\mu\text{l}$, 0.0065 $\mu\text{g}/\mu\text{l}$), *B.subtilis*(1 $\mu\text{g}/\mu\text{l}$, 0.1 $\mu\text{g}/\mu\text{l}$, 0.01 $\mu\text{g}/\mu\text{l}$, 0.001 $\mu\text{g}/\mu\text{l}$), and *pUC*(μl , 0.3 $\mu\text{g}/\mu\text{l}$, 0.03 $\mu\text{g}/\mu\text{l}$, 0.003 $\mu\text{g}/\mu\text{l}$, 0.0003 $\mu\text{g}/\mu\text{l}$) was repeated at five different DNA template concentrations to zoom in on the minimum concentration that yielded a clear gel band. This minimum DNA template concentration at which the source pathogen's presence was detectable was documented as the MPC value(0.03 $\mu\text{g}/\mu\text{l}$ for *pUC*; 0.01 $\mu\text{g}/\mu\text{l}$ for *B. subtilis*; 0.065 $\mu\text{g}/\mu\text{l}$ for *E. coli*). The above study demonstrates that MPC thresholds can be predetermined and catalogued for bioterror agents. Publishing MPC data may help with optimal PCR assay design for faster and more accurate detection of the agents in case of a bioterror outbreak when time to detect becomes crucial.

Schar Room 203

Poster Board No. 017 THE EFFECT OF LIGHT TYPE AND SPECTRUM ON FIR (*ABIES BALSAMEA*) NEEDLE ABSCISSION. Samantha P. Rowland, carrie.rowland@wright.edu, 747 Hawk Avenue, Tipp City OH 45371. (Tippicanoe Middle School)

Natural production of ethylene gas, coupled with heat, likely trigger fir (*Abies balsamea*) needle abscission in Christmas trees. While research has been conducted to limit the effect of ethylene gas on needle abscission, methods rely heavily on chemical treatments. This experiment compared two different decorative holiday light types; light emitting diode (LED) and incandescent, and three different spectrums of light; red, white, and blue on the rate of fir needle abscission as an alternative to chemical treatment. It was hypothesized that white lights, being most similar to full spectrum sunlight, in the cooler LED treatment would result in the least needle abscission. A total of 14, three foot tall, 15 year old fir trees were exposed for 21 days to red, white, or blue lights in both LED and incandescent forms (N=2 trees per treatment). Overall, the fir trees exposed to LED light exhibited the least needle loss, however, color also seemed to make a difference. Trees exposed for 21 days to red LED light lost

the least number of needles (3,625), while those exposed to white incandescent light lost the most (24,509). Fir trees exposed to red incandescent light did almost as well as those exposed to red LED light. While both blue and red light drive photosynthesis well, both also trigger stomatal opening. Stomatal opening, however, is much more sensitive to blue light than to red. Blue light alone may stimulate more water loss and drying which may have been more deleterious than its beneficial effect. It is likely that the red LED and red incandescent trees lost fewer needles for this reason. The white incandescent treatments tended to generate more heat (2-5°F), and were likely more drying. This research indicates that the best light type and color for a Christmas tree is LED in the spectrum of red.

Poster Board No. 018 CONTROLLING THE FACTORS OF RUST ON STEEL. James C Mangicaro Jr, monica.spence@gmail.com 812 Hartz Dr. A, Lebanon OH 45036(Royalmont Academy, Mason OH 45040)

This experiment identified the different factors causing steel to rust. The hypothesis was that if a steel sample is left outside and or exposed to water the steel sample will rust. Ninety steel washers were used in this experiment. The types of steel washers used were stainless steel, galvanized steel, uncoated steel, and zinc coated steel. To produce uncoated steel washers, the galvanized coating was removed from some of the galvanized washers by soaking them in vinegar for several days. The chemical reaction is $Zn + 2H_2O \rightarrow Zn(OH)_2 + H_2$. In the experiment, four different types of water were used: salt water, rain water, commercial available bottled water, and bottled water with added WD-40™. One separate set of washers was used as a control (the washers that didn't have any water applied to them). Forty-five washers were attached to two peg boards. One board was treated inside and one was treated outdoors. Each board was sprayed two times a day with each type of water. The temperature and humidity around each board was recorded daily. Final results caused me to conclude that the washers exposed to water rusted more than those that were not exposed to water, confirming the hypothesis. It was also discovered that the washers on the inside board rusted more than the ones on the outdoor board and application of salt water caused the most rusting. One possible reason for more rust on the inside washers could be attributed to the higher inside temperature and relative humidity. The control washers that were left outdoors also showed additional signs of rusting. The findings from this experiment may be useful in identifying ways to keep steel from rusting. Rust is an oxidation process. The chemical reactions are $Fe + \frac{1}{2}O_2 + H_2O \rightarrow Fe(OH)_2$ and $2Fe(OH)_2 + \frac{1}{2}O_2 + H_2O \rightarrow 2Fe(OH)_3$.

Poster Board No. 019 ANTIOXIDANT LEVELS IN VARIOUS TYPES OF VITAMIN WATERS. Jane Kim, 13jkim@beaumontschool.org, 4960 Foxlair Trail, Richmond Heights OH 44143. (Beaumont School)

Countless people in the world suffer from degenerative diseases, such as diabetes and cancer. Free radicals are one of the deadly root causes. Antioxidants neutralize free radicals and prevent such fatal effects from occurring. People often turn to health drinks for vitamins and nutrients, especially vitamin waters. With so many available, the choice is difficult. This project tests various types of vitamin waters to reveal which ones hold the most and least antioxidants. By examining the nutrition labels of seven drinks, it was hypothesized that Vitamin Water Rise® held the most antioxidants because of its very high percentage of vitamins C and A, while G2® had the least. This hypothesis was tested by using a spectrophotometer, which measures light intensity. 200 µL of the radical solution, 2,2-diphenyl-1-picrylhydrazyl, was mixed with 3 mL of methanol and 5 µL, 10 µL, 15 µL, and 20 µL of the vitamin water being tested each respective time. The spectrophotometer measured the radical solution's light absorbance before and after the vitamin water was added. By plugging in the recorded initial and final absorbances

of each of the vitamin waters into the equation $1/(final\ absorbance - initial\ absorbance)$, the percentage of radicals inhibited was determined. After plotting the results, the IC50 (the amount of vitamin water needed to inhibit 50% of the free-radicals) was determined. From these results, it was concluded that the initial hypothesis made was partially incorrect. Nutrient Enhanced 365® had the lowest IC50 of 9 µL, showing that it had the highest amount of antioxidants. It had 7 times more antioxidants than Propel Berry®, which had an IC50 of 60 µL and showed to have the lowest concentration of antioxidants that could be plotted. Function® and G2® both had the lowest amount of antioxidants, inhibiting less than 1% of the radicals. The results of Function® and G2® were not able to be plotted to determine their IC50s due to the extremely low concentrations of antioxidants, which could not inhibit at least 50% of the radicals. Vitamin Water Rise® had the second lowest IC50 of 13 µL and the second highest concentration of antioxidants. The conclusions were quite unexpected because the vitamin water drinks that specifically advertised the excellent antioxidant abilities the particular drink had, notably Propel Berry® and Propel Grape®, had some of the lowest amounts of antioxidants. These results indicate that some product labels may overstate the true nutrient capability that foods have.

Poster Board No. 020 RADIO FREQUENCY IDENTIFICATION (RFID) TECHNOLOGY: A NOVEL METHOD TO ASSIST THE BLIND, THE VISUALLY IMPAIRED AND DEMETIA PATIENTS. Aman Kumar, kumarhome@yahoo.com, 4637 Forest Ridge Drive, Mason OH 45040. (William Mason High School).

There are many disabilities without simple cures including blindness and dementia. While others work to find medical solutions to these problems, computer assisted technology can be used to help improve quality of life. The application of Radio Frequency Identification (RFID) to enable the blind and visually impaired and dementia could be of great assistance. The hypothesis was that RFID technology can be applied to help a blind person improve his or her independence and safety at home. RFID chips work like a sensor and can be used to control surroundings for the personal comfort and safety of the person. In the experiment, only passive RFID chips were used as it does not require any battery. Testing of over 100 chips with 13.56 MHz vs. 900 MHz each showed that 100% of the 900 MHz chips read with accuracy at a distance of 1 meter while less than 10% of 13.56 MHz chips were read accurately. Testing of the portable 900 MHz RFID scanner with the computer was done over 10 times and showed that the instructions were 100% accurate when the simulated blind person walked within 1 meter of the 12 areas where RFID chips were placed in a house. Visual Basic (VBA) converted commands typed in Microsoft® Excel® by the caregiver to voice output. Testing of the Excel® based instructions (typed by simulated caretaker) linked to Visual Basic programming showed that instructions were immediately voiced to the simulated blind person. Testing confirmed that whenever a person equipped with the scanner came into an area where RFID chips were installed, he or she was guided accurately by voice instructions associated with the RFID chip. This RFID-based system could make the home safer by allowing for increased independence.

Poster Board No. 021 THE EFFECT OF PAINTBALL IMPACT ON GOGGLE INTEGRITY IN WINTER TEMPERATURES. Michael Kruzer, mskruzer@aol.com, 12493 Bentbrook Drive, Chesterland, Ohio 44026 (West Geauga High School).

Paintball is the 3rd largest alternative sport, played by 10,357,000+ individuals in the US alone in 2006. Paintball is relatively safe, but when eye injuries result from the impact of high velocity paintballs, they are often severe and can lead to blindness. Eye injury incidence in 2000 exceeded 1200, with 40% pediatric. Students use paintball masks, but often wear safety or ski goggles because of cost and availability, while proper eye protection with a certified ASTM F1776-10 full-face paintball mask can prevent 97%

of injuries. It was hypothesized that if protective eyewear was impacted by paintballs shot within a 3m distance in winter temperatures (-5°C – 0°C), lens integrity would be compromised, risking severe eye injury. 2 safety goggles, 1 ski goggle, and 2 full-face paintball masks were tested at different ranges to assess their ability to withstand paintball force at different ranges in winter temperatures. The paintball marker was calibrated to 86.26-87.48 m/s, tests were performed at distances of 12.2m, 9.1m, 6.1m, 3.0m, and 1.5m from the goggles; each lens was shot 5 times, cleaned, inspected for damage, and repeated at the closer distance. The hypothesis was partially supported- the 2 paintball mask lenses and the AO Safety Impact Goggle withstood the force of impact to 1.5m. The MSA Safety Goggle and the Smith Ski Goggle failed at 3.0m. The limited number of trials does not prove that impacts of 1.5 or 3.0m are safe even with appropriate masks. ASTM F1776-10 certified masks designed for paintball should be used during paintball to prevent serious eye injuries.

Poster Board No. 022 DEVELOPMENT OF A SINGLE-USE, DISPOSABLE CHOLESTEROL BIOSENSOR USED IN HUMAN SERUM. Alice T. Catanzaro¹, alicecatanzaro@roadrunner.com, Metini Jayasupab², mxj53@case.edu, Chung-Chiun Liu², cx19@case.edu, ¹2803 Scarborough Rd., Cleveland Heights OH 44118. (Hathaway Brown School), ²Department of Chemical Engineering, Case Western Reserve University.

The rapid and simple determination of cholesterol levels is a growing need due to the recent increase in obesity and cardiovascular disease. Cholesterol level determination is a common medical procedure and necessary for determining the risk for heart attacks or strokes. It was hypothesized that a thick-film, screen-printed, disposable cholesterol biosensor using iridium nanoparticles that provides high sensitivity at a low voltage operation could be created. The biosensor was prepared by immobilizing the cholesterol oxidase enzyme, covalently bonded with Nafion (an ion conductive polymer) solution on a sensor prototype. Through the quantification of the hydrogen peroxide as a byproduct of the cholesterol oxidation reaction, the biosensor can accurately determine cholesterol concentrations from 20 to 250mg/dl at room temperature in human serum with amperometry (current vs. time) and cyclic voltammetry (current vs. potential). The preliminary results show that this biosensor can successfully detect cholesterol concentrations from 20-250 mg/dl, which includes the clinically important range of 200mg/dl and above (risk level for heart disease). The biosensor provides a good sensitivity of 2.55nA/ (mg/dl) with an R² of 0.97. A low Michaelis-Menten constant of 52.5 millimolar shows a high affinity of cholesterol oxidase for the cholesterol, translating into less enzyme needed for this detection. The sensor takes only 100 seconds run time to detect cholesterol. The lower detection limit was determined to be around 18-20mg/dl. The effectiveness of the biosensor in human serum indicates that the sensor can have a practical application for human cholesterol detection. Furthermore, the biosensor, which costs only a few dollars, is capable of accurately detecting a wide range of cholesterol concentrations with a simple reaction and just 100 seconds run time.

Poster Board No. 023 THE CORRELATION BETWEEN AERODYNAMIC LIFT AND AIRFOIL TYPE. Will C. Tekulve, dnrnk4@hotmail.com, 42 Illona Drive, Cincinnati OH 45218. (Walnut Hills High School)

This study determined which of three wing types would generate the most lift. Wings were categorized by symmetrical, under cambered, and flat bottom. The prepared tests will determine the order of lift generated. The original hypothesis predicted that the under cambered wing would be first, the symmetrical wing second, and the flat bottom third. The testing was completed by putting each of the three wing types in a wind tunnel (each wing was constructed using identical size balsa wood to keep wing area constant). Then a weight was attached to the

wing, and the leaf blower was turned on (generating wind), causing the wing to lift upward. This subtracted a reading from the scale on which the weight was placed. The difference was recorded as lift generated. This was done three times for each wing, called one testing session, and the testing session was repeated five times. The results state that the under cambered wing was first overall in lift generated, with an average lift of 37.2 grams. The flat bottom wing was second, with an average of 16.1 grams. The symmetrical wing generated the least lift, with an average of 13.7 grams. These results signify that the shape of the under cambered wing is the most effective choice for a high-lift and low-air-speed aircraft.

