The Ohio Academy of Science
116th Annual Meeting
Hosted by
Cuyahoga Community College Eastern Campus
April 21-22, 2007

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!

Cuyahoga Community College Eastern Campus welcomes you to the 116th 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 9, 2007. Please use Registration Form on the last page. Mail completed form and fee to:

OAS Annual Meeting Registration
The Ohio Academy of Science
PO Box 12519
Columbus OH 43212-0519
FAX 614/488-7629 (for Credit Card or PO only)

Registration by credit card or purchase order only will be accepted by FAX at 614/488-7629. Your registration materials, receipt, and name tag will be ready at the meeting registration desk upon your arrival. For further information, please call 614/488-2228.

An Adobe PDF form is available at:

http://www.ohiosci.org/Tri-CRegistrationForm.pdf

Online payment option www.merchantamerica.com/ohiosci

Friday, April 20: Registration will not be open on Friday.

Saturday, April 21: Registration in the lobby of the Liberal Arts Center (ELA) from 7:30AM-11:30 AM. On-site registration is possible by check, VISA, or MasterCard. Cash is discouraged.

SATURDAY PARKING: Watch for signs. See map in program.

SMOKING POLICY: Smoking is not permitted in any building.

HOUSING: Please contact hotels and motels directly.
See list on page 4.

MEALS: Friday, April 21. None planned. Saturday, April 22. Lunch available at nearby restaurants.

GENERAL SCHEDULE

Friday, April 20, 2007

3:00 PM-5:00 PM	The Ohio Academy of Science Board of Trustees Meeting ELA Room 229

Saturday, April 21, 2007

7:30 AM-11:30 AM	**General Meeting Registration** ELA Lobby
9:00 AM-11:00 AM	**Pathways to Your Future Symposium** ELA Room 122
9:00 AM-11:30 AM	**Morning Podium Sessions in ELA** **Morning Poster Sessions in ELA Commons**
11:30 AM	**Official Notice of Annual Business Meeting** for Academy Members Only. ELA Room 122
11:30 AM	**Lunch on your own** Available at nearby restaurants.
1:00 PM	**All Academy Lecture** **ELA Theater**

Welcome and Introduction of Speaker by
Dr. Jacquelyn Joseph-Silverstein
Executive Vice President
Academic & Student Affairs
Cuyahoga Community College

Emerging Technologies that Support Space Exploration

By Dr. Woodrow Whitlow, Jr.

Dr. Woodrow Whitlow, Jr., is Director of the National Aeronautics and Space Administration (NASA) John H. Glenn Research Center at Lewis Field in Cleveland, Ohio. Appointed to this position effective December 25, 2005, he is responsible for planning, organizing, and directing the activities required to accomplish the missions assigned to the Center.

While managing an annual budget of approximately $500 million, he oversees a workforce of close to 1700 civil service employees that is supported by approximately 1400 contractors. The Center has 24 major facilities and over 500 specialized research facilities located at the 350-acre Cleveland site and the 6400-acre Plum Brook Station site in Sandusky, Ohio.

From September 2003 through December 2005, Dr. Whitlow served as the Deputy Director of the NASA John F. Kennedy Space Center. There his duties included assisting the Director in determining and implementing Center policy and in managing and implementing the Center's missions and Agency program responsibilities in the areas of processing, launch, and recovery of launch vehicles; processing of spacecraft; and acquisition of launch services. Prior to this appointment as Deputy Director, he served as the Director of Research and Technology at the Glenn Research Center.

Dr. Whitlow began his professional career in 1979 as a research scientist at the NASA Langley Research Center, Hampton, Virginia. He assumed various positions of increasing responsibility before moving to the Glenn Research Center in 1998. In 1994, he served as Director of the Critical Technologies Division, Office of Aeronautics, at NASA Headquarters.

Dr. Whitlow earned his Bachelor of Science, Master of Science, and Doctor of Philosophy degrees in Aeronautics and Astronautics from the Massachusetts Institute of Technology. He has written nearly 40 technical papers, most in the areas of unsteady transonic flow and aeroelasticity.

Dr. Whitlow has received numerous awards, including U.S. Black Engineer of the Year in Government, NASA Exceptional Service Honor Medal, NASA Equal Opportunity Honor Medal, the (British) Institution of Mechanical Engineers William Sweet Smith Prize, and the Presidential Rank of Meritorious Executive. The American Institute of Aeronautics and Astronautics named him an associate fellow in 1993.

Dr. Whitlow and his wife have two daughters and two granddaughters.

2:00-4:00 PM **Bridges to Success in the Sciences**

Program Directors:
Dr. Cindy Holland and Ms. Cathleen Jenkins
ELA Room 122
Open to all meeting attendees
Program Highlights
Recognitions
Student Presentations

About Our Host

Chairperson, Local Arrangements:
Sandy Robinson, Associate Dean
Health Careers/Sciences, Western Campus

Cuyahoga Community College opened in 1963 and was Ohio's first community college. It now serves 55,000 students each year at three traditional campuses, two Corporate College locations, 50+ off-campus sites, and via television and the Internet. More than 700,000 county residents have passed through Tri-C's doors, representing one in five county residents.

Tri-C, Ohio's largest community college, offers associate degrees, certificate programs and the first two years of a baccalaureate degree. Students can choose from nearly 1,200 credit courses in over 130 career, certificate and university transfer programs. More than 125 off-campus credit courses are available at various locations near home, at work sites, on cable television, and via the Internet; and over 225 non-credit workforce and professional development courses are offered each semester through Corporate College and Workforce Development.

Tri-C offers a top quality education and flexible learning options at the lowest tuition in Northeast Ohio. The College also generates spending of about $500 million annually in Northeast Ohio and sustains more than 25,000 jobs.

In addition, more than 500,000 Northeast Ohio residents attend college-sponsored cultural, community and sports programs each year. The College is home to Tri-C JazzFest Cleveland, the nation's premier educational jazz festival, and also hosts popular cultural arts programs at Playhouse Square and at campus theaters.

Meeting Site: Eastern Campus Overview

The Eastern Campus in Highland Hills, southeast of Cleveland, opened in the fall of 1971 with permanent facilities being completed in 1981. The campus features high-tech classrooms, laboratories, a library, a 600 seat performing arts center, a business conferencing center, a gymnasium, an indoor jogging track, an art gallery, music studios, a Children's Center, a cafeteria and an outdoor athletic complex equipped with basketball, volleyball and tennis courts, an Olympic running track and a soccer field.

The Technology Learning Center, which opened at the Eastern Campus in 1996, contains state-of-the-art electronic classrooms capable of videoconferencing and distance learning, three advanced technology lecture classrooms, an 130-computer open lab and seven individual computer classrooms providing students with e-mail and Internet access.

The Eastern Campus is located southeast of Cleveland off I-271 at:
4250 Richmond Road
Highland Hills OH 44122
216.987.2000

Hotels Near Cuyahoga Community College/Eastern Campus

4250 Richmond Rd
Highland Hills, OH 44122-6104

Marriot Cleveland East (0.5 miles)
26300 Harvard Road, Warrensville Hts 216-378-9191
Hampton Inn (0.84 miles)
3840 Orange Place, Beachwood 216-831-3735
Extended Stay America (0.88 miles)
3820 Orange Place, Beachwood 216-595-9551
Super 8 Motel (0.94 miles)
3795 Orange Place, Beachwood 216-831-7200
Holiday Inn Cleveland-Bchwood (1.03 miles)
3750 Orange Place, Beachwood 216-831-3300
Courtyard-Cleveland/Beach wood (1.15 miles)
3695 Orange Place, Beachwood 216-765-1900
Homestead Studio Suites Hotel (1.30 miles)
3625 Orange Place, Beachwood 216-896-5555
Innsbruck Chalet (2.19 miles)
24201 Hazelmere Rd, Beachwood 216-561-2522
Embassy Suites Hotel (1.05 miles)
3775 Park East Dr, Beachwood 216-765-8066
Hilton Cleveland East (1.21 miles)
3663 Park East Dr, Beachwood 216-464-5950
Residence Inn-Cleveland Bchwd (1.25 miles)
3628 Park East Dr, Beachwood 216-831-3030
Clarion Hotel (1.40 miles)
26300 Chagrin Blvd, Beahwood 216-831-5150
Radisson Hotel (1.40 miles)
26300 Chagrin Blvd, Beachwood 216-360-7341
Days Inn (2.11 miles)
30050 Chagrin Blvd # 360, Beachwood 440-248-3110
Econo Lodge (1.52 miles)
4353 Northfield Rd, Cleveland 216-475-4070
Days Inn (1.57 miles)
4511 Northfield Rd, Cleveland 216-662-9200
Knights Inn N Randall (1.80 miles)
4751 Northfield Rd, Cleveland 216-475-3100
Shaker House (2.08 miles)
3700 Northfield Rd, Beachwood 216-991-6000
Red Roof Inn (2.44 miles)
24801 Rockside Rd, Bedford 440-439-2500

Restaurants near Cuyahoga Community College/Eastern Campus

River City Grill (at the Marriot East) - (216)378-9191-26300 Harvard Rd
Cafe 56 Grill - (216) 464-3090 - 23230 Chagrin Blvd # 3
Shuhei Restaurant Of Japan - (216) 514-0927 - 23360 Chagrin Blvd
Benihana - (216) 464-7575 - 23611 Chagrin Blvd
Ruby Tuesdays - (216) 464-2700 - 24325 Chagrin Blvd
Szechwan House (216) 292-4446 - 24155 Chagrin Blvd
Yours Truly Restaurant - (216) 464-4848 - 25300 Chagrin Blvd
Giovanni's Restaurant - (216) 831-8625 - 25550 Chagrin Blvd
Charley's Crab - (216) 831-8222 - 25765 Chagrin Blvd
P F Chang's China Bistro - (216) 292-1794 - 26001 Chagrin Blvd
Hyde Park Prime Steakhouse - (216) 464-0688 - 26300 Chagrin Blvd
Corky & Lenny's (216) 464-3838 - 27091 Chagrin Blvd
Mitchell's Fish Market - (216) 765-3474 - 28601 Chagrin Blvd # 700
Fleming's Prime Steak House - (216) 896-9000 - 28869 Chagrin Blvd
Bravo Cucina Italiana - (216) 360-0099 - 28889 Chagrin Blvd
Red Lobster - (216) 464-4057 - 3655 Orange Place
Bob Evans (216) 591-0157 - 3700 Orange Place
Olive Garden (216) 765-1919 - 3725 Orange Place
Houlihan's - (216) 378-9090 - 3750 Orange Place
Bahama Breeze - (216) 896-9081 - 3900 Orange Place
Red Robin (216) 378-9362 - 4009 Orange Place
Quiznos Sub - (216) 593-0245 - 24175 Chagrin Blvd
Boston Market - (216) 591-1990 - 24195 Chagrin Blvd
Pizza Hut - (216) 524-4444 - 27520 Chagrin Blvd
Starbucks - (216) 514-1822 - 27099 Chagrin Blvd
Wendy's - (216) 292-3852 - 27400 Chagrin Blvd
Wild Oats Natural Market Place - (216) 464-9403 - 27249 Chagrin Blvd
De Gaetano's Village Square Pizza - (216) 831-5282 - 27349 Chagrin Blvd
Mc Donald's - (216) 464-3393 - 27570 Chagrin Blvd
Dairy Queen - (216) 831-8773 - 28300 Chagrin Blvd
Stone Oven Bakery Café - (216) 831-3630 - 28601 Chagrin Blvd # 910
Original Pancake House - (216) 292-7777 - 28700 Chagrin Blvd
The Cheesecake Factory - (216) 691-3387 - 24265 Cedar Rd
Bistro at The Hilton - (216) 910-1296 - 3663 Park East Dr
Tomaydo Tomahhdo - (216) 591-9191 - 3429 W Brainard
Wang King - (216) 581-4374 - 20801 Miles Rd
Winking Lizard Tavern - (216) 831-3488 - 25380 Miles Rd
Moxie Restaurant - (216) 831-5599 - 3355 Richmond Rd # 150
Mc Donald's - (216) 475-7570 - 22801 Emery Rd
KFC - (216) 662-2405 - 22855 Emery Rd
Augie's Pizza - (216) 292-6634 - 23018 Emery Rd
Astoria Restaurant - (216) 292-2720 - 25860 Emery Rd

Index to Sessions

Planning Notes

9:00 A.M. - 11:00 A.M.

Symposium:

Pathways to Your Future:

Preparing Tomorrow's Scientists

ELA Room 122

Editor's Note: This symposium has two major goals: First it will acquaint the audience with the opportunities that exist at the community college level to engage students in research. Second, speakers will discuss the research that has been conducted at the community college level in collaboration with four-year institutions. There will also be a discussion period to look at future research and or activities that could be done at the two-year level. The Bridges Program, the Wetland Project and the Student Initiated Student Inquiry Projects are very important to science, the environment and the economy of Ohio. Northeastern Ohio in particular has been know for its brain drain where talented individuals leave the area following graduation. The state must put forth a concentrated effort to stimulate individuals to stay in the area and contribute to the research that is currently being conducted in Ohio. Community colleges must also encourage students to seek research and science fields as we look to the needs of Ohio.