Poster Board No. 024 STUCK ON SLUMP: A TEST OF LIGHTWEIGHT CONCRETE. Mica L Brooks, mbrooks@students.theelms.org, 2427 Covington Road, Akron, OH 44313. (Our Lady of the Elms High School)

The purpose of the experiment was to determine if a concrete slump test is an accurate way to test the strength of uncured lightweight concrete. The ASTM procedure number for a slump test is C143A. Previous research and observations showed that the use of a slump test with lightweight concrete could have some faults, due to the texture and other features of the aggregates in the lightweight concrete. Three slump tests were performed using perlite, vermiculite, and pea gravel aggregate mixtures. The slump averages of each aggregate mix were compared to the average compressive strengths of the aggregates from previously cured cylinders. The hypothesis was that if these lightweight aggregates are used in a concrete slump test, then the slump test would not be accurate in relation to the compressive strength of the concrete. The vermiculite had a slump of 1/2 in. (13 mm) and a relative compressive strength of 48.5 psi/ lb (736.2 kPa/kg), the perlite had a slump of 1/4 in. (6 mm) with a strength of 195.96 psi/ lb (2974.7 kPa/kg), and finally the pea gravel had a slump of 5 2/3 in. (144 mm) with a strength of 181.5 psi/ lb (2755.2 kPa/kg). The hypothesis was supported. The slump tests are not accurate in relation to the relative compressive strengths. The results demonstrated that slump tests are not a good test of strength for lightweight concrete.

Poster Board No. 025 THE EFFECT OF IRON ON CARBON SEQUESTRATION IN FRESHWATER DIATOMS. Samer Alkhalili, samer.alkhalili@gmail.com, 4691 fairway Lane, Sylvania Ohio 43560 (Toledo Islamic Academy).

The large increase in atmospheric carbon dioxide (CO²) implies that CO² emissions exceed carbon sequestration. This project explores the effect of iron on the growth rate of freshwater diatoms. It is hypothesized that exposing diatoms to an optimal concentration of iron will produce the most growth in diatoms in a set period of time. Counted samples of diatoms were placed into six pairs of flasks, each set of two containing a different dilution - a control group with no iron added, 1nM, 5nM, 10nM, 50nM and 100nM - of iron-enhanced spring water solution at 23 °C. Over a period of 14 days, well-mixed samples from each flask were taken on days 1,3,5,9,11, and 14 and diatoms counted using a Neubauer Counting Chamber under a compound microscope. The number of diatoms per milliliter in each flask was determined and then converted into overall percent increase. The level of carbon dioxide in parts per million (ppm) was measured using the Control Wizard CO₂ Test kit on days 1 and 14 for each of the control and 50nM iron solution. For accuracy, three replications of the experiment were conducted. The 50nM concentration of iron produced a 77% decrease in the level of carbon dioxide on Day 14 compared to Day 1, while the control produced a 31% decrease. The 5nM concentration of iron produced the most growth in diatoms, accounting for a total increase of 182% on average. Both the 10nM and 50nM solutions were moderately effective, producing a 167% and 166% growth increase, respectively. The 100nM solution was the least effective with only an increase of 114%. The control and the

1nM solutions produced a limited growth with only 143% and 147% increases, respectively. These results imply that diatoms can react to small amounts of iron in their environment and the optimal concentration to remove the most carbon dioxide from the atmosphere was around 5 nM. These findings suggest that iron fertilization may be adopted as a carbon sequestration strategy.

Poster Board No. 026 THE EFFECTIVENESS OF THE SOLAR DISINFECTION METHOD (SODIS) IN TREATING CONTAMINATED WATER. Osama Alkhalili, osamaalkhalili8@yahoo.com, 4691 Fairway Lane, Sylvania Ohio 43560 (Maumee Valley Country Day School).

The lack of access to safe drinking water in undeveloped nations demands finding affordable water-disinfection methods. This project investigates the effectiveness of the solar disinfection method (SODIS) in treating contaminated water. It is hypothesized that exposing contaminated water to sunlight for a specific time will be effective in disinfecting the contaminated water. All tools were sterilized by boiling prior to collecting a water sample from Lake Olander in Sylvania, Ohio. Two clean 16-oz PET plastic bottles were filled with the lake water, placed onto a dark, metal sheet beneath a lamp with a Daylight Blue Reptile bulb and exposed to UV-A light at 350 nm for 12 and 24 hours, respectively. A third PET bottle was filled with filtered lake water using a Whitman Filter Paper and exposed to UV-A light for 24 hours. One cup of the lake water was boiled for 15 minutes. Samples were cultured on tryptic soy agar plates. Bacterial colonies in each plate were counted after 24, 48, 72, and 96 hours. The entire experiment was repeated two additional times. In the untreated sample, the average numbers of bacterial colonies were 95, 170, 320, and 500 at 24, 48, 72, and 96 hours, respectively. Boiled sample showed no bacterial growth over the 96-hour period. The 12-hour SODIS sample resulted in an average bacterial growth of 30, 45, 75 and 130 colonies at 24, 36, 48 and 96 hours, respectively. The unfiltered 24-hour SODIS sample resulted in an average bacterial growth of 5, 8, 12, and 22 colonies at 24, 48, 72, and 96 hours, respectively, while the filtered 24-hour sample had 2, 4, 7, and 12 colonies at 24, 48, 72, and 96 hours, respectively. Results showed that boiling is the most effective method for disinfecting contaminated water. The SODIS method could be fairly effective, if optimal exposure time is used. The turbidity of the water may reduce the efficiency of the SODIS method, which can be corrected easily by water filtration. These findings suggest that the SODIS can be adopted as a water-disinfection method in undeveloped nations that do not have the means and infrastructures to clean and disinfect their drinking water.

Poster Board No. 027 THE EFFECTS OF GREEN MATERIALS UTILIZED AS ABSORBENTS IN OIL SPILL CLEAN UP. Hannah A. Barlow, mbarlow25@yahoo.com, 7245 Zwickle Rd., Logan OH 43138. (Logan-Hocking Middle School)

This project began out of concern over the 2010 Gulf of Mexico oil spill cleanup efforts, to determine which materials would best absorb oil. It was hypothesized that "green" materials could be used to effectively absorb oil. Materials used were 1.5 cattail seed heads, 2 corn cobs, 4 pine cones (Spruce), and 1 cup (227kg) Lake Huron zebra mussel shells. These "green" materials were crushed to measure one-half cup (113kg), and then placed into each of the one cup (227kg) capacity funnels with 6 ½ inch (16.5cm) necks. Next, one-half cup (118ml) of used motor oil was poured into each of the funnels to drain into one cup (250ml) glass beakers. Cattail seed heads absorbed 2.5 oz. (75ml) of oil or approximately 60%. Corn cobs absorbed 2.02 oz. (60 ml) of oil or approximately 50%. Pine cones absorbed .51 oz. (15ml) or approximately 13%. Zebra mussel shells absorbed .34oz. (10ml) or approximately less than 1%. These results indicate that it would take approximately 3 cattails to absorb one cup (236ml) of oil. Based on 16 cups (3784ml) per 1 gallon, it would take 48 cattails to absorb one gallon of oil, and therefore 2,016

cattails per barrel of oil based on a 42 gallon barrel. Since 60,000 barrels of oil were leaked daily during the 2010 Gulf oil spill, it would take approximately 120,960,000 cattails to absorb one days worth of oil from the Gulf oil spill, or 11,007,360,000 cattails to absorb the 91 days worth of oil spilled into the Gulf of Mexico. This research demonstrates that green technology could be considered and used as an environmentally sound solution for future oil spills.

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Poster Board No. 033 AQUATIC OIL SPILL CLEAN-UP. Abigail L Myers, myersa13@embarqmail.com, 4251 N County Line Rd, Sunbury, OH 43074 (Big Walnut Middle School)

Oil produced offshore to meet energy needs is transported through aquatic environments. In offshore drilling and production (e.g., BP Deepwater Horizon) and oil transport (e.g., Exxon Valdez), accidental spills occur. Therefore, cleaning up spills is necessary – one method is to use sorbents. For a sorbent to be successful in an aquatic environment, it must have a high level of oleophilicity and be hydrophobic. Absorption and adsorption are processes that can remove oil from water. Through absorption, oil fills in cavities in the sorbent and through adsorption oil sticks to the material surface. This experiment investigated how well synthetic (polypropylene, polyurethane, and polyester) and organic (cotton, straw, and sawdust) sorbents remove oil from water by absorption and/or adsorption. Initial research led to the hypothesis: synthetic sorbents would remove more oil than natural organic sorbents, with polypropylene being the best. Each sorbent (1.5g) was placed into a beaker containing an oil slick (20 ml) floating on the water surface (150 ml), timed (5 min), and removed. The masses of used sorbent and fluids were determined, and volumes of remaining fluids were measured. The synthetic sorbents demonstrated greater effectiveness than natural organic sorbents, with a mean weight ratio (mass of oil removed to mass of sorbent used) of 9.5, compared to 7.9 for organic sorbents. Based on this experiment, polyester removed the most oil, with a weight ratio of 13.5, followed by cotton (12.2), polypropylene (9.4), sawdust (6.6), polyurethane (5.5) and straw (4.9). Additional work could include revised methods to simulate wave action.

Poster Board No. 034 LEAD CONTENT OF SCHOOL DRINKING WATER. Halle A. Miller, millerbdhc@aol.com, 13684 Janell Drive, Columbia Station OH 44028 (Columbia High School)

The goal of this project was to discover how the lead content of drinking water varied between school buildings of different ages. The objective was to determine if there was a direct correlation between school age and the lead content of its drinking water. The hypothesis was that if a school is older, the lead content of the drinking water will be greater because of different piping and soldering methods used in the past. Three water samples were collected from each of ten different public high schools from a restroom sink. Each sample was collected from a faucet running cold water and the test tubes were sealed with Parafilm. A stopwatch was used to time thirty seconds between samples. The samples were tested at the Avon Lake Water Filtration Plant, with help from a qualified scientist, using the graphite furnace of an Atomic-Absorption Spectrometer. Standard samples were analyzed for calibration and then conducted on Test Group #1. A blank sample was run to recalibrate the machine and the process was repeated for Test Group #2 and then Test Group #3. The standard deviation results in parts per billion (site one 2.68ppb, site two 0.40ppb, site three 0.35ppb, site four 0.91ppb, site five 9.45ppb, site six 0.38 ppb, site seven 9.45ppb, site eight 0.68ppb, site nine 0.17ppb, site ten 0.69ppb), were under the EPA specified 15ppb. However, some of the raw samples reached levels of 20.0ppb and 25.3ppb. The results were found to support the hypothesis, on average. The schools built before 1967 had greater lead contents, on average, and the schools built during or after 1967 had little to no lead detected in

the averaged samples. In conclusion, the age of a building does affect the lead content of its drinking water.

Poster Board No. 035 THE OPTIMAL OIL ABSORBANT CLEAN-UP ANALYSIS Mitchell K. Pallaki mcorrigan@metrohealth.org Saint Raphael School, Bay Village, Ohio 44140

Oil spills are dangerous and economically devastating. This study evaluates which substance will absorb/adsorb the most oil in salt versus fresh water, and therefore, be the optimal method for oil spill clean-up. It was hypothesized that booms made of natural substances, such as hair and dog fur, when tested in a water-to-oil solution of a constant concentration might perform better at absorbing oil than polypropylene, the industry standard. Booms tested in salt water will absorb more oil than in fresh water baths. N=20 fresh water trials and N=20 salt water trials using 40-19g booms. They were prepared from each of the following substances: hair, dog fur, dryer lint, polystyrene, polypropylene and peat moss. Each were tested to determine the booms' absorptive properties in simulated oil baths of both fresh and salt water. Booms were placed in oil:water baths with a 750:100 ml ratio for 5 minutes and removed. The remaining oil and water volume was measured and subtracted from the original volume, and the amount of oil and water absorbed was calculated. The percentage of oil absorbed to the total amount of liquid in the Fresh Water Bath is as follows: Hair 84%, Dog Fur 84%, Peat moss 80%, Polypropylene 79%, Polystyrene 75%, Lint 10%. The percentage of oil absorbed to the total amount of liquid in the Salt Water Bath is as follows: Dog Fur 99%, Polypropylene 97%, Peat moss 93%, Polystyrene 77%, Hair 74%, Lint 13%. The average oil absorption in the salt water and fresh water for the various substances were similar. The polypropylene, hair, and dog fur ab/adsorbed the most oil. Boom efficiency was better in each case in salt water, except for hair. Dog fur efficiency exceeded polypropylene in both environments. According to this study, dog fur is the optimal, environmentally friendly substance for oil spill clean-up.

Poster Board No. 036 ROE CELL PROCESSING. Takeisha L. Hankins, thankins@noblesolutions.org, Thurgood Marshall High School, Dayton OH 45417

Roe has been identified as an alternative resource for laser and optical based sensor materials. For example, roe cells that have been sonicated are in high use for laser based electronics such as higher performance systems required for information gathering, transmission, processing storage and display for control of weapons systems and for energy generation and direction concepts in aircrafts. This project was designed to test roe cells and their capability to break down into smaller molecules using the probe sonicator. Through DNA processing roe is sonicated, filtered, mixed with CTMA (Hexadecyltrimethylammoniumchloride), purified, and dissolved in butanol. There is a great demand for roe cells that have completed this process. It is hypothesized that if roe cells are broken into smaller molecules with a probe sonicator then the molecular weight will be much smaller. Continuous trials of sonicating roe cells for 10 cycles revealed diverse changes in molecular weight. For the first week of data, the molecular weight appears to be around 500kDa and 1300kDa. The goal was to get a molecular weight of 200kDa in the third trial, which was achieved through 15 cycles of sonication.

Poster Board No. 037 ANALYSIS OF NUTRITIVE VALUES OF PSEUDO-CEREALS, CEREALS & LEGUMES Kanithra Chandra Sekaran, sandalraj@gmail.com 7345 Popham Place, Solon, OH 44139 (Solon High School)

The purpose of this study is to investigate the nutritional profile (lipid, protein and carbohydrate content) of three different food categories such as legumes - Horse gram (HG), cereals - Rye (RY), and pseudo-cereals - White Quinoa (WQ) & Red Quinoa (RQ). The hypothesis of

this study is that HG has the highest protein, lowest carbohydrate and lipid content followed by WQ, RQ and RY. This was tested by a solubility test using the solvents methylene chloride and hexane. The lipid content of each of the grains was quantified after separating the lipids using a non-polar solvent i.e., hexane. The nature of the lipid (saturated or unsaturated) was determined using Br₂-acetic acid solution test. Qualitative analysis of lipids was performed using Fourier transform infrared (FTIR) and nuclear magnetic resonance (NMR) spectroscopy. The quantity of protein content was determined via a Biuret test and UV-visible spectroscopy. The relative abundance of the simple carbohydrate content was determined by Benedict's solution and the complex carbohydrates by I₂ test. Quantitative analysis of the lipid content revealed that HG < RY < WQ < RQ. Un-saturation was compared with that of fish oil (control) using Br₂-acetic acid solution test, in which numbers of drops of Br₂-acetic acid solution consumed by the lipids extracted from each food item were compared. This provides an insight on the magnitude of un-saturation. On analysis it was found that HG < RY < WQ < RQ due to the lowest lipid content in HG. Qualitative analysis of the oils using IR & NMR techniques revealed that structure of the organic compounds present in oils were similar. IR spectral analysis identify the presence of functional groups like alkenes (1462.56 cm⁻¹), carboxyl group (3016.28 cm⁻¹) in unsaturated fatty acids, alkanes (722.61 cm⁻¹ & 1376.88 cm⁻¹) along with C—H stretch (2927.79 cm⁻¹ & 3016.28 cm⁻¹). The peaks in the ¹H and ¹³C NMR spectra of the lipids were similar to those for omega-3 fatty acids in fish oil. Analysis using Biuret Test and UV-visible spectroscopy showed WQ < HG < RQ < RY. The mean protein concentration was 2.61 x 10⁻² g/1g for HG, 6.03 x 10⁻³ g/1g of rye, 2.77 x 10⁻² g/1g of WQ, and 1.24 x 10⁻² g/1 g of RQ. Analysis of simple carbohydrates using Benedict's solution test indicates that Starch > RY > WQ > RQ > HG. These carbohydrates were compared using starch (control). Analysis of complex carbohydrates using I₂-test indicated HG > RQ > WQ > RY > Starch. Identification of the nutritional profile of newer cereals, pseudo-cereals & legumes will help in the design of suitable diets for people with nutritional problems.

Poster Board No. 038 COMPARISON OF DIFFERENT LUBRICANT SYSTEMS. Anna K. Mayo, mayo16@zoominternet.net, 309 Township Road 1135, Proctorville OH 45669. (Chesapeake HS)

The purpose of this study was to test the lubricating performance of oils of equal viscosity (n= 4; base 10W oil, synthetic oil, hydraulic oil, and gear oil). The hypothesis was that a revolving wheel would revolve the longest, and would withstand the greatest amount of torque, when lubricated with synthetic oil. A viscosity test was performed on each of the oils to confirm equal viscosity levels. A revolving wheel machine was constructed using a drill motor, metal rings and plates. A small metal block was mounted into the revolving wheel. Using one sample of oil at a time, 3 drops of oil were applied to the revolving wheel using a medicine dropper. The wheel revolved 15 seconds, and then torque was applied. Torque was applied again 15 seconds later. The procedure was repeated until the wheel seized. The experiment was repeated four times, and results were averaged. Test results were: dry wheel 1 minute, 13 seconds; hydraulic oil 2 minutes 3 seconds; gear oil 2 minutes 27 seconds; base oil 2 minutes 31 seconds; and synthetic oil 3 minutes, 29 seconds. Torque results were: dry wheel 4.5 lbs/ft.; hydraulic oil 5.2 lbs/ft.; gear oil 5.5 lbs/ft.; base oil 5.9 lbs/ft.; and synthetic oil 7.1 lbs/ft. When lubricated with synthetic oil, the wheel ran the longest, and withstood the greatest amount of torque.

Poster Board No. 039 REGULATION OF PAXILLIN TYROSINE 88 PHOSPHORYLATION IN THE CELL CYCLE. Sara R. Spain sspain13@hb.edu, 24290 Letchworth Rd., Beachwood, OH 44122; Anthony, J., Scott ajs181@case.edu and Zhenghe Wang zwx22@case.edu, Case Western Reserve University Department of Genetics. (Hathaway Brown)

Paxillin, an adaptor protein involved in signaling from

focal adhesions, is an oncogene. Its activity is regulated by tyrosine phosphorylation, and data show the tumor suppressor PTPRT dephosphorylates Paxillin at tyrosine 88 (Y88). Since PTPRT suppresses colorectal cancer growth, Paxillin Y88 phosphorylation levels are higher in the tumor than in matched normal control tissue. To study the implications of this phosphorylation event, tyrosine 88 was mutated to phenylalanine (Y88F), which cannot be phosphorylated. Accordingly, Y88F mutants were less tumorigenic, growing 20% more slowly than control cells in cell culture, displaying a 71% reduction of anchorage independent growth, and completely unable to form tumors in nude mice. However, why Paxillin PY88 is tumorigenic is still unknown. Since data show that mutants experience a 10-fold increase in abnormal cytokinetic events and occurrence of multinucleated cells (N = 214 parental cells, 161 Y88F mutant cells), it is hypothesized that Paxillin PY88 has a role in the cell cycle. To test this hypothesis, HCT 116 colon cancer cells were arrested at various stages of the cell cycle to determine Paxillin PY88 levels. Three Western Blot results (n=1) show that Paxillin Y88 phosphorylation occurs preferentially during mitosis. Western Blot results (n=1) also show that SRC kinase, an oncogene involved in mitosis, phosphorylates Paxillin PY88. Ultimately, understanding the role of Paxillin PY88 in the cell cycle will better explain how PY88 is tumorigenic.

Poster Board No. 040 SEROTONIN (5HT) ANTAGONISTS EFFECT ON MDA - 2B31 BREAST CANCER CELL PROLIFERATION. Aarti Kumar¹, kumarhome@yahoo.com, Dr. Laura Hernandez,² Ekta Yadav² ¹William Mason High School, ²University of Cincinnati, 4637 Forest Ridge Drive, Mason, OH 45040

Today, approximately 13.4% of women will develop breast cancer in their lifetime. Breast cancer is the uncontrolled cell growth of regular epithelial cells forming a malignant tumor through mutations or gene changes. Serotonin (5-HT) a signaling molecule also known as 5-hydroxytryptophan is significant in the processes of the mammary gland. Alteration in 5-HT production and tryptophan hydroxylase 1 (TPH1) enzyme activity leads to enhanced proliferation of breast cancer cells, which is opposite to what occurs normally. The project hypothesis was that if the 5HT receptors: 5HTR2B and 5HTR1D are blocked with receptor antagonist treatments; there will be less MDA-MB-231 cell proliferation and less Cyclin D1 or mRNA gene expression. The methodology included cell culture of MDA-MB231 breast cancer cells, RNA isolation/cDNA synthesis, reverse transcription, MTT Assay, and Quantitative PCR (qPCR). Based on the MTT Assay, the 5HTR1D antagonist proved to be more effective, decreasing proliferation of MDA-MB231 cells by more than 37% at a concentration of 100 μ m. This analysis is statistically valid because the T-Test was 0.0007 (< 0.05). The 5HTR2B antagonist decreased Cyclin D1 gene expression from 1.1 to 0.01 relative fold differences at an antagonist concentration of 100 μ m. This indicates a 5HTR2B treatment effectively reduces the amount of Cyclin D1 gene expression. These results support the hypothesis that Cyclin D1 expression decreases and breast cancer cell proliferation decreases after antagonist treatment.

Poster Board No. 041 THE REGULATION OF METABOLIC INFLAMMATION BY MACROPHAGE KLF2. Yasemin Cobanoglu, ycobanoglu14@gmail.com, Wendy A. Goodman, Yoichi Takami, Nikunj Sharma, Ganapati H. Mahabaleswar, G. Brandon Atkins, Mukesh K. Jain, Case Western Reserve University, Dept of Medicine, Cleveland OH 44106. (Hathaway Brown)

Metabolic inflammation is associated with obesity-induced insulin resistance and enhanced susceptibility to atherosclerosis. Insulin resistance is a chronic inflammatory condition mediated by activated, tissue-resident macrophages. These macrophages accumulate in the liver, skeletal muscle, and adipose tissue, and secrete pro-inflammatory mediators to cause tissue dysfunction. Current studies explore the role of Kruppel-

like Factor 2 (KLF2), a zinc-finger transcription factor, in modifying metabolic inflammation *in vivo*. The basis of the hypothesis states that macrophage KLF2 regulates metabolic inflammation via repressive effects on NF κ B. Mac-KLF2^{ΔΔ} mice develop accelerated obesity when placed on a high-fat diet, gaining an average of 28.7g±0.8g during 20 weeks of high-fat feeding, compared to control mice which gained an average of 22.1g±0.6g (p<0.01, n=10-12 mice per group). Glucose tolerance was also impaired in Mac-KLF2^{ΔΔ} mice compared to control mice 30min after intraperitoneal (i.p.) glucose injection (592mg/dL ± 12mg/mL versus 436mg/dL ± 14mg/dL, respectively, p<0.05). In addition to increased obesity and decreased glucose tolerance, Mac-KLF2^{ΔΔ} mice also showed increased infiltration of proinflammatory macrophages into visceral adipose tissue; these macrophages expressed significantly elevated TNF α , IL-6 and IL-1b (gene expression elevated by more than 2-fold over control macrophages, n=3, p<0.05). Crossing Mac-KLF2^{ΔΔ} animals to ApoE^{-/-} mice results in enhanced susceptibility to experimental atherosclerosis. KLF2 suppresses the transcriptional activity of NF κ B, a central pro-inflammatory pathway that activates many macrophage gene targets. In Mac-KLF2^{ΔΔ} macrophages, promoter regions of NF κ B target genes show enhanced recruitment of NF κ B p65 and decreased occupancy by the co-repressor molecule NCoR. KLF2 has an essential role in modulating macrophage differentiation and function.

Poster Board No. 042 THE EFFECTS OF RACK1, NHERF1, AND PKC EPSILON ON CFTR MEMBRANE STABILITY IN CYSTIC FIBROSIS. Danielle Jones, daniellejones@thecopiousgroup.com 3555 Runnymede Blvd. Cleveland Heights, OH 44121. (Hathaway Brown)

The Cystic Fibrosis Transmembrane Conductance Regulator (CFTR) is a protein in the apical membrane of epithelial cells that acts as a chloride-ion pump. Defects in CFTR activation, expression, or localization result in the disease Cystic Fibrosis. Previous studies have shown that interactions between CFTR, RACK1, NHERF1 and PKC ϵ play a role in expression and activation of CFTR in Calu3 epithelial cells. NHERF1 interacts directly with CFTR through its PDZ1 and PDZ2 domains and regulates CFTR channel gating, while PKC ϵ is connected to the complex by the propeller shaped RACK1 adapter protein and is responsible for CFTR activation. In order to determine the effect these proteins have on surface expression of CFTR, inhibitory peptides were delivered into the cell (RACK1 WD1-WD6 repeats, PDZ1, PDZ2), which compete for a binding spot between the endogenous proteins in the complex and disrupt their interaction. Competitive inhibition of the PKC ϵ /RACK1 interaction with the WD6 repeat inhibitory peptide, followed by biotinylation and Western Blotting, demonstrated little loss in CFTR expression (11% inhibition) at the cell surface, indicating that this interaction at WD6 may not be solely responsible for stabilization of CFTR at the membrane. Inhibition of the NHERF1/CFTR interaction with the PDZ1 inhibitory peptide demonstrated a 50% and 34% loss of membrane-bound CFTR and complexed NHERF1 respectively. Inhibiting with the PDZ2 inhibitory peptide resulted in a 68.5% loss of NHERF1 and 51% loss of RACK1. These results suggest that the NHERF1 PDZ1 domain may play a role in CFTR localization at the membrane, and the PDZ2 domain may help maintain the structural integrity of the downstream complex.