The intended learning objectives and/or benefits for the participants:

- Become aware of the funding opportunities that are available nationally geared to STEM fields
- How to design bridging and research programs
- Identifying the benefits to students in being involved in such bridging and research programs
- How to form links with 4-year schools
- Forming links among faculty at different institutions and sustaining them
- Designing career paths for students
- How to rebuild and redevelop landfills into wetlands
- Discussion of potential biofuels

TAPPING THE POTENTIAL OF UNDERGRADUATE RESEARCH: STUDENT INITIATED INQUIRY BASED LEARNING AS A COMMUNITY COLLEGE MODEL. John R. Crooks, jcrooks@lorainccc.edu, Lorain County Community College, 1005 N. Abbe Rd., Elyria OH 44035-1613.

It is imperative that community colleges be involved in fulfilling workforce needs to meet our nation's growing shortage of college and university graduates who qualify as STEM skilled workers. The participation of women and minorities in higher education is significant at the community college level. Nationally, community colleges enroll 46% of all undergraduates; 58% of women, 47% of black, 56% of Hispanic, 48% of Asian/Pacific Islander, and 57% of Native American undergraduate students. In the Fall of 2006, Lorain County Community College enrollment was 67% female. The College also enrolled 60% of black and Hispanic students who graduated from a Lorain County high school and directly attend college in Fall 2006. Lorain County Community College has developed a model to contribute to increasing the diversity of and addressing shortages in the STEM workforce. Our model takes advantage of inquiry based learning principles. Inquiry based learning allows the student to determine the direction of the research project and the role of the faculty member is defined as an advisor to the student. Thirty four students have conducted research investigating (1) microbial diversity in newly created wetlands; (2) the dead zones in Lake Erie; (3) the economic transition occurring in Lorain County; and (4) the chemical characterization of potential biofuels. The information learned from these projects has been disseminated at scientific conferences throughout North America. Specifically, presentations have been made at annual meetings of the AAAS in Boston, San Francisco, and Seattle; of Sigma Xi in Montreal; and the Ohio Academy of Science. 30 of the 34 students have continued their education beyond the associate degree. The research program has been tied to our 3 + 1 University Partnership Biology degree program with Bowling Green State University. All students are expected to have a research experience. The program has also involved 30 Boy Scouts and 10 Girl Scouts and is expected to grow and include students from our Early College High School. This program is designed to build capacity of skilled STEM workers and exposure to research is seen to be a key element. The initial data indicate the community college is an excellent place to conduct research activity by serving underrepresented groups; that quality research can be done at this level; and that community colleges can be an excellent entry point for future STEM graduates.

THE WEST CREEK URBAN WETLAND PROJECT: A COLLABORATIVE COMMUNITY EFFORT IN THE REHABILITATION OF AN URBAN WATERSHED IN CUYAHOGA COUNTY, OH. Terry E. Greathouse, terry.greathouse@tri-c.edu, Western Campus, Cuyahoga Community College, Dept of Health Careers and Sciences, Parma OH 44130.

West Creek is a tributary of the highly urbanized lower Cuyahoga River. The problems present in the watershed include storm water surges and transfer of nutrients, pollutants and sediment from the urban areas into the creek. There is a lack of viable plant and animal habitat and large populations of invasive plants are present. It was hypothesized that the creation of a constructed wetland in a basin between two landfills and rehabilitation of the surrounding area would help address these problems. The West Creek Urban Wetland Project is a collaborative partnership between Cuyahoga Community College (Tri-C), the West Creek Preservation Committee, the City of Parma, Ohio and HB Engineering. Grants were obtained in January, 2002 and a 2-acre basin was excavated by the Parma Service Department. Vegetation was established using containerized roots, rhizomes and whole plants. Three plant communities were created; a moist, saturated soil zone, a shallow water zone (5 to 60 cm deep) and deep water zone (1 to 1.5 m deep). Tri-C students were involved in all phases of the project, including the eradication of invasive plants and the planting of over 10,000 native Ohio wetland plants. Results include creation of a 2-acre urban wetland complex, restoration of a 2-acre riparian zone and rehabilitation of 3-4 acres of landfill to field habitat. The West Creek Urban Wetland Project is an example of how a community college and the community can come together to create a strong urban watershed rehabilitation program.

BRIDGES TO SUCCESS IN THE SCIENCES PROGRAM. Ormond Brathwaite, ormond.brathwaite@tri-c.edu, Judy Barker, judith.barker@tri-c.edu, Cuyahoga Community College, 4250 Richmond Rd., Highland Hills OH 44122-6104.

"Bridges to Success in the Sciences Program" is a ten year old Program at Cuyahoga Community College (Tri-C), funded by the National Institutes of Health. Bridges is committed to increasing the number of underrepresented minority students who study in the various science disciplines at Tri-C, who continue their science education by transferring to four-year institutions, and ultimately attend to graduate school in a science discipline. Each Bridge student has both a Tri-C faculty mentor and a research faculty mentor at one of our partner institutions, (i.e.) Case Western Reserve University, Cleveland State University, Baldwin-Wallace College, the University of Akron and John Carroll University. Participants work in their mentor's lab for 8 to 10 hours per week during the academic year and 30 to 40 hours a week for the summer. They also attend bi-weekly brown bag luncheons at their campus and monthly meetings with featured speakers. Currently, Bridges focuses on students interested in Biology, Chemistry or Psychology. To date there have been a total of 110 Bridges' students over the past 10 years. Seventy five of these students have transferred to four year schools. The Tri-C Bridges transfer rate is 68%. This rate of Transfer is greater than both that for Tri-C (40%) and the national rate (30%). One aspect of the Program is that we are adamant about is that Bridges is a family. Once you are in the Bridges family, we consider you a part of the family forever. We stay in close contact with all students, and we offer them ongoing mentoring and networking opportunities. Twenty Bridges students have graduated from four year schools. This fall (2006) there will be a total of 8 Bridges students attending graduate school.