Poster Board No. 043 MALARIA SENSITIVITY IN KENYAN INFANTS AS SEEN THROUGH THE ELISA AND ELISPOT METHODS OF ANALYSIS. Alyssa M. Bryan, alyssa.m.bryan@hotmail.com 8211 Timber Trail, Chagrin Falls OH, 44023 (Hathaway Brown School)

Perhaps the most menacing disease in Sub-Saharan Africa aside from HIV, malaria kills an average of 1 million annually. Of those, 90% of deaths are in children under five-years-old, therefore understanding the anti-malaria immune response in infants is critical for prevention of mortality and morbidity. Kenyan infant blood samples (0-6 months) were tested by both cytokine ELISA and ELISPOT

to quantify the expression of immune response indicator interferon gamma (IFN- γ), and transitively, the malaria parasite as IFN- γ is secreted in the immune response to the malaria parasite. Whereas cytokine ELISA is a method used to measure the concentration of the cytokine, and transitively the antibody concentration, through colorimetric methods, ELiSpot measures the number of cells secreting IFN- γ in the sample. This analysis compared the results of samples tested using both assays to determine percent of concordance, and it was hypothesized that high concordance would result. A positive sample was deemed as that in which the measured absorbance exceeded one and a half times the positive control in ELISA and spot count exceeded the same in ELiSpot. The rate of concordance was found to be roughly 68.4% (N=100) across all nine tested antigens, including those of Merozoite Surface Protein-1 and *Plasmodium falciparum* P0 Ribosomal Phosphoprotein. Most concordant was found to be Schizont and RBC, each with 100% concordant, and least concordant MSP1-42 (3D7), with 52.4% concordant. The results supported the hypothesis, showing that the correlation existed, indicating that there was concordance between the two assays testing for malaria sensitivity.

Schar Room 265

Poster Board No. 049 A STUDY OF THE EFFECT OF SPHERICAL HDL'S STRUCTURE AND FUNCTION IN REGARDS TO CHOLESTEROL REGULATION IN THE BODY. Nayab F. Habib, nhabib13@hb.edu, Thomas Tallant, tallant@ccf.org, 24035 Wimbledon Road Shaker Heights OH, 44122, Dept of Microbiology, Dept of Preventive Cardiology, Cleveland Clinic. (Hathaway Brown School)

High Density Lipoprotein's (HDL) function is to transport cholesterol from the body's peripheral tissues to the digestive tract for re-utilization or excretion. HDL is not only injected with cholesterol from the peripheral cells but also with cholesterol-ester from Low Density Lipoproteins (LDL) catalyzed by the enzyme Lethicin:C cholesterol:Acetyltransferase (LCAT). By completing this transfer, the ultimate goal is to study the role of HDL in certain biological functions, such as cholesterol transport, reverse cholesterol transport, and its effectiveness as an anti-inflammatory agent relating cardiovascular diseases. Beginning with nHDL, containing very little cholesterol, an enzyme, ATP-binding cassette transporter (ABC A1) facilitated the movement of cholesterol from the peripheral tissue cells into the HDL particle. The particle matured by receiving large amounts of cholesterol in the form of cholesterol-ester from LDL and became large and round, hence the term sHDL. nHDL and isolated LDL were obtained from plasma, then purified LCAT enzyme catalyzed the transfer of cholesterol-ester from LDL into nHDL to assemble sHDL. The efficiency of the cholesterol-ester transfer was determined by radiometric enzyme assays. It was hypothesized that enzymatic assays would show that 99% of the time the transfer being successfully complete determined by the activity of radioactive isotopes. About 20 radiometric assays were conducted and 97% of the time there was a strong presence of radioactive isotopes, expressing that the transfer had been completed thus supporting the hypothesis. By making different mutant versions of ApoA1 synthetically, nHDL can be made from the various ApoA1 proteins and ultimately, specific biological functions of these mutants can be determined, a step crucial in understanding the existence of certain diseases and specifically designing drugs to target them.

Poster Board No. 050 THE EFFECT OF TEMPERATURE ON THE POTENCY OF AMOXICILLIN. Colleen M. Fazio, colleenfaz55@aol.com, 2395 Flyway Court, Beavercreek OH, 45431, (Carroll High School)

This experiment demonstrates how heat affects the potency of diluted reconstituted amoxicillin over time. It

was hypothesized that at higher storage temperatures, amoxicillin is less effective on *Escherichia coli*, ATCC 25922 – a strain commonly used for experimentation. The diluted amoxicillin was stored at four temperatures: -70°C, 4°C, 22°C, and 37°C, for 1, 3, 6, 14, and 20 days. After the storage time, the potency of the amoxicillin was tested using a Petri dish with *E. coli* coated agar. A filter paper disk was immersed in the diluted amoxicillin, placed on the agar, and incubated at 37°C for 24 hours. The clear area around the filter paper disk, void of *E. coli* growth, was measured and recorded. Results supported the hypothesis. Data for samples stored at 4°C, 22°C, and 37°C from each of the sample days were base-lined on the results at -70°C. An increase in area around the filter paper indicated a higher antibiotic potency. At 4°C the area around the filter paper increased 6% over the baseline area on Day 1, but decreased 13% on Day 3, 18% on Day 6, 6% on Day 14, and 4% on Day 20. At 22°C there was an 8% increase on Day 1, 4% decrease on Day 3, 9% increase on Day 6, and a 6% decrease on Days 14 and 20, and at 37°C, data revealed a 20% increase on Day 1, 2% increase on Day 3, and a decrease of 7% on Day 6, 34% on Day 14, and a 40% on Day 20.

Poster Board No. 051 CONSTRUCTION OF A HIV-1 ENVELOPE EXPRESSING CLONE. Preeya Shankar, preeya.shankar@sbcglobal.net¹, Yuejin Li², yxl111@cwru.edu, ¹16500 Parkland Drive, Shaker Heights OH, 44120 (Hathaway Brown School) and ²Case Western Reserve University, School of Medicine, Cleveland OH, 44106

HIV-1 envelope protein (env) is an important immunogen in eliciting humoral immune response and is an important candidate protein for HIV-1 vaccine development. The goal of this work is to further HIV vaccine development research by experimenting with the HIV envelope protein (gp160), which is a vital protein in the process of infection of the human body by HIV. A yeast-based homologous recombination technique was used to construct a plasmid expressing HIV-1 env. The full length env gene from plasmid pREC-HIV-nfl-NL4-3 was PCR amplified and was inserted into pREC-HIV-gag-URA3-3'LTR by replacing the URA3 gene through the yeast-based homologous recombination. The constructed clone was named pREC-HIV-gag-env-His-puro-3'LTR. A His-tag gene was inserted into the 3'-end of the env gene in order to purify the expressed protein. A puromycin resistance gene was inserted downstream of the env gene to establish stable expression of the protein. The constructed clone with the envelope protein insertion was verified through PCR testing and gene sequencing. After transfection to the 293t cells for 48 hours, the envelope protein (gp160) was detected in the cell lysate through Western blot analysis, showing the results that the clone was functional and the envelope protein was expressed. For selection of stable expression cell clones, the plasmid was transfected with plasmids pREC-HIV-5'LTR-gag-pol-mu, R8.91 and VSV-G. These plasmids complemented each other and produced a pseudotyped virus in the transfection supernatant. In the next step, the pseudotyped virus will infect the 293t cell again. The virus gene will be integrated into the genome of the host cell and will constantly express the env protein. Puromycin (1 μ g/ml) will be added to the cell culture and the puromycin resistant cells will be selected and enriched. The protein expression will continue to be detected, and the expressed protein will be purified through His-tag binding chromatography.

Poster Board No. 052 DO DOGS' OR HUMANS' MOUTHS HAVE MORE BACTERIA? Wesley R. Wolf, joan@gahosp.com, 1976 Shinkles Ridge Road, Georgetown OH 45121. (Georgetown Elementary School)

This experiment was designed to test whether dogs' or humans' mouths contain more bacterial colony forming units (CFUs). It was hypothesized that young dogs would have fewer CFUs than young humans because of dietary differences. Due to humans having a higher level of dental hygiene, it was hypothesized that senior humans would have fewer CFUs than senior dogs. There were 6 test

groups, each containing 4 subjects; young humans (0-17 years), adult humans (18-55 years), senior humans (56-100 years), young dogs (0-1 year), adult dogs (2-6 years) and senior dogs (7-20 years). A sterile swab was rolled on the roof of each subject's mouth and was plated on a blood agar plate using the serial streak plating method to reduce the number of colonies to a countable level. The plates were incubated in a bacterial culture incubator at 101°F. The colonies in quadrant 4 on each plate were counted at 48 hours of incubation. The dogs had 22 colonies and the humans had 92 colonies. The mean number of colonies for the dogs was 1.83, and 91.67% of the samples fell within 1 standard deviation (+/- 3.21 colonies). The mean number of colonies for the humans was 7.67, and 75% of the samples fell within 1 standard deviation (+/- 7.09 colonies). Standard deviation confirmed that the dogs had significantly fewer CFUs in their mouths than the humans. Young dogs had more CFUs than young humans, 16 versus 12, and senior dogs had fewer CFUs than senior humans, 4 versus 37.

Poster Board No. 053 EXAMINING THE EFFECTS OF FOXO3A, A TRANSCRIPTION FACTOR ASSOCIATED WITH MUSCLE ATROPHY IN RUNT PIGLETS. Sachin R Rudraraju, sachin.rudraraju@gmail.com, 3938 Hampshire Ave, Powell OH 43065, (Olentangy Liberty High School).

Foxo3a is a transcription-factor implicated in muscle atrophy. The purpose was to identify the difference between the expression of Foxo3a in runt piglets versus normal piglets using immunohistochemistry. It was hypothesized that Foxo3a was expressed more in runt piglets than in normal piglets. Tissue samples from three pairs of piglets were used. Each pair contained one runt and one normal piglet from the same litter. Two slides were prepared for each piglet, using antibodies for Foxo3a and pFoxo3a, the inactive form. A Hematoxylin stain was used for background staining. Foxo3a and pFoxo3a Primary-Antibodies anneal to the transcription-factor. A Biotinylated-Universal-Secondary-Antibody anneals to the Primary-Antibody and is stained brown by a DAB wash. In the resulting slides, bundles of muscle fibers were clearly visible. In each bundle, one larger type-2 fiber was surrounded by several smaller type-1 fibers. Type-2 fibers are more metabolically active than type-1 fibers and provide quick bursts of high output. Qualitative analysis of the images suggests that pFoxo3a was stained more in the normal piglets than the runts, especially in localized type 2 fibers. RGB values sampled from the images support this finding. This leads to the conclusion that type-2 fibers in runt piglets are being degenerated to a higher extent than the same fibers in normal piglets. Runt piglets lose this important source of metabolic activity, which may be a cause for metabolic health disorders in later life. Western blotting can be used to further study these proteins quantitatively.

Poster Board No. 054 DO THE DOCTORS WHO PRACTICE AT SOUTHERN OHIO MEDICAL CENTER OR THE TEACHERS AT WHEELERSBURG LOCAL SCHOOLS HAVE MORE CONTAMINANTS ON THEIR CELL PHONE? Mary M. Martin, mmmarymarlene99@gmail.com, 7613 Sun Hill Drive, Portsmouth OH 45662. (Wheelersburg High School)

The purpose of this experiment was to determine whether the cell phones belonging to doctors who practice at Southern Ohio Medical Center (SOMC) or the cell phones belonging to Wheelersburg High School teachers contained more contaminants. The hypothesis was that doctors' cell phones would contain more contaminants than those of teachers. To test the hypothesis, fifteen teachers' and fifteen doctors' cell phones were individually swabbed over all surfaces of the cell phone using sterile swabs. The participants filled out a short questionnaire regarding cell phone usage during work hours. Each participant's cell phone was swabbed and the swab used was immediately transferred onto a five percent sheep blood agar. Sterile gloves were worn and changed for each participant. After repeating the process with each participant, the agars

were kept at room temperature. Following seven days of growth, the agars were assessed by Dr. Cassity at SOMC to identify and count the contaminants. In conclusion, the hypothesis was not supported as teachers had a total number of 598 contaminants while doctors only had 297 colonies of contaminants. 211 contaminants discovered on teachers' cell phones were abnormal skin flora, including, but not limited to, *staphylococcus aureus* and *bacillus cereus*, as well as 54 colonies discovered on doctors' cell phones. The participating teachers saw, on average, 105 students a day. Participating doctors saw an average of 20 patients per day. 90% of the total participants do not wash their hands after using their cell phones on a regular basis.

Poster Board No. 055 HISTONE MODIFICATIONS WITH MECP2. Shefali S. Shah, shefali100@yahoo.com, 469 Township Road 1535, Proctorville OH 45669. (Fairland High School)

Histone proteins coil DNA—together into nucleosome structures leading to the formation of chromatin. Tightly bound nucleosomes promote gene repression, while loosely bound nucleosomes help activation of DNA transcription. Histones have an amino tail. MeCP2 can recognize histone H3 through its amino tail. By modifying histone tails and recruiting MeCP2, the compaction of chromatin changes. MeCP2, "methyl CpG binding protein 2," is a protein responsible for histone compaction and is involved in normal brain functions. MeCP2 mutations cause Rett Syndrome, a genetic defect leading to mental retardation. This project tested whether MeCP2 can recognize modified histone H3. The histone H3 tails were modified at several different amino acids. Amino acids (Lysine 27, Lysine 9, Lysine 4) were modified by attaching a methyl or acetyl group. Then, using western blot, MeCP2's ability to bind to the modified tails was tested. The hypothesis was that MeCP2 would recognize specific modifications of histones H3. The results showed that MeCP2 attaches to transcription repression markers: H3 Lysine 9 tri-methyl and H3 Lysine 27 di-methyl. It also attaches to H3 Lysine 4 di-methyl (activation marker). MeCP2 does not attach to the transcription activation markers: H3K9/14 or H3K4 me3. Nor does it attach to H3K27 me3 (repression marker). It appears that MeCP2 cannot differentiate between these activation and repression markers tested. Further tests will be required to investigate if MeCP2 activity is solely due to its interactions with histone H3 with a single modification or requires other partners to promote gene repression.

Poster Board No. 056 THE EFFECTIVENESS OF GARLIC OIL, THIEVES' OIL, COLLOIDAL SILVER, AND AMOXICILLIN WITH CLAVULANIC ACID IN INHIBITING THE GROWTH OF STAPHYLOCOCCUS AUREUS AND STAPHYLOCOCCUS EPIDERMIS WITHOUT INHIBITING THE GROWTH OF LACTOBACILLUS ACIDOPHILUS. Alex C. Carrico, chrisarrico@frontier.com, 1229 Bickel Church RD NW, Baltimore OH, 43105 (Liberty Union High School)

This study compares the effectiveness of garlic oil, colloidal silver, Thieves' oil, and Amoxicillin with Clavulanic Acid in inhibiting the growth of *Staphylococcus aureus* and *Staphylococcus epidermidis* without harming *Lactobacillus acidophilus*. Thieves' Oil is a combination of natural antibacterial agents such as lemon, cinnamon, and clove oil. Colloidal silver is hypothesized to be the most effective agent because it kills by decomposition, reacting with the oxygen in the bacterial cell wall. Garlic and olive oil were mixed in a 1:1 ratio for easy application. Before inoculation, circles of blotting paper were soaked in each agent to be used as sensitivity disks for a modified Kirby-Bauer test. Thirty µg Amoxicillin disks were used. Mueller Hinton agar was inoculated using Kirby Bauer inoculation with a 0.5 McFarland Turbidity Standard for the *Staphylococcus aureus*, *Staphylococcus epidermidis*, and *Lactobacillus acidophilus*. After inoculation, one disk was applied to each dish and put into an incubator for 24 hours. The zones of inhibition surrounding each disk were recorded after experimentation. The Amoxicillin had an

average zone of 32 mm for *Staphylococcus aureus*, 35 mm for *Staphylococcus epidermidis*, and 26 mm for *Lactobacillus acidophilus*. The Thieves' oil had an average zone of 15 mm for *Staphylococcus aureus*, an average of 12 mm for *Staphylococcus epidermidis*, and no zone for *Lactobacillus acidophilus*. The colloidal silver and garlic oil had no zone for each trial and were therefore ineffective. This study demonstrates that alternative remedies may have efficacy in treating some antibiotic resistant infections.

Poster Board No. 057 THE KEY ROLE OF ADRA1D IN MAKING B-BLOCKERS MORE EFFECTIVE. Peeyush Shrivastava, 6555 Glenstone Way, Mason OH 45040 (Mason HS).

The adrenergic receptors mediate the actions of norepinephrine and epinephrine throughout the body; stimulation of an adrenergic receptor occurs by epinephrine binding to an agonist. The myocardial response is a fatal increase in heart rate, known as a ventricular tachycardia (VT). The objective of this study is to identify the cause for the failure in beta-blocker treatments, and identify how to overcome the problem. ADRA1D was the variable of gene knockdown in this study because ADRA1D was the most unique receptor subtype, showing no fluctuations in cAMP, unlike other receptors. The efficiency of ADRA1D gene silencing was determined using Western Blot analysis in which cell lysate samples were loaded onto 12% SDS gels and then transferred onto nitrocellulose membrane. For the average of the three trials conducted for Sotalol, it appears that the control heart rate of the cardiac myocytes was reduced from the initial contraction rate of 131.67 bpm to 103 bpm with the applied non-selective beta-blocker. These data are consistent with the original purpose of experimentation considering the non-selective beta-blocker did not effectively reduce heart rate to below 100 bpm. Furthermore, once ADRA1D was silenced through N-terminal encoded siRNA transfection, heart rate surmounted from the initial 131.67 bpm to 157.33 bpm; the fact that the blocker was applied simultaneously as ADRA1D was silenced and heart rate still increased in the cardiac myocytes supports the hypothesis that the 30% of failure of beta-blockers to reduce heart rate in cardiac myocytes can be traced to the key role of ADRA1D.

Poster Board No. 058 ATTACHING MOLECULES TO COWPEA MOSAIC VIRUS FOR APPLICATIONS IN DRUG DELIVERY. Aparna Narendrula aparna.n.14@gmail.com, (Nicole F. Steinmetz, nfs11@case.edu) 34240 Seminole Way, Solon OH 44139 (Hathaway Brown School)

Cancer is the second leading cause of death in America. Chemotherapy, the leading cancer treatment, treats cancer with chemicals destroying cancer cells. It does not differentiate between cancer and healthy cells, therefore results in harmful side effects. Through nanomedicine, nanoparticles deliver therapeutics to cancer while avoiding healthy tissues, increasing therapy and decreasing side effects. The goal of this research is to see if organic and benign plant viral nanoparticle cowpea mosaic virus (CPMV), can be used as a vehicle to carry drugs to target areas. The hypothesis is CPMV will bind cancer specific targeting proteins. To test this hypothesis, a sample of CPMV was purified and modified by attaching Oregon Green 488®, which was used to image and detect the particles in cells, and biotin, which served as a molecular handle to bind cancer specific targeting proteins. These CPMV nanoparticles were produced in cowpea plants and isolated from infected leaves through centrifugation and chemistry; concentration was determined using UV-Vis spectroscopy: a peak at protein's absorbance indicated CPMV's presence (0.401 absorbance). Once purified, these nanoparticles were synthesized with the dye; agarose and SDS gels and UV-Vis spectroscopy affirmed the presence of Oregon Green 488® (there was a peak (0.021) at the dye's absorbance spectrum). There were 51 and 45 dyes per particle for the samples. Biotin was attached and confirmed with a stained and unstained agarose gel and a dot blot. This unit was used to target cancer cells. This technology has the potential to replace chemotherapy in treating cancer.

Poster Board No. 059 IMMUNOHISTOCHEMICAL IDENTIFICATION OF CELLS IN THE RESPIRATORY RHYTHM-GENERATING CENTER OF THE DEVELOPING RAT BRAIN. Jennifer L. Jones¹, jlhbjones@sbcglobal.net, Catherine A. Mayer², caa4@case.edu, Christopher G. Wilson², cgw5@case.edu, ¹2201 Chatfield Dr., Cleveland Heights OH 44106 (Hathaway Brown School) and ²Dept. of Pediatrics, Case Western Reserve Univ., Cleveland OH 44106.

Episodes of apnea that can lead to long-term respiratory morbidities are one of the major problems faced by premature infants in neonatal intensive care units. This project investigated the developmental changes in expression of the underlying neurotransmitters and neural network using immunohistochemistry. The regions of the brain responsible for respiration have been extensively studied in the rat. The regulation of mammalian respiration by the inhibitory neurotransmitter adenosine evolves during early brain development. Activating adenosine A_{2A} receptors can induce apnea in young rats, but not in rats older than postnatal day 21 (P21). Sprague Dawley rats were studied at ages P0, P4, P7, P14, and P21. Brainstem tissue sections (20 µm) were taken and immunostained for neural and astrocytic marker proteins (NK1, NeuN, A_{2A}, GAD, and S100β) taking 5 samples of each age/protein combination. Commercially manufactured primary antibodies were used to characterize cell types (Millipore AB5060, Millipore MAB377, Genway GWB-32D8EE, Millipore MAB5406, and Abcam AB4066 respectively). The stained sections were viewed by a camera attached to a light microscope, and the images analyzed by Stereology Resource Center unbiased stereology software which counted the numbers of stained cells. This allowed neurons, A_{2A} receptors, GABAergic neurons, and astrocytes in the respiratory rhythm-generating center, the preBötzing Complex (pBC), to be localized and cell densities to be calculated. Neuron density (cells/10⁶ µm³) decreased 53% from 168 at P0 to 79 at P7. A_{2A} receptor density (receptors/10⁶ µm³) decreased 87% from 163 at P0 to 21 at P7. GABAergic neuron density was relatively stable over P0 to P21, with 9% variation, while astrocyte density rose 27% over P0 to P21. The observed rapid drop in A_{2A} expression in the pBC of rat pups during the first week of life suggests that the reduced susceptibility to apnea observed in maturing neonates may be a consequence of the declining role of the inhibitory neurotransmitter adenosine in the neural network controlling respiration.

Poster Board No. 060 PATHOLOGICAL EFFECTS OF TBI IN A MOUSE MODEL OF ALZHEIMER'S DISEASE. Lena J Ransohoff, LRansohoff13@gmail.com, Hathaway Brown School, 19850 Marchmont Rd., Shaker Hts. OH 44122, Olga N Kokiko-Cochran, Kokikoo@ccf.org, Bruce Lamb, Lambb@ccf.org

Alzheimer's Disease (AD) is the most common cause for dementia. Post-mortem AD brain tissues show beta-amyloid (Aβ) plaques, intracellular neurofibrillary tangles (NFT), neuroinflammation and neuronal loss. Traumatic brain-injury (TBI) is a significant risk factor for AD. At post-mortem, TBI brain tissues can exhibit AD-like neuropathological changes and patients can show memory impairment during life. This project studied a mouse model for the interaction between Aβ-deposition and TBI, using R1.40 mice, in which a transgene contains a genomic copy of the human amyloid precursor protein (APP) with a familial AD mutation. Previous studies showed neuroinflammation at 6 months of age, with Aβ plaques, learning and memory impairment after 12 months. Strain-matched wild-type (WT) mice were used as controls. At 2 months of age, WT and R1.40 mice (N=4/group) received fluid-percussion brain injury. Behavioral testing, sacrifice and pathological examination were all done 3 months later. Rotorod (motor), Y-maze (memory) and Morris water-maze (learning) were tested to assess behavior. Histochemistry characterized lesion size and cellular pathology. Rotorod testing showed equivalent deficits in percussion-injured WT and R1.40 mice. WT and R1.40 sham mice showed average of latency (in seconds) which was borderline

different between genotypes. However, WT and R1.40 brain-injured mice showed average latency of 154 ± 61 and 151.32 , respectively ($P > 0.05$). Given equal motor performance, valid memory and learning comparisons could be done between injured WT and R1.40 mice. At 3 months, memory and learning tests showed no differences between WT and R1.40. Histochemistry showed larger brain percussion-injury lesions in R1.40 mice. Conclusion: Behavioral testing established equal baseline deficits for WT and R1.40 mice at the early 3-month time-point after TBI. Therefore, valid behavioral comparisons between brain-injured WT and R1.40 mice can be done at later time-points.

Schar Room 232

Poster Board No. 064 ENERGY CONTENT FOR PROTEIN SYNTHESIS IN GERMINATING SEEDS IS DERIVED FROM STORED STARCH AND FAT. Dhweeja Dasarathy, ddasarathy@gmail.com, 391 East St Andrews Drive, Highland heights OH 44143. (Birchwood School)

Quality and quantity of protein in germinating seeds of different lentils is greater than the dry seeds. Since seeds lack photosynthetic capacity and increase in protein content is an energy requiring process, the present study was performed to determine the source of energy to improve protein content with germination. Green soy, white soy, kidney beans and chick pea ($n=4$ each) were germinated in tap water at room temperature. Protein content was quantified by the Lowry method using biocinchonic acid reduction. Total fat and triglycerides were quantified by the ether extraction and glycerol assay. Total starch as a measure of carbohydrate content was quantified by a colorimetric assay for starch. All assays were performed in triplicate. Total starch, fat and triglyceride content (all values mean \pm standard deviation in mg/g) in the dry seeds (green soy 24.2 ± 6.3 , 14.5 ± 5.1 , 12.2 ± 3.7 ; white soy 23.7 ± 7.4 , 10.5 ± 3.3 , 9.7 ± 3.1 ; kidney bean 35.2 ± 8.1 , 18.1 ± 5.1 , 16.8 ± 5.5 ; chick pea 36.1 ± 6.9 , 16.5 ± 5.2 , 15.5 ± 4.6 respectively) were significantly higher ($p < 0.01$) compared to the germinating seeds (green soy 16.4 ± 5.1 , 9.2 ± 3.1 , 8.5 ± 2.5 ; white soy 15.2 ± 3.7 , 7.2 ± 2.4 , 6.4 ± 2.1 ; kidney bean 27.4 ± 7.2 , 9.8 ± 2.3 , 7.8 ± 1.9 , chick pea 26.8 ± 6.9 , 9.9 ± 3.0 , 8.5 ± 2.5 respectively). Total protein content (mg/g) of dry seeds v. germinating seeds (green soy 2.6 ± 0.43 v. 4.3 ± 0.61 , white soy 3.1 ± 1.7 v. 5.2 ± 1.4 , kidney bean 2.4 ± 1.1 v. 3.9 ± 1.5 , chick pea 2.2 ± 0.7 v. 3.8 ± 1.9) showed significantly higher values ($p < 0.01$) with germination. Germinating lentil seeds have higher protein content, lower triglyceride, total fat and starch content. This improves the nutritive value and explains the potential source of energy for the increase in protein content.

Poster Board No. 065 SONG SPARROWS: AS TEMPERATURE DECREASES BODY SIZE INCREASES, ALWAYS? Kyle M. Davis, kdavis716@embarqmail.com, 12885 Centerburg Rd., Sunbury, OH 43074 (Big Walnut High School)

There are 24 subspecies of song sparrows (*Melospiza melodia*) in North America. Most live in western North America with only three in the east. Bergmann's Rule states that individuals within a species are larger in colder habitats, those closer to the poles. The size increase is well documented in western song sparrows (*Melospiza melodia*), but does Bergmann's Rule apply to eastern subspecies as well. The western subspecies sampled: *M. m. fallax* (south), *M. m. morphna* (middle), and *M. m. kenaiensis* (north); and eastern subspecies: *M. m. melodia* in Georgia (south), New England (middle), and northeastern Canada (north). The tarsometatarsus was measured with digital calipers to find the mean length of 123 song sparrows. These specimens were measured at the University of Michigan Natural History Museum. Mean tarsal length was compared across subspecies with ANOVA and in pairs with Bonferroni. In the west *M. m. kenaiensis* (24.8 mm) was the largest, *morphna* (22.6) intermediate, and *fallax* (21.8), the most southern, was smallest. Differences in

the east were much less, northeastern Canada (22.2), New England (21.8), and Georgia (21.4). The western subspecies differ significantly ($df = 116$; 5 ; $P < 0.001$). *M. m. kenaiensis* was significantly larger ($P < 0.001$) than all other subspecies, none of which differed significantly from each other. Bergmann's Rule describes variation in western subspecies only if the northernmost subspecies is included. In both western and eastern subspecies the insignificant cline follows the pattern predicted by Bergmann's Rule.