Poster Session A

Multidisciplines

9:00 – 10:00 AM

BOARD 01 **EUGLENOPHYTA FROM THE GREAT SMOKY MOUNTAINS NATIONAL PARK. Christopher T. Boehler, cboehler@heidelberg.edu, Susan Carty, scarty@heidelberg.edu, Dept of Biology, Heidelberg College, Tiffin, OH 44883.**

In 2004 Jeff Johansen and others showed only one Euglenophyte species has been identified from the Great Smoky Mountains National Park. As part of the All Taxon Biodiversity Inventory conducted in the park, the goal of an algal team was to document all algal species throughout the park. This report focuses on members of the Euglenophyta. It was hypothesized that there were

more species to be found. A small pond near the Methodist Church site in the Cades Cove area was sampled in May, June, and October 2004, July 2005, and March and May 2006. Samples were immediately examined and micrographs taken; some samples were examined using scanning electron microscopy. Twelve species were identified to include: *Euglena helicoideus, E. fusca, E. polymorpha, E. spirogyra, E. splendens, Monomorphina pyrum, Phacus suecicus, P. tortus, Strombomonas cf urceolata, Tracholomonas hispida, T. superba*, and *T. volvocina*.

BOARD 02 **AQUATIC MACROINVERTEBRATE COMMUNITIES WITHIN AGRICULTURAL DRAINAGE DITCHES AND STREAMS OF THE UPPER BIG WALNUT CREEK WATERSHED, OHIO. Peter C. Smiley Jr., smiley.50@osu.edu, USDA-ARS Soil Drainage Research Unit, 590 Woody Hayes Drive, Columbus OH 43210.**

Drainage ditches are headwater streams that have been modified or constructed for agricultural drainage. These modified streams are a common landscape feature in Ohio, and constitute 25% of stream habitat within the state. Management of ditches focuses on removing excess water from agricultural fields without considering how these actions influence the aquatic biota. The objective of this study was to assess if macroinvertebrate communities differed between ditches and streams and among seasons. Macroinvertebrates were sampled from four sites in two ditches and two headwater streams within the Upper Big Walnut Creek watershed, Ohio, in the spring, summer, and fall of 2005. Three dipnet and three surber samples were collected from each site in each season. A two factor ANOVA coupled with the SNK test was used to determine if response variables differed among habitat types and seasons. Taxa richness was greater in streams than ditches ($n = 12$, $p < 0.001$). No difference in evenness occurred between habitat types. Abundance was greater in ditches than streams ($n = 12$, $p < 0.001$). EPT (Ephemeroptera Plecoptera Trichoptera) abundance was greater in streams than ditches in the spring ($n = 4$, $p = 0.002$), and no difference between habitat types occurred in other seasons. Differences in taxa richness, evenness, and abundance were not observed among seasons. The increased taxa richness and EPT abundance observed in streams suggests a need to manage ditches in the Upper Big Walnut Creek watershed for the conservation of macroinvertebrate communities.

BOARD 03 **THE EFFECTS OF LARVAL REARING DENSITY AND FOOD AVAILABILITY ON ADULT WING COLORATION AND MATING SUCCESS IN MONARCH BUTTERFLIES (*DANAUS PLEXIPPUS*). Amy L. Smith, smitham@wooster.edu, (Michelle J. Solensky, msolensky@wooster.edu), The College of Wooster C-2745, 1189 Beall Ave., Wooster OH 44691.**

Developmental stress can have important physiological effects on organisms. Completing development is energetically expensive and can impose substantial fitness costs. Dark orange wing coloration in adult monarch butterflies (*Danaus plexippus*) is correlated with higher male mating success (one way to measure fitness), and a color manipulation study suggests that this correlation is not due to female preference. Larval rearing conditions could produce adult coloration that correlates with mating success. This study tested the prediction that low food stress and low density larval rearing (control treatment) should produce darker orange wing coloration and higher male mating success. Research in our lab suggests that the correlation between wing coloration and male mating success may stem from a genetic correlation, so family lines were considered as well. Larvae (n=420) were reared in low and high food stress and density treatments, and then the wing color and mating frequency of adult males (n=89) were measured. Adults emerged from the high density treatment were significantly larger than adults from the control treatment (ANOVA with post-hoc Tukey HSD: $p=0.003$), and family had a significant effect on forewing area (2-way ANOVA: $F=8.68$, $df=6$, $p<0.001$), percent of black coloration (Kruskal-Wallis test: $X^2=16.22$, $df=6$, $p=0.013$), and orange hue (Kruskal-Wallis test: $X^2=21.56$, $df=6$, $p=0.001$). Mating success was not correlated with adult size or coloration (multiple linear regression: $p>0.10$). These data suggest that larval rearing density and food stress do not explain the correlation between adult male coloration and mating success observed in previous studies.

BOARD 04 **PLANT LIFE OF SELECTED VERTICAL AND HORIZONTAL CAVE ENTRANCES IN CARTER CAVES STATE RESORT PARK, CARTER COUNTY, KY. Katherine G. Ferguson, s09.kferguson@wittenberg.edu, (Horton H. Hobbs III, hhobbs@wittenberg.edu), Box 2791, Wittenberg University, Springfield OH 45501.**

Caves shelter uncommon and/or vulnerable species in their unique microclimates and though few surveys of flora associated with cave entrances have been conducted anywhere, there has never been one in Kentucky. A pilot survey of plants found within 0.6m of selected cave entrances in Carter Caves State Resort Park, Carter County, KY was conducted during the summer of 2006. This site was chosen for inventories of vascular plants, mosses, and mushrooms associated with cave entrances since many small-to-medium sized caves, both horizontal and vertical, are concentrated in a limited geographical area. Thirteen caves were included in the investigation, three of which had vertical entrances. A narrow transect was laid at or through the entrance of every cave examined. Detailed notes and photographs were taken of all plants found along each transect and were identified at least to genus. Once this base list was established, nearby trees and other major plants within 0.6m of the entrance were recorded. Fifty species assigned to forty-four genera were identified, including mosses, ferns, fungi, liverworts, and herbaceous and woody plants, none of which were imperiled. There appeared to be a greater occurrence of mosses around caves entrances than in the surrounding areas, but this difference has not been proven significant. Documentation over several seasons would increase the number of species of fungi and wildflowers identified, and lichen identification would add depth to the survey.