Poster Board No. 066 PAPER ROCKET DESIGN AND AERODYNAMICS. William A. Frey, amafrey@fuse.net, 8094 Strimple Rd., Cleves OH, 45002. (La Salle High School)

One limiting factor of the altitude achieved by a rocket is its drag. Understanding the component with the highest influence on drag and minimizing it would allow for maximum altitude. The problem that was investigated was determining what part of the rocket had the most influence on the altitude that was achieved. The hypothesis was that the rocket with the smallest components would achieve the greatest altitude. Twelve rockets were constructed with all combinations of three body lengths, two fin sizes, and two nose cone sizes. The heaviest rocket was weighed; weight was added to each rocket so that all the rockets would have the same mass, thus eliminating this as a variable. These were then launched, and the altitude was tracked using dual tracking stations to correct for wind. All the parts of the rocket influenced the drag differently, but the fins influenced the altitude the most. Six of the twelve rockets constructed with small fins, 1.9cm width by 3.8cm height, achieved the highest altitudes which ranged from 92.4m to 110.3m. The remaining six rockets had large fins, 3.8cm width by 5.08cm height, and achieved altitudes ranging from 68m to 81.1m. The six rockets with small fins achieved altitudes averaging 29m higher than those with large fins, thus supporting the original hypothesis. In current rocketry, ninety percent of the weight of the rocket is fuel, nine percent is structure weight and one percent is payload. Decreasing drag would allow for more payload, thus making the travel through Earth's atmosphere to space more economical.

Poster Board No. 067 SURFACE ALIGNMENT AT A SMECTIC A LIQUID CRYSTAL TRANSITION. Joyce Guo, jguo13@gmail.com, 23814 Edgehill Dr., Beachwood OH 44122. (Hathaway Brown School)

Controlling surface conditions of liquid crystal (LC) displays is a vital operation to a \$150B industry. When inserted into a glass cell, LC molecules become parallel, perpendicular, or tilted to the surface. The range of tilt angles was examined in the nematic phase whose orientation becomes parallel, perpendicular, or remains unchanged when cooled to the smectic-A phase. The polymer SE1211, which contains side chains that promote homeotropic alignment, was used to control the tilt angle of the LC. Previous experiments utilized a rubbing technique that altered the polymer's side chains such that the LC molecules became a tilted orientation. Because temperature also affects side chains, the working hypothesis is that higher baking temperatures, similar to strong rubbing strengths, produce greater tilt angles. Polymer SE1211 was deposited onto a semitransparent conductor-coated glass slide, baked, then rubbed so that the LC octylcyanobiphenyl exhibited a controlled oblique tilt angle in the nematic phase. All 12 samples were prepared similarly. Those baked at 240°C (3 trials) resulted in homeotropic (90°) alignment; those baked at 250°C (3 trials) resulted in planar (0°) alignment; those baked at 260°C (3 trials) resulted in planar (0°) alignment; those baked at 270°C (3 trials) resulted in a 57° angle alignment and remained in the tilted orientation upon cooling to the smectic-A phase. These angles were determined from a plot of the intensity of a laser passed through the cell vs. an applied electric field on the cell. These results support the hypothesis stated earlier in the abstract.

Poster Board No. 068 THE RELATIONSHIP OF BASS VIOL PRICE VERSUS PREFERENCE EXPRESSED BY A PANEL OF MUSICIANS. Celeste E. Smith, cesmith4242@gmail.com. (Deborah Bogard), Dempsey Middle School, 599 Pennsylvania Ave. Delaware OH 43015

The quality of an instrument's sound in a musical performance can greatly enhance an audience's pleasure. A bass string vibrates creating a sound wave. The frequency of the vibration of the string creates the pitch of the note. The four strings used on standard basses Hz (or frequencies) are 41Hz (E string), 55 Hz (A string) 72.4 Hz (D string) and 98 Hz (G string); these were tested in this study. The purpose of this research was to learn if buying a more expensive instrument resulted in a sound preferred by musicians. It was hypothesized that if a bass was more expensive, then musicians would report that they enjoyed the sound more. A group of six basses were tested. These were either built or rebuilt in 2000-2010. Three of these were less expensive (\$1,200-\$2,000) and the other three more expensive, (\$5,000-\$12,000). All basses were played into recording software, called a spectrogram, which graphed the frequency of the instruments. Musicians took a blind online survey of which sounds they preferred. Thirty-nine musicians responded, and the most preferred sound was of Bass C with twelve votes. Bass C cost \$3,125 and was built in 2004. Five voted for Bass A (cost \$2,550), one voted for Bass B (cost \$10,500), three voted for Bass D (cost \$3,125), four voted for Bass E (cost \$12,450), six voted for Bass F (cost \$8,400), and seven voted for "cannot tell the difference." There was not a correlation between the spectrogram and the survey, because the value the spectrogram showed was the same for all frequencies. The conclusion of this study is that the quality of sound produced by the basses tested was not dependent on price. Further research would greatly enhance the validity of this study.

Poster Board No. 069 RADIATION EMBRITTLEMENT OF MISSE 5 POLYMERS AFTER 13 MONTHS OF SPACE EXPOSURE Grace T. Yi¹, gyi13@hb.edu, Gianna G. Mitchell, gmitchell13@hb.edu, Claire E. Ashmead, cashmead12@hb.edu, 5375 Portchester Drive, Hudson OH, 44236. (Hathaway Brown School)

As the prevalence of satellites serving communication and navigation purposes increases, understanding the degradation patterns of space materials is becoming ever more important for designing durable space components. As a result of space radiation exposure, atomic oxygen interaction, and thermal cycling, the outer surfaces of space materials degrade when exposed to low Earth orbit (LEO). The objective of this study was to measure radiation-embrittlement-altered material properties of polymers used in spacecraft applications.

As part of the Materials International Space Station Experiment 5 (MISSE 5), 39 polymers of varying materials were flown aboard the International Space Station for 13 months. The samples were flown in a nadir-facing position and received relatively low doses of radiation. To determine the altered mechanical properties of the samples, each sample underwent bend testing, which utilized successively smaller mandrels to apply surface strain to samples placed on a semi-suspended pliable platform. The procedure included optical microscopy plus a coordinate system to ensure precision and regularity in documentation. For each flight sample, a pristine control sample was also tested. Of the 39 flight samples, 31 experienced some degree of surface cracking from the bend test, even though they were exposed to relatively low doses of radiation. None of the 39 pristine counterparts experienced any surface cracking. These results indicated that even low doses of radiation have embrittling effects on polymers. In conclusion, even minimal exposure to radiation cannot be ignored when designing materials for space use, forcing engineers to reevaluate materials previously thought to be appropriate for space use and travel.

Poster Board No. 070 SYNTHESIS AND EVALUATION OF HIGHLY ELASTOMERIC POLY(DIMETHYLSILOXANE) AEROGELS. Devon M Kilroy, dkilroy13@aol.com, 8810 Fairmount Road, Novelty, OH 44072. (Hathaway Brown School)

The freeze-drying of an aqueous clay gel results in a low-density material known as a clay aerogel. Aerogels are primarily air containing inorganic skeletal structures and when aerogels are prepared using only laponite clay, which is a synthetically layered silicate, they tend to have less desirable mechanical properties, such as very weak compression moduli, in comparison to most other materials. The addition of polymers to a clay aerogel matrix has the potential to greatly improve the various mechanical properties of the material. Polymer/clay aerogel composites have a wide range of potential applications in packaging, insulation, and as light-weight structural materials. Poly(dimethylsiloxane)/clay aerogel composites were formed by adding room temperature vulcanized poly(dimethylsiloxane), Karstedt's catalyst, which is an organometallic platinum complex and a crosslinking agent, and a surface binding agent to an aqueous laponite clay gel. The clay/water gel was blended until exfoliation occurred. Then dimethylsiloxane and Karstedt's were added to the solution. The resulting gel was placed in a rotating lyophilization shell freezer (Virtis Freeze Mobile S2EL, -85° C—70° C temperature range and with a pressure reduced to approximately 5 microbar) to sublime the water and create the finished poly(dimethylsiloxane)/clay aerogel. This aerogel was formed into a porous, elastic silicone network and it had an average density of 0.652 g/cm³; higher than most other polymer/clay aerogel composites. As demonstrated by compression testing, the resulting material lacked strength and stiffness, but demonstrated toughness with a 100% recovery and a modulus of 0.043 MPa in comparison to pure poly(dimethylsiloxane) that recovered 95.1% with fractures in the composition and a modulus of 0.341 MPa. The most noteworthy observation was that the poly(dimethylsiloxane)/clay aerogel acts elastically, recovering completely from high compressive strain without permanent deformation, even after multiple loading and unloading cycles.

Poster Board No. 071 DESIGN AND CONSTRUCTION OF AN AUTONOMOUS ROBOTIC RECYCLABLES TRANSPORTER (ARRT). Samantha B. Santoscoy, sb.santoscoy@gmail.com, Ketki Lele, klele12@hb.edu, 7870 Fox Hill Dr East, Gates Mills OH 44040 (Hathaway Brown School)

Recycling is an important aspect of modern society as resources become increasingly limited. The goal of this project was to design, build, wire, and program a robot to autonomously navigate a building and pick up designated recycling bins, thus implementing a more efficient method of recycling. It is hypothesized that this robot would successfully self-navigate the building, pick up recycling bins, and dump each bin's contents into its trailer 100% of the time. After a series of designs, the main structure of this Autonomous Robotic Recyclables Transporter (ARRT) was built using aluminum bars. Aspects of ARRT include a dual mechanical arm, pneumatics to operate the arm and clamp onto recycling bins, and Omni wheels for greater maneuverability in high obstacle zones. To program ARRT, the student researchers wrote several programs in Java. A series of waypoints were used to map out the robot's route and a PID controller was used to keep the robot from straying away from the determined path. Sensors such as encoders attached to the motors and a gyroscope were used to obtain information about the robot's position and heading, integral components of a successful PID controller. Each physical portion of ARRT and program written for ARRT functioned correctly 100% of the time in 10 trials. The entire robot can complete its designated route, thus marking the success of this project. ARRT can be easily applied to any building because of its ability to adapt to new paths and be used for transporting other materials, such as medical or janitorial supplies, as long as they are within the allotted width (2 feet). ARRT is

capable of bringing about a more labor and time efficient recycling method.

Poster Board No. 072 MALE HORMONES, FEMALE BEAUTY: DOES TESTOSTERONE BRING OUT THE COLOR IN GUPPIES? Frank J. Szmania, masterbass4@gmail.com, 5321 S. Main St. Apt. 303 Sylvania, Ohio 43560. (St. Joseph School, Sylvania)

Synthetic testosterone can cause guppies' true colors to be shown. If a fish breeder is having a hard time finding the right female to match the male's color, the breeder could use synthetic testosterone to bring out the female's true color. The hypothesis is that synthetic testosterone can cause a change in the coloration of a female guppy. In order to test this hypothesis, two 37.85L tanks were set up to test two different conditions. Each tank had eight, female guppies. Gravel, internal power filters and artificial coral were added, in similar fashion, to both tanks to ensure a stable environment. Tank one was used as a control, meaning that no testosterone was added to the water while 15 drops of a synthetic testosterone was added to each liter of water in the second tank. A color chart was used to determine color change in the female guppies. After two weeks, the control tank had no change in coloration in the females. One guppy had died. In tank two, where fifteen drops of synthetic testosterone had been added, a definite change in coloration was seen in seven of the eight female guppies. One died in this tank as well. In conclusion, the color change was related to the synthetic testosterone affecting the natural pigments in the females. This supported the hypothesis that synthetic testosterone can be used to enhance the coloration of female guppies for breeding.

Poster Board No. 073 IS AVIAN FEEDING BEHAVIOR SHAPED BY METEOROLOGICAL CONDITIONS? A MULTIPLE SPECIES ANALYSIS. Zoe P. Buccella, artistheart@comcast.net, 147 Pine Lane, Barnesville OH 43713. (Home School)

Knowledge of meteorological conditions is important to better sustain our future avian populations. This study was performed from February 13, 2011 to March 11, 2011 in Barnesville, Ohio. The purpose of the project was to determine and compare the effects of Ohio winter meteorological conditions on the feeding behavior of black-capped chickadees (*Poecile atricapilla*), mourning doves (*Zenaida macroura*), dark-eyed slate-colored juncos (*Junco hyemalis*), white-breasted nuthatches (*Sitta carolinensis*), northern cardinals (*Cardinalis cardinalis*), blue jays (*Cyanocitta cristata*), tufted titmice (*Baeolophus bicolor*), and red-bellied woodpeckers (*Melanerpes carolinus*). The hypothesis was that temperature, dew point, humidity, precipitation, barometric pressure, and UV Index would have different effects on the feeding behavior of each avian species studied. The experiment consisted of fifteen-minute observation sessions (N=80). During the observation sessions, the number of avian visits was recorded. A visit was recorded when an avian attempted to feed from a feeding device. During the experiment similar visitation rates were observed in seven of the eight avian species studied with the exception being the white-breasted nuthatch. The experimental data revealed that during mild meteorological conditions, including high barometric pressure (30.06 in.--30.64 in.), high UV Index (>3), no precipitation, medium humidity (19%--47%), high dew point (4.6°C--12.8°C), and high temperature (9.2°C--17.4°C), white-breasted nuthatches visited more frequently (152%) than the seven other species studied. The results of this study suggest that the white-breasted nuthatch, a notorious food hoarder, utilized milder meteorological conditions to gather and store food.