BOARD 05 **EXPRESSION AND LOCALIZATION OF NOVEL PROTEINS IN *PLASMODIUM*. Tashara L. Banks, tloeloe@yahoo.com, (Tobili Y. Sam-Yellowe, PhD), Cleveland State University, Dept of Biological, Geological, and Environmental Sciences, 2121 Euclid Ave., Cleveland OH 44115.**

Malaria is an infectious disease caused by the genus *Plasmodium.* The disease causes approximately 3 million deaths each year. The four species that cause malaria in humans are *P. falciparum, P. malariae, P. ovale,* and *P. vivax*. In this study, *P.yoelii*, a rodent model, was used to study proteins in the blood-stage malaria parasite. With the completion of the sequencing of the *Plasmodium* genome, vaccine development efforts have intensified. Proteins in blood stage merozoites have been identified as possible vaccine candidates. Rhoptry organelle proteins take part in the parasite invasion of the erythrocyte and parasitophorous vacuole formation. These proteins are strong candidates for developing a vaccine against malaria. Multidimensional Protein Identification Technology (MudPIT) analysis of the rhoptry organelle, obtained by subcellular fractionation, revealed 36 novel proteins. Eighteen were hypothetical proteins and had no homology to known proteins. To confirm rhoptry origin of the proteins, plasmid recombinants of PY01146 and PY02301 were constructed. Full length cDNAs of PY01146 and PY02301, encoding two of the hypothetical proteins were obtained by polymerase chain reaction (PCR) and subcloned into the plasmid vector pRSET-A®. Recombinant plasmids were transformed into *Escherichia coli* strain BL21DE3 competent cells and IPTG-induced expression was performed. Antibodies were also synthesized against the peptides obtained from MudPIT. Western blot analysis revealed antibody recognition of the recombinant proteins using antibodies made against rhoptries and antibodies made against synthetic peptides encoded by genes PY01146 and PY02301. Histadine tags on the recombinant proteins were also stained to observe recombinant protein expression and size of the proteins. Immunofluorescent assay analysis showed that antibodies made against synthesized peptides recognized the native proteins in parasite infected erythrocytes showing a punctate pattern characteristic of rhoptry localization. The IFA results and the presence of PY01146 and PY02301 peptides in rhoptry-enriched fractions, supports the conclusion that PY01146 and PY02301 are localized in the rhoptry.

BOARD 06 **POPULATION DENSITIES OF SEA URCHINS (*ECHINOMETRA LUCUNTER*) IN ROCKY INTERTIDAL ZONES OF SAN SALVADOR. Emily Mattes, s07.emattes@wittenberg.edu, Alison Levato, s07.alevato@wittenberg.edu, Sarah Norman, s08.snorman@wittenberg.edu, Wittenberg University, Dept of Biology, Springfield OH 45504.**

Echinometra lucunter is a common sea urchin found in the rocky intertidal zone of pan-tropical areas including San Salvador, The Bahamas. *E. lucunter* density variation was measured based on wave action in the rocky intertidal zones. It was hypothesized that the density of *E. lucunter* would be greater in the seaward sections of rocky intertidal zones due to greater wave action, which erodes the limestone rocks of the rocky intertidal zone, creating crevices that provide ideal habitats for *E. lucunter*. Two rocky intertidal zones were chosen for this study. One-meter polyvinyl chloride (PVC) quadrants with a diameter of two-and-a-half centimeters were used.

Urchins were counted at each site (site 1 = 234m^2, 3,212 urchins; site 2 = 100m^2, 867 urchins); urchins were counted within the grid for each quadrant and both populations were completely censused. The data from each site were combined and the primary results of the pooled data (N = 4,079 urchins) suggested that *E. lucunter* densities increase as proximity to the seaward side of the rocky intertidal zone increases. The average of the total urchins found on the seaward side was 15.62 urchins/m^2. On the landward side the average number of urchins measured was 7.65 urchins/m^2. In other studies, this tendency was found to be influenced by stronger wave action on the seaward side of the rocky intertidal zone.

BOARD 07 **MACROINVERTEBRATE FUNCTIONAL GROUP BIOASSESSMENT FOR STREAMS OF COSTA RICA.**

Douglas A. Vonderhaar[1], vonderda@notes.udayton.edu, Casey M. Hanley[1], Muhtadi M. Islam[1], Josh M. Siefring[1], Mollie D. McIntosh[2], M. Eric Benbow[2], Albert J. Burky[1], [1]Dept of Biology, University of Dayton, Dayton OH 45469-2320 and [2]Dept of Entomology, Michigan State University, East Lansing MI 48824-1115.

Sustainable management of stream systems and the development of bioassessment standards are important for sustainable natural resources. Macroinvertebrates and water quality data were collected in May 2005 and 2006 for the development of a rapid bioassessment protocol for Costa Rican streams. Six qualitative macroinvertebrate samples were taken using 30s dip net and scouring techniques from two flow habitats (i.e. riffles vs. pools/ banks) at three sites in each year: a near headwaters reference site, a downstream site in Rio San Luis (Site 1 and 2), and a downstream site impacted by runoff from a small community in Rio Guacimal (Site 3). Downstream sites were assessed immediately above the confluence of Rio San Luis and Rio Guacimal. Compared to Sites 1 and 2, the Rio Guacimal had the highest conductivity (2005/2006: 37.1/ 32.8, 68.1/ 86.2, 126.8/ 117.8; site 1, 2, 3, respectively) and turbidity (2005/2006: 1.09/ 1.86, 1.97/ 1.9, 8.43/ 5.9) in both 2005 and 2006. There are similar patterns in functional feeding group (FFG) ratios for riffle habitats between the years. Riffles are expected to remain similar depending on spate events, as these sites are more tolerant/stable during high water flow. Pool and bank habitats showed greater variation in FFG ratios between the years, and were expected to be more susceptible to spate events. This could be attributed to the sample size, as macroinvertebrate counts from pool and bank habitats (average: 11.85) were consistently lower than riffle habitats (average: 31).

BOARD 08 **ASSESSMENT OF BIOLOGICAL IMPACT OF WASTEWATER TREATMENT PLANT EFFLUENT ON RIVERS IN SOUTHWEST OHIO USING FUNCTIONAL FEEDING GROUP RATIOS TO INDICATE ECOSYSTEM ATTRIBUTES.**

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Management of stream systems and development of bioassessment standards are important for sustainable natural resources. Macroinvertebrates and water quality data were collected June-August of 2006 for evaluation of biological impact from wastewater in southwest Ohio. Quantitative macroinvertebrate samples were taken using a Hess sampler at ten sites: the Springfield, Waynesville, Xenia, Eaton, Versailles, Delaware, Troy, Washington Court House, and the Blacklick Wastewater Treatment Plants as well as the City of Fairborn Water Reclamation facility. Six samples were collected, upstream and downstream of the outfall at each site. Four ecosystem attributes were determined: autotrophy to heterotrophy index (P/R), coarse particulate organic matter to fine particulate organic matter index (CPOM/FPOM), fine particulate organic matter in transport to fine particulate organic matter storage in sediments (TFPOM/BFPOM) and substrate channel stability. Seven of the ten sites showed greater substrate stability and a higher level of suspended fine particulate organic matter downstream when compared to upstream. For example, at one site, P/R ratios increased from .151 to .617, CPOM/FPOM from 0 to .25, TFPOM/ BFPOM from .039 to .211 and channel stability from .196 to .879 (substrates are considered stable if >0.5). The change was large enough to warrant a change of classification in channel stability. In all cases with increases of autotrophy to heterotrophy ratios, the increase was in the downstream sites. On the whole, the CPOM/FPOM ratios showed no appreciable changes in upstream and downstream areas sampled. Conductivity showed a downstream increase in eight of the ten sites.