Poster Board No. 074 DOES COCA-COLA® LOSE CARBONATION FASTER AT HIGH OR LOW TEMPERATURES? Jonathan J. Konecny jkonecny23@gmail.com 1143 Devil's Hole Road Pemberville, Ohio 43450. (St. Aloysius Catholic School, Bowling Green, Ohio.)

Temperature affects the solubility of CO₂ in water. As temperature increases, the molecular activity of the CO₂ increases causing a decrease in the solubility of the CO₂. Does Coca-Cola® lose carbonation faster at hot or cold temperatures? The soda will lose carbonation faster at hot temperatures because at the colder temperatures, the pop's ability to lose carbonation will become slower. Materials needed to test this hypothesis include: one oven with light, an interval timer, a bowl, ice, a refrigerator, eight bottles of Coca-Cola®, and one Carbonation Loss Apparatus (CLAP). To carry out the experiment, the CLAP and the oven had to be built and set up. The desired temperatures of six of the bottles must be achieved and maintained using the ice bowl, the oven and the refrigerator. The remaining two bottles were left out. The bottles left out were attached, tested, and recorded. Once those bottles had been tested, the remaining six bottles were tested. After all of the bottles had been tested, the levels were recorded in a data table. On average the amount of carbonation lost from the soda was 178.85ml from the room temperature bottles, 154.84ml from the refrigerator bottles, 89.67ml from the ice bottles, and 197.96ml from the hot bottles. Coca Cola® loses carbonation faster at hot temperatures. The real-world connection is: the best place to put an opened, unfinished soda is in a cooler filled with ice because the colder the soda, the more carbonation left.

Poster Board No. 075 MAX GENE MUTATION SCREENING FOR PHEOCHROMOCYTOMA/ PARAGANGLIOMA (PCC/PGL) PATIENTS, Kiren K. Walters (kwally001@aim.com), 1482 Fitzroy St., Westlake, OH 44145, Ying Ni, MS, Cleveland Clinic, Genomic Medicine Institute, Charis Eng, M.D., PhD, Cleveland Clinic, Genomic Medicine Institute. (Hathaway Brown School)

Pheochromocytoma (PCC) is an unusual neoplasia deriving from the adrenal medulla which secretes adrenaline and other hormones that affect blood pressure. PCC can be inherited and is caused by gene mutation. Until recently, PCC has been associated with germline mutations in one of nine susceptibility genes. Unlike most other diseases, 30-40% of PCC cases are due to genetic causes. Recently, germline mutations in the *MAX* (gene encoding MYC-associated factor X) have been identified as yet another cause of PCC. A pilot study was conducted with germline DNA from 20 PCC/paraganglioma (extra adrenal PCC) patients and 8 ancestry-matched population controls. Patients were selected that had at least one clinical "red flag" for heritability, bilateral adrenal PCC, a family history of the disease or any malignant tumors, who did not carry mutations in the known 9 predisposition genes. To address the hypothesis that *MAX* mutations are the cause of PCC/PGL, the polymerase chain reaction (PCR) was used to amplify all 5 exons in the *MAX* gene. PCR products were sent for direct sequencing. Of the 20 patients, 3 germline variants were identified in the intronic regions of the *MAX* gene. The common intronic single nucleotide polymorphism (SNP) c.63+49C>T was observed in 52% of the samples, in both patients and controls. The SNPs c.63+67G>A and c.34+138C>T occurred in 8.3% and 5% of patients respectively. In conclusion, 3 noncoding variants of unknown function were found in the patients. No previously reported pathogenic-mutations were identified.

1:30 PM

Undergraduate Research Session
Dr. Jeffrey D. Weidenhamer, Presiding
Kettering Science Center Lecture Hall Room 112

1:30 Introduction—Dr. Jeffrey D. Weidenhamer—See page 5.

1:40 MENTORING UNDERGRADUATES FOR SUCCESS IN RESEARCH. S. Tonia Hsieh, sthsieh@temple.edu, Department of Biology, 1900 North 12th St, Temple University, Philadelphia, PA 19122.

Undergraduate research and inquiry-based learning are two tools critical for inspiring our future generations of scientists and leaders. While these methods for engaging students are well-known and often-practiced at predominately undergraduate institutions, exploring new methods for teaching and prioritization of undergraduate research at more research-focused institutions are often overlooked. Primary reasons cited for not involving undergraduates in research include principal investigators lacking the time to work with undergraduates due to already over-burdened schedules, the lack of preparation amongst the student body for critical thinking skills necessary for research, and the (supposed) inability of undergraduates to produce “useful” research. Such misperceptions are a travesty for scientific progress and a disservice to an undergraduate population that is filled with creative, knowledge-hungry students who can play a critical role driving innovation in even the busiest research lab. When properly conceived and supported by the right strategies, undergraduate research can be mentored by a “time-taxed” assistant professor at a research university and lead to undergraduates presenting talks at national meetings and co-authoring peer-reviewed publications.

2:30 LEAD AND CADMIUM IN CONSUMER PRODUCTS: UNDERGRADUATE RESEARCH AT ASHLAND UNIVERSITY IMPACTING PUBLIC POLICY. Jeffrey D. Weidenhamer, jweiden@ashland.edu, Department of Chemistry, Geology & Physics, 401 College Ave, Ashland University, Ashland, OH 44805.

Following the death of a 4-year-old Minnesota boy after swallowing a highly leaded bracelet charm, the lead content of children’s jewelry from local dollar stores was investigated in a course for non-science majors on lead’s chemistry and toxicity. This blossomed into an ongoing research effort that has involved science majors in Ashland University’s analytical chemistry courses and independent research projects. Jewelry samples and painted toys were screened for heavy metal content by X-ray fluorescence (XRF), and lead and cadmium content determined by acid digestion followed by atomic absorption analysis. Lead and cadmium bioavailability from jewelry has been determined using saline extractions to simulate exposure by mouthing of jewelry and dilute HCl extractions to simulate the worst-case scenario of ingestion of a jewelry item. Most recently, cadmium bioavailability was evaluated in 86 components of 57 jewelry items found to contain high levels of cadmium (> 10,000 ppm) by XRF. Saline extraction yielded as much as 2,200 µg cadmium, and 24-hr dilute HCl extraction yielded a maximum of > 20,000 µg cadmium. These amounts exceed the maximum amounts recommended by the United States Consumer Product Safety Commission (CPSC) by a factor of 100, indicating the potential for dangerous exposures to children who mouth or swallow this jewelry. The undergraduate research projects have resulted in eight peer-reviewed publications (including four papers co-authored by six different undergraduates), and more than a dozen CPSC recalls of jewelry and toys with high lead content as well as the first CPSC recalls of consumer products for cadmium contamination.

2:45 UNDERGRADUATE RESEARCH IN POLYMER CHEMISTRY AT ASHLAND UNIVERSITY: POLYLACTIDE/POLYETHYLENE GLYCOL STAR BLOCK COPOLYMERS. Perry S. Corbin, pcorbin@ashland.edu, Ashland University, Department of Chemistry/Geology/Physics, 401 College Ave., Ashland, OH 44805.

The synthesis of polymers that have varied molecular architectures and are designed to self-organize into higher-order structures is critical to the continued development of multifaceted materials. The preparation of such polymers has been the goal of a long-term undergraduate research program at Ashland University. Studies have recently focused on novel four-armed, calixarene- and resorcinarene-core polylactide (PLA)/polyethylene glycol (PEG) star block copolymers. These polymers may function as useful drug-delivery vehicles upon assembling into aqueous micelles. To synthesize the block copolymers, PLA star homopolymers were first prepared by tin(II)-catalyzed ring-opening polymerizations of L-lactide. To couple PEG with the PLA chains, the homopolymer end groups were activated, and, subsequently, reacted with a nucleophilic, amino-PEG. The PLA-PEGs were purified by dialysis and multiple water washes. The disappearance of the signal for the terminal methine hydrogens of the PLA chain ends in nuclear magnetic resonance (¹H-NMR) spectra of the activated PLA homopolymers suggested that the activation proceeded to completion. ¹H-NMR spectral integrations also allowed the degree of PLA-PEG coupling to be estimated in the second step of the convergent synthesis. Coupling efficiencies were estimated to be high (>90%). Further fluorescence spectroscopic and light-scattering studies indicated that aqueous micelles, indeed, form from the calixarene- and resorcinarene-core star block copolymers. In addition to the scientific merit of such studies, undergraduates obtain invaluable research training, develop reasoning skills, and examine important aspects of polymer chemistry—an area that, in some instances, does not receive its due attention in undergraduate chemistry curricula.

3:00 FROM PROTEINS TO POLYLACTIDES: APPLICATION OF MALDI MASS SPECTROMETRY TO UNDERGRADUATE RESEARCH AT ASHLAND UNIVERSITY. Rebecca W. Corbin, rcorbin@ashland.edu, Ashland University, Department of Chemistry/Geology/Physics, 401 College Avenue, Ashland OH 44805.

Matrix-assisted laser desorption/ionization (MALDI) with time-of-flight mass spectrometry (TOF MS) is one of the most versatile methods for the characterization of biological as well as synthetic polymer samples. MALDI-TOF MS serves an important role in a variety of interdisciplinary research projects at Ashland University. Over twelve undergraduates have been involved with these collaborations. Students learn to prepare samples, to evaluate matrix-analyte formulations, to optimize instrumental parameters, and to determine appropriate data analysis strategies for collaborative projects involving proteomics as well as polymer synthesis. One proteomics project involves MALDI-TOF MS analysis of recombinant and purified eye lens crystallins from the zebrafish *Danio rerio*. Results indicate the identity of specific crystallin sequences and suggest the presence of structurally modified forms. A second research project is the identification of circadian clock-associated proteins in the filamentous fungus *Aspergillus nidulans*. Comparing two-dimensional gel electrophoresis profiles of proteins isolated at different time points allows the targeting of candidates associated with an internal circadian oscillator. One such protein, glyceraldehyde-3-phosphate dehydrogenase, has been identified by tryptic digestion of an excised gel spot followed by MALDI mass fingerprinting. The long-term goal of an additional proteomics collaboration is the identification of neuronal interleukin-16 binding partners. MALDI-TOF MS also proves to be effective for the characterization of synthetic polymers. Specifically, the acquisition of mass spectra from polylactide star polymers provides information that is complementary to molecular

weight measurements based on NMR spectroscopy and gel permeation chromatography.

3:15 SMALL SCALE UNDERGRADUATE RESEARCH PROJECTS CAN MAKE VALUABLE CONTRIBUTIONS TO LARGER SCIENTIFIC OUTCOMES: A CASE STUDY ON THE ORIGIN OF TWO MAJOR LITHOLOGIES IN THE ADIRONDACK LOWLANDS, NEW YORK. Michael R. Hudson (mhudson@ashland.edu) Department of Chemistry, Geology & Physics, Ashland University, Ashland, OH 44805

Science faculty at many undergraduate institutions where teaching is stressed, graduate programs do not exist, and/or loads are heavy, often advise students on research projects that have meaningful conclusions for relatively small scale and often diverse questions. However, the case study identified in the title demonstrates that there is validity in conducting research on larger, complex questions by constructing projects that make incremental progress toward a unified research goal. This has been done very successfully at Ashland University where a large, multiyear project was designed to create a collective data set that would ultimately be used to draw conclusions concerning the origin of two major Mesoproterozoic lithologies (the Popple Hill Gneiss and the Hermon Granite) in the Adirondack Lowlands. A project of this magnitude was well beyond the time frame of a typical year-long undergraduate research endeavor; however, segmenting the research into parts that arrived at independent conclusions was a valuable way of achieving a synthesis outcome. Nine students were exposed to multiple aspects of scientific discovery during a 13 year period (number of projects in parentheses): field sampling (5), petrography (3), bulk chemistry by EDXRF (5), U-Th-Pb chemical geochronology of monazites by electron microprobe analysis (5), and data manipulation and analysis (9). These projects resulted in: six presentations at Annual Geological Society of America (GSA) Meetings, five presentations at Sections Meetings of the GSA, and one presentation at an Ohio Academy of Science Meeting. Additionally, this work is integral to a paper in press for *Precambrian Research* on the origin of the Popple Hill Gneiss and one in preparation on the origin of the Hermon Granite.

3:30 Q & A

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How to get to Ashland University

401 College Avenue
Ashland, OH 44805
419.289.4142 | 800.882.1548

Coming from the north or south on I-71:

From Interstate 71, take exit #186 or U.S. Route 250, Ashland. Off the exit ramp, turn left on Route 250 heading west. Do not take the Route 250 bypass; continue west on Main Street into Ashland. As you pass the downtown business district and Home Hardware on your left, merge into the left lane and turn left on Claremont Avenue at the next intersection. Continue south on Claremont Avenue in the left lane and turn left at the second traffic light, the intersection of King Road and College Avenue. Make a soft left turn onto King Road. Please refer to the Parking Lots on Campus text below or campus map for specific parking information.

Coming from the east on U.S. Route 30 or U.S. Route 250:

When U.S. Routes 30 and 250 split on the west side of Wooster, take U.S. Route 250 west toward Ashland. Do not take the Route 250 bypass; continue west on Main Street into Ashland. As you pass the downtown business district and Home Hardware on your left, merge into the left lane and turn left on Claremont Avenue at the next intersection. Continue south on Claremont Avenue in the left lane and turn left at the second traffic light, the intersection of King Road and College Avenue. Make a soft left turn onto King Road. Please refer to the Parking Lots on Campus text below or campus map for specific parking information.