BOARD 09 **PRELIMINARY SEQUENCING AND ANALYSIS OF A GENOMIC DNA AMPLIFICATION PRODUCT FROM A POPULATION OF WALL LIZARDS (PODARCIS MURALIS) NEAR CINCINNATI, OHIO.**

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The wall lizard, *Podarcis muralis*, is one species of the *Podarcis* genus, a genus whose phylogenetic relationships are still mostly unknown. In the 1950s a small number of these lizards were released near Cincinnati, Ohio, and since this time have established a large colony in the area. Such isolated breeding populations are prone to limited genetic variation due to their restricted gene pool. Sequencing and analysis of *Podarcis* DNA is a highly effective strategy for identifying genetic relationships among this species. Determination of genetic relationships can be based upon amplification of extracted DNA via the polymerase chain reaction (PCR) followed by DNA sequencing of the amplified fragment. Sequence analysis permits identification of the single nucleotide polymorphisms that are diagnostic of each species. Samples of DNA were collected from 17 lizards between 22 June 2000 and 28 January 2001. These have been amplified using two primer pairs (B4, C9) previously used in genetic studies of other populations of *Podarcis muralis*. These amplification products provide the basis for analysis of genetic variation. The current study reports an analysis of fragment sizes and sequences from these primer pairs in the Cincinnati population of wall lizards.

BOARD 10 **IS CHYTRIDIOMYCOSIS (BATRACHOCHYTRIUM DENDROBATIDIS) PRESENT IN DECLINING POPULATIONS OF BLANCHARD'S CRICKET FROG (ACRIS CREPITANS BLANCHARDI)?**

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Despite being implicated as the cause of declines in numerous populations of amphibians, the presence or absence of chytridiomycosis (a pathogenic disease caused by the fungus *Batrachochytrium dendrobatidis*) in declining populations of Blanchard's cricket frog has not yet been investigated. The purpose of this research was to address: (1) whether or not chytridiomycosis is present in populations of Blanchard's cricket frogs in the Midwestern United States; (2) the overall prevalence of infection, if any, at each site; and (3) the geographic distribution of the disease. Skin swabs or toe clips were collected from 205 cricket frogs at 21 sites throughout the Midwestern United States in the summer of 2006. The sites were from six states with samples from 82 specimens from Ohio (6 sites in Auglaize, Preble, Greene, Clinton, and Fulton Counties), 53 specimens from Michigan (6 sites in Barry, Lenawee, Washtenaw, St. Clair, and Kent Counties), 39 specimens from Illinois (3 sites in Jackson, Effingham, and Will Counties), 17 specimens from Iowa (4 sites in Madison, Guthrie, Lucas, and Ringgold Counties), 9 specimens from Oklahoma (1 site in Cleveland County), and 5 specimens from Kansas (1 site in Jefferson County). The samples were subsequently tested for the presence of chytridiomycosis by running a polymerase chain reaction involving primers specific to *B. dendrobatidis.* Given that chytridiomycosis has been implicated as the cause of declines in numerous species, it was hypothesized that chytridiomycosis would be detected in these declining populations of cricket frogs and that a tentative relationship between presence of *B. dendrobatidis* and population die-offs would be found. Data revealed that the chytrid fungus is present in populations of Blanchard's cricket frogs, as *B. dendrobatidis* was detected in 31 of 205 (15.1%) skin swab and toe clip samples. Infected individuals were found in all states except Kansas and there appeared to be no obvious geographic pattern in infection. These data show that the *B. dendrobatidis* is present in many populations of Blanchard's cricket frogs in the Midwestern United States. However, no mortality was observed in the infected, yet seemingly healthy populations of cricket frogs at the investigated sites. Also, the wide geographic occurrence of *B. dendrobatidis* in Blanchard's cricket frogs suggests that the presence of chytridiomycosis is not necessarily causing the documented decline. It is likely that more than one factor is responsible for the ultimate cause of the rapid and extensive decline of Blanchard's cricket frogs, with chytridiomycosis possibly working in synergy with these other factors.

BOARD 11 **EFFECTS OF MALE MATING HISTORY ON SPERM TRANSFER IN MONARCH BUTTERFLIES (*DANAUS PLEXIPPUS*). Beth A. DeLong, bdelong08@wooster.edu, (Michelle J. Solensky, msolensky@wooster.edu), The College of Wooster, Dept of Biology, C-1395, 1189 Beall Avenue, Wooster OH 44691.**

Male monarch butterflies (*Danaus plexippus*) deposit a spermatophore into a female upon mating. This spermatophore contains accessory gland material, eupyrene (nucleated) sperm, and apyrene (anucleate) sperm. Males appear to maximize spermatophore size during each mating, but strategically allocate eupyrene sperm based on female mating history, which reflects the risk of sperm competition. Apyrene sperm can not fertilize eggs, and are smaller and therefore energetically less expensive than eupyrene sperm. While their role in reproduction remains unclear, research suggests that apyrene sperm may delay female remating, preserving the last male's sperm precedence. Because the spermatophore also functions to delay female remating, apyrene sperm transfer is predicted to follow the same pattern as spermatophore size, with maximization rather than strategic allocation. This study examines the relationship between the amount of spermatophore material, eupyrene and apyrene sperm deposited by males and male and female mating history. If males strategically allocate eupyrene, but not apyrene, sperm then the number of apyrene, but not eupyrene, sperm should increase with time since last mating. Eupyrene sperm transfer, but not apyrene sperm transfer, should correlate with risk of sperm competition. We used laboratory-reared males of known mating history, and dissected the spermatophores from females immediately after mating to count the number of eupyrene and apyrene sperm transferred. We dissected spermatophores from 129 females. Males had mated 1-14 days prior to the focal mating. We will use linear regression to measure the effect of time since last mating on male sperm transfer.

BOARD 12 **MECHANISMS OF LONG DISTANCE TRANSMISSION OF THE AMPHIBIAN CHYTRID FUNGAS *(BATRACHOCHYTRIUM DENDROBATIDIS)*. Jennifer L. Cadnum, Cadnumjl@muc.edu, (Brandon Sheafor, sheafobr@muc.edu), Mount Union College, 1972 Clarke Ave., Alliance Oh 44601.**

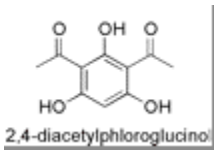
Global amphibian decline has been a leading concern of vertebrate biologists for the past several decades. Research has linked part of this global decline to chytridiomycosis, an infection of the epidermis in amphibians caused by the chytrid fungus, *Batrachochytrium dendrobatidis*. The spread of chytridiomycosis from direct contact with an infected amphibian is the method of transmission that has been primarily studied to date. However, long distance transmission (over hundreds of meters) appears to occur in the environment and the method of transmission is still unknown. Further growth of *B. dendrobatidis* is dependant upon the release of motile zoospores from a sessile sporangium. In laboratory settings, Amphibians have only contracted chytridiomycosis when directly exposed to *B. dendrobatidis* contaminated water or infected amphibians, suggesting an aquatic method of transmission. A possible method of long distance transmission in nature is transmission of zoospores by mist or water droplets. This may naturally occur in environments with fast moving water, waterfalls, or tropical regions where the air is thick with moisture. Using a misting mechanism, the viability of zoospore transmission will be tested using tryptone plates to analyze the ability of zoospore infected mist to form colonies on plates over a range of distances from the source. The affect of droplet size on transmission will also be analyzed. The information gained from these experiments will increase our understanding of long distance transmission of *B. dendrobatidis* which may be vital in preventing the spread of chytridiomycosis in amphibian populations worldwide.

BOARD 13 **IDENTIFICATION OF STRAIN-DEPENDENT MODIFIER GENES OF THE *SKI* PROTO-ONCOGENE THROUGH IMMUNOHISTOCHEMICAL STAINING OF MICE EMBRYOS. Lindsay M. Greenawalt, greenalm@muc.edu, (Jonathan J. Scott, scottjj@muc.edu), Mount Union College, 1972 Clark Ave, Alliance, OH 44601.**

The mouse *ski* proto-oncogene is a direct homolog of human *SKI*, which has been identified as the primary gene involved in monosomy 1p36 syndrome, one of the most common terminal deletion syndromes. Characteristic phenotypes include craniofacial defects, vision and eye problems, and heart defects, which are all phenotypes associated with *ski*-deficient mice. *Ski*$^{-/-}$ have distinct strain-dependent phenotypes. C57BL/6J mice that lack *ski* develop mostly midline facial clefting, while the 129 *ski*$^{-/-}$ mice display exencephaly as the dominant phenotypes. Due to independent segregation of the genetic background, there are also mice which display no gross phenotype and both phenotypes. It has been hypothesized that these phenotypes are a result of a modified tetrahybrid inheritance, in which wild type C57BL/6J and 129 mice have reciprocal genotypes of at least four modifying genes. The four craniofacial phenotypes observed result from segregation of four postulated semi-dominant suppressor loci. From Chi-Square analyses, several significant genomic loci have been identified as regions of interest. Within these significant loci, top candidate genes have been chosen for further analysis based on: 1) similar phenotypes between the candidate gene and *ski*$^{-/-}$, and 2) previously demonstrated biochemical connections. To test whether candidate genes may actually modify the *ski*$^{-/-}$ phenotypes, expression of the candidate genes is examined in areas of craniofacial defects to determine if there is a difference between C57BL/6J and 129 strains through immunostaining antibodies against each gene. A difference strongly suggests that the gene is a modifier of *ski* and that the strain is directly affecting the phenotypes.

BOARD 14 **INHIBITION OF BATRACHOCHYTRIUM DENDROBATIDIS BY AN ANTIFUNGAL COMPOUND, 2,4-DIACETYLPHLOROGLUCINOL, PRODUCED BY BACTERIA FOUND ON THE SKIN LAYER OF AMPHIBIANS. Robert M. Brucker, bruckerm@muc.edu, (Brandon Sheafor, sheafobr@muc.edu), Mount Union College, 1972 Clarke Ave, Alliance OH 44601.**

Amphibians face one of the largest extinction rates of any extant vertebrate class and the fungal pathogen *Batrachochytrium dendrobatidis* has been shown to be a major contributor to population declines throughout the world. Not all amphibian species are fatally susceptible to *B. dendrobatidis* and this could be due to competition between the pathogenic fungus and the amphibian epidermal microflora. Bacterial isolates of *Pseudomonas fluorescence* have been found living on many species of amphibians, including amphibians that seem to be able to tolerate *B. dendrobatidis* fungi. This bacteria is known to produce the antifungal compounds pyoluteorin, pyrrolnitrin, and 2,4-diacetylphloroglucinol (2,4-DAPG). Chemical analysis shows that 2,4-DAPG is also produced by *Lysobacter gummosus*, another common skin bacterium. The hypothesis is that 2,4-DAPG produced by epidermal bacteria may be important in conferring resistance to pathogenic fungi like *B. dendrobatidis*. To test this, the inhibitory effects of 2,4-DAPG on *B. dendrobatidis* will be explored using a 96 well, MTT (3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) assay. The assay will quantify the cellular activity of *B. dendrobatidis* against varying concentrations of 2,4-DAPG by measuring a difference in absorbency as the fungal zoospores reduce MTT to formazan crystals over an incubation time of 6 hours.



2,4-diacetylphloroglucinol

BOARD 15 **DISTRIBUTION OF ROCKY INTERTIDAL ZONE GASTROPODS *NERITA VERSICOLOR* AND *N. PELORONTA* IN SUN AND SHADE MICROHABITATS ON SAN SALVADOR, THE BAHAMAS. Tracy E. Dohn, s09.tdohn@wittenberg.edu, John M. Tiggelaar II, s08.jtiggelaar@wittenberg.edu, Wittenberg University, Box #1600, 734 Woodlawn Avenue, Springfield OH 45504.**

Nerites living in the tropical rocky intertidal zone are subjected to severe environmental stressors such as direct sunlight which causes desiccation. The habitat selection of *Nerita versicolor* and *N. peloronta* was studied to determine microhabitat distribution relative to shade. It was hypothesized that *N. versicolor* and *N. peloronta* would more likely be found in shaded areas where the ambient temperature would be lower. Observations were taken at 17 different 1 m^2 quadrants at four separate locations containing 1003 *N. versicolor* and 45 *N. peloronta* on the island of San Salvador, The Bahamas, from 5 June 2006 to 12 June 2006. Percentages of sun and shade for each quadrant were estimated and compared to the percentages of nerites occupying the shaded area. Some quadrants had only *N. versicolor* present. Most nerites (68.4%) were located in the shade (69.0% of *N. versicolor* and 55.6% of *N. peloronta*). The average amount of shade available per quadrant was 24%. As found here, previous studies show that other species of rocky intertidal zone gastropods are more likely to be found in sheltered areas.