Coming from the west on the Ohio Turnpike or coming from the north on U.S. Route 250:

From the Turnpike, exit 118, U.S. Route 250 and travel south on Route 250 about 37 miles to Ashland. Do not take the route 250 Bypass, continue straight into Ashland. This will become Cottage Street. As you approach the third traffic light, which is Main Street, be sure to stay in the center lane to go down the hill and straight through the intersection. When you cross Main Street, you will now be on Claremont Avenue. Continue south on Claremont Avenue in the left lane and turn left at the second traffic light, the intersection of King Road and College Avenue. Make a soft left turn onto King Road. Please refer to the Parking Lots on Campus text below or campus map for specific parking information.

Coming from the north on State Route 58:

Take State Route 58 south toward Ashland. Do not take the Routes 250 and 58 bypass, continue straight into Ashland on Orange Street. Bear left onto Union Street and continue south to the intersection of Main Street. Turn right onto Main Street. Continue through the downtown business district. At the second traffic light turn left on Claremont Avenue. Continue south on Claremont Avenue in the left lane and turn left at the second traffic light, the intersection of King Road and College Avenue. Make a soft left turn onto King Road. Please refer to the Parking Lots on Campus text below or campus map for specific parking information.

Parking Lots On Campus

Please park in Lots B or C.



The Ohio Environmental Science
& Environmental Engineering



Scholarship Program
APPLICATION

Program description: <http://www.ohiosci.org/OESEESCHOLARSHIPS.htm>

Online, Adobe PDF fill-in application: <http://www.ohiosci.org/ScholarshipApplication.pdf>

Deadline: Mail First Class. **Postmarked by June 1.**

Page 1 of 2

\$1,250 two year programs and \$2,500 for four or five year programs, non-renewable.

THESE MERIT BASED, NONRENEWABLE, scholarships will be given to undergraduate students admitted to and enrolled in Ohio state or private colleges and universities who can demonstrate their knowledge and commitment to careers in environmental sciences or environmental engineering. Students must be in the final year of the program by the autumn term. Awardees will be selected by an Academy appointed panel using a blind review process. Scholarships may be used for tuition, fees, books, personal protection equipment, tools, instruments and field equipment but not housing.

1. Check Title _____ Ms. _____ Mr.
2. First _____ 3. Middle _____ 4. Last _____
5. Home Address _____
6. City _____ 7. State _____ 8. ZIP _____
9. EMAIL _____ 10. Home phone (_____) _____
11. Last four digits of Social Security No. _____
12. Year in school by autumn term: _____ 2nd _____ 4th _____ 5th
13. College or university in which you will be enrolled _____
14. Academic major _____ 15. Expected graduation date _____
16. Advisor's full name _____ 17. Office phone (_____) _____
18. If selected, are you willing to participate in annual follow-up surveys for three years after receipt of a scholarship? _____ YES _____ NO
19. May the Academy release your name and resume to potential employers? _____ YES _____ NO

PLEASE ATTACH APPROPRIATE SUPPORTING INFORMATION TO RESPOND TO THE FOLLOWING:

20. Academic record with an overall GPA of at least 3.0. Your current GPA _____ on a 4.0 system. Please attach a current (full) transcript and circle the GPA. Transcript must include all courses taken to-date. Enclose an "OFFICIAL" transcript with your original signed application and unofficial copies in the 6 identical sets. Alternatively attach only a sealed transcript if that is your school's policy.

21. Attach a maximum two page vita, biosketch, or resume that includes the following elements, in this order: contact information, education, employment and/or internships (basic information only), honors/awards, professional memberships, publications (full citation), presentations given and professional meetings attended, and community service.

Continued on page 2

22. Repeat First and Last Name _____

Applicants from four-year colleges:

Each of the following essays may not exceed one two-sided page, double spaced, 12 point font, 1" margins.

23. Attach an essay (not exceeding one two-sided page, double spaced, 12 point font, 1" margins) to describe your reasons for choosing a career in environmental science or environmental engineering and how this scholarship will help you.

24. Attach an essay detailing any original research, scholarship, employment and/or internships, or other unique contributions to environmental science or environmental engineering.

25. Attach an essay describing your extracurricular activities and participation in organizations that demonstrate your leadership and interpersonal skills and social responsibility.

Applicants from two-year colleges:

Please combine your response to requirements 23, 24 and 25 into a single essay that covers as many of the points as possible with the length not to exceed three two-sided pages, double spaced, 12 point font, 1" margins.

26. Attach two letters of recommendation from education or environmental professionals, addressed to Scholarship Review Committee. One must be from a faculty member at your institution. They may be sealed or unsealed copies.

27. *Amount Requested \$ _____

***Maximum: \$1,250 for two year programs and \$2,500 for four or five year programs, non-renewable.**

28. Date needed _____

Scholarship checks will be sent to the college financial aid office. All applicants will be notified of the scholarship recipients.

I certify that all information provided is true and accurate, I authorize independent verification, and I understand that if awarded a scholarship, information contained in this application may be released to the media.

29. SIGNATURE _____ 30. DATE _____

Please enclose a self-addressed, stamped postcard to acknowledge receipt of your application.

QUESTIONS? Phone (614) 488-2228 • Email oas@iwaynet.net

MAIL FIRST CLASS a complete, original signed copy with stapled attachments and 6 identical, two-sided, collated and stapled (please do not bind in a folder or cover) copies (7 total) **postmarked by June 1.**

**Environmental Science Scholarships
The Ohio Academy of Science
PO Box 12519
Columbus OH 43212-0519**

THE OHIO ACADEMY OF SCIENCE

Registration Form

121st Annual Meeting
April 13-14, 2012
Ashland University

Advance registration must be received by April 6, 2012

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

STUDENTS, SPOUSES, OR RELATIVES: A special discount schedule has been approved to promote and encourage participation of undergraduates, pre-college students, non-science spouses or relatives. All students, non-science spouses, parents or relatives must register using a separate form. This registration does not include membership or meals.

**Each person must use a SEPARATE REGISTRATION FORM
Please copy this form as needed.**

An Adobe PDF online fill-in form is available at
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PLEASE PRINT OR TYPE

Check: _____ Ms. _____ Mrs. _____ Mr. _____ Dr.

Name _____
First Middle Last

Job Title _____

School, Organization, Agency, Institution, or Employer

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City _____

State _____ Zip _____ Ohio County _____

Work Phone (_____) _____

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Columbus OH 43212-0519
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_____ Algae (8:30-4:00)	\$20	\$25
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_____ Box Lunch after All-Academy Lecture	\$10	\$N.A.
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Please use a separate form for each MEMBERSHIP RENEWAL

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121st Annual Meeting
The OHIO ACADEMY of SCIENCE
Hosted by Ashland University, Ashland, Ohio

April 13-14, 2012

Advance registration must be received by April 6, 2012 to qualify for lower rates.

ALL attendees must register.

An Adobe PDF online fill-in form is available at <http://www.ohiosci.org/AshlandRegistrationForm.pdf>

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

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

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

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The Ohio Journal of Science

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The Ohio Journal of Science considers for publication solicited **Book Reviews** and **Research Reviews**, and unsolicited **Brief Notes** and **Research Reports**. Solicited submissions will be requested by the editor or member of the editorial board. Book reviews will be requested of experts in the subject matter of the book to be reviewed. Research Reviews will be requested to serve as extensive surveys of the literature of an area of science in which Academy members have an interest.

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All manuscripts will be organized as follows:

Page 1 – Title, Author(s), Running Head, Abstract

Page 2 and remainder – Introduction, Materials and Methods, Results, Discussion, Acknowledgments, Literature Cited, Tables, Figure Legends, Figures.

STYLE. *The CBE Manual for Authors, Editors, and Publishers*, 7th Ed. is used for editorial decisions with regard to style. Manuscripts should be typewritten using 1 inch margins on 8.5 x 11 inch paper. Text should be left-justified using elite print (twelve characters per inch). Three copies should be submitted. Manuscript should be double spaced throughout, including the title and abstract. Arabic numerals should be used in preference to words when the number designates anything that can be counted or measured (7 samples, 43 species). One exception to this use is that numerals are not used to begin a sentence (Twenty-one species were found in . . .). The 2nd exception is when 2 numeric expressions are adjacent in a sentence. The number easiest to express in words should be spelled out and the other left in numeric form (The sections were divided into eight 4-acre plots.).

TITLE, AUTHOR(S), AFFILIATION(S). The first page of the manuscript should contain the title, author(s) name(s), the affiliation of the author(s) at the time the research was carried out, a shortened title (running head), and the abstract. The title must be typed in upper and lower case letters as it will appear when typeset. Name(s) of the author(s) should be typed in capital letters below the title. The address (department, institution, city, state, postal code, country if not USA) should appear below the name of the author(s). If more than one institution is to be credited, they should appear in the order of the authors' affiliation. A running head of not more than 38 letters and spaces should be typed in capital letters between the address and the abstract.

ABSTRACT. The abstract should summarize the main conclusions and any new methods or procedures critical to the results of the study. It should be 250 words or fewer.

INTRODUCTION. The introduction should describe the knowledge that gave rise to the question examined by, or the hypothesis posed for the research.

MATERIALS AND METHODS. This section should describe the research design, the methods and materials used in the research (subjects, their selection, equipment, laboratory or field procedures), and how the findings were analyzed.

RESULTS. The text of the results should be a descriptive narrative of the main findings, of the reported study. This section should not list tabulated data in text form. Reference to tables and figures included in this section should be made parenthetically in the text.

DISCUSSION. This section should compare and contrast the data collected in the presented study with that previously reported in the literature. Unless there are specific reasons to combine the two, as explained by the author in the letter of transmittal, Results and Discussion should be two separate sections.

ACKNOWLEDGMENTS. Colleagues and/or sources of financial support to whom thanks are due for assistance rendered in completion of the research or preparation of the manuscript should be recognized in this section rather than in the body of the text.

LITERATURE CITED. References to scientific literature should be arranged alphabetically by first author's last name using the Name/Year (N-Y) method as described in the *CBE Manual*.

Journals:

Author(s). Year. Article title. Journal title volume number (issue number):inclusive pages.

Thomison JB. 1988. Uniform requirements for manuscripts. *South Med J* 81(8):947-52.

Form of citation: (Thomison 1988)

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FIGURES. All illustrations are referred to as "Figures" and must be numbered consecutively. Figures may be photographs, hand-drawn or computer generated drawings in black ink. Each figure should be identified along the top edge with the name of the author(s) and figure number, and on the back with name of author(s) and manuscript title. Illustrations other than those generated by the author(s) must bear permission for use and credit to the originator. ORIGINAL ARTWORK WILL NOT BE RETURNED UNLESS SPECIFICALLY REQUESTED AT TIME OF SUBMISSION. Each figure must have a complete legend. The legend should not be placed on the figure, but should be typed in order, double-spaced, on a separate sheet which precedes the figures in the manuscript. Figures should be referred to parenthetically in the text, for example (Fig. 1). The size and proportion of each illustration should be suitable for reduction. Excessive white space should be avoided. Illustrations will be reduced to one column width (3 and 3/8 inches) or two column width (7 inches) at the discretion of the editor. Lettering should be done of a size to ensure that it can be read after reduction. On maps and other illustrations where original size is a concern, a graphic scale should be incorporated into the figure.

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After consulting the manuscript preparation guidelines at <http://www.ohiosci.org/ojsinstr.htm>, please submit all materials to:

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Non-Credit Workshops

Open to the public and college students as non-credit courses. Participants must be at least 18 years of age.

- Larval Fish Identification Workshop (June 24)
- Algae Identification Workshop (August 6 – 7)
- Dealing With Cyanobacteria, Algal Toxins, and Taste & Odor Compounds (August 9 – 10)
- Outdoor Photography Workshop (August 10 – 12)
- Lake Erie Sport Fishing Workshop (August 10 – 12)
- Fish-Sampling Techniques Workshop (September 15 – 16)



Science Courses for Educators

Classes are open to classroom teachers and education majors with a junior rank or above by summer 2012.

1-week courses, 2 semester hours

- EARTHSC 5189.05: Geologic Setting of Lake Erie (June 16 – 22)
- ENR 5690: Climate Change Education (July 22 – 28)
- EEOB 4950: Field Ecology (July 22 – 28)
- EARTHSC 5584: Principles of Oceanography for Educators (July 29 – August 4)
- ENR 5194: Climate and Sustainability (July 29 – August 4)

REU Program

Live the life of a professional researcher this summer! In Stone Lab's Research Experience for Undergraduates Scholarship Program, students spend five weeks working alongside top scientists to learn how to conduct in-the-field research. This year students will lead the following projects:

- Reproductive biology and early life history of fishes (Ichthyology)
- Survival rates of birds of the Lake Erie islands (Ornithology)
- Dissolved oxygen in Lake Erie; tracking the "dead zone" (Limnology)
- Nutrient loading (Eutrophication) and algal production (Limnology)
- Fisheries techniques; research and fish survey development
- Efficiency of developed snake deterrents (Herpetology)
- Biological curation; phylogeny and taxonomy

Tuition Assistance and Jobs

All students taking for-credit courses are eligible for scholarship funds, which typically range from \$100 to \$2,500. Students enrolled in five-week courses can also apply for Stone Lab's part-time positions or find jobs at local Put-in-Bay businesses.

Course credits are based on the Ohio State University semester credit system and are transferable to most colleges and universities.

For more information, including details about scholarships and jobs, visit stonelab.osu.edu or call 614.292.8949.



F.T. Stone Laboratory, The Ohio State University's Island Campus, is the Lake Erie research and teaching laboratory for the Ohio Sea Grant College Program. Course credits are based on the Ohio State University semester credit system and are transferable to most colleges and universities.