BOARD 16 **EVALUATION OF SELECTED TUMORS AND CANCERS OF HUMAN SKIN BY MEANS OF HIGH RESOLUTION LIGHT MICROSCOPY (HRLM), IMMUNOMICROSCOPY, AND TRANSMISSION ELECTRON MICROSCOPY (TEM). Lisa M. Martorano, s08.lmartorano@wittenberg.edu, and David L. Mason, dmason@wittenberg.edu, Wittenberg University, Box 2783, Springfield OH 45501.**

Tissue samples (n=7) of known skin tumors and cancers were obtained from Community Hospital in Springfield, OH and other hospitals in the Dayton-Miami Valley region for analysis through high resolution light microscopy, immunomicroscropy, and electron microscopy. These techniques were implemented to distinguish histological features of the skin cancers. The following lists the findings of each cancer. Clusters of dividing cells were seen forming a nodular growth in the epidermis, indicative of basal cell carcinoma. HRLM showed the basal lamina separating malignant cells from the underlying dermis. With squamous cell carcinoma, HRLM revealed malignant squamous epithelial cells penetrating into the dermis. These cells contained a strong presence of keratin as detected by immunomicroscopy. In a case of malignant melanoma, dark melanin pigment was found in malignant cells under HRLM; however, malignant cells appeared devoid of melanin in a case of amelanotic melanoma—TEM readily showed premelanosomes within the cytoplasm of the amelanotic cells. In a case of merkel cell cancer, small neurosecretory granules located beneath the cytoplasmic membrane of the malignant cells were revealed by TEM. Furthermore, immunomicroscopy detected neuron-specific enolase (NSE) in the malignant cells. NSE was also present in malignant cells of a carcinoid. HRLM showed malignant lymphocytes invading the dermis and epidermis in a case of mycosis fungoides. Between the squamous epithelial cells, TEM illustrated the deeply clefted shape of the T-lymphocytes. Overall, the above forms of microscopy helped to better identify the unique cellular structures of malignant skin cancers.

BOARD 17 **HIGH RESOLUTION LIGHT MICROSCOPY EMPLOYING LABELED ANTIBODIES HELPFUL WITH THE IDENTIFICATION OF A SPECIFIC TYPE OF CANCER. David L. Mason, dmason@wittenberg.edu, Wittenberg University, Box 720, Springfield OH 45501.**

From approximately 300 cases of human cancers presenting at Community Hospital in Springfield, OH, and other hospitals in the Dayton Miami Valley, tissues were fixed in neutral buffered formalin (NBF), dehydrated, embedded in Spurr plastic, sectioned on an ultramicrotome, and placed onto glass slides for immunostaining. Primary antibodies were applied, followed by a secondary antibody (link antibody) that was conjugated to either peroxidase or a fluorescent stain. The results on the following cases revealed by immunoidentification a specific antigen by light microscopy that was helpful with the identification of each type of malignancy. Cortisol was detected in cells of a malignant adrenal cell carcinoma; ulex europaeus 1 agglutinin in proliferating endothelial cells in a case of a hemangiosarcoma; CD13 surface receptor for both myelocytes and monocytes in a case of myelomonocytic leukemia; IgG kappa in a case of plasma cell leukemia; glial fibrillary acidic protein (GFAP) in the malignant cells of an astrocytoma of a brain; epithelial membrane antigen (EMA) in malignant cells of a lobular carcinoma of a female breast; carcinoembryonic antigen (CEA) in malignant glandular cells that had migrated into the squamous cell region of a breast nipple in a case of Paget's disease; vimentin in malignant bone cells in a case of osteogenic sarcoma; alpha-1-antichymotripsin in the metastatic cancer cells in a bronchial tube in a case of malignant fibrous histiocytoma (the primary cancer was later detected in the retroperitoneum); gastrin in the malignant cells of a carcinoid in a colon; prolactin in tumor cells of a pituitary gland; alpha-fetoprotein (AFP) in malignant liver cells in a case of hepatoma; CD-4 expression protein in cells of a malignant T-helper lymphoma; adrenal corticotrophic hormone (ACTH) in tumor cells of a pituitary tumor; chorionic gonadotropin alpha (HCG) in malignant cells of an embryonal cancer of a testis; melanin specific antigen in malignant skin cells of an amelanotic melanoma; gastrin in tumor cells of a pancreatic gastrinoma; desmin in malignant cells of a leiomyosarcoma; thyoglobulin in the malignant cells of a follicular carcinoma of the thyroid gland; and calcitonin in malignant cells of a medullary carcinoma of a thyroid gland. In conclusion, detection of specific markers in malignant cell types is extremely important, especially as it relates to the pathological evaluation and treatment for the cancer type.

BOARD 18 **THE EFFECT OF ROUNDUP® ON THE GERMINATION OF OSTRICH FERN SPORES. Brandon T. Sinn, btsinn@student.ysu.edu, Carl F. Chuey, cfchuey@ysu.edu; Dept of Biological Sciences, Youngstown State University, 1 University Plaza, Youngstown OH 44555.**

When using over-the-counter herbicides, it is possible that the consumer may accidentally introduce these chemicals to the spores of native, wild ferns when spraying nearby weeds in garden beds or forests adjacent to fields in agriculture. It was the intent of this experiment to determine what effects these consumer available herbicides may have on the germination of the spores of ostrich fern (*Matteuccia struthiopteris* (L.) Todaro). After being washed from their sporangia and placed on nutrient agar, 0.05 mL of consumer grade 18% glyphosate Roundup® mixed to the recommended concentration for annuals (8.9 mL of herbicide to 380 mL of distilled water) was dropped onto the spores in each petri dish. Roundup® was applied at 24 hours or 48 hours with herbicide free controls for both time intervals, thus creating 4 treatments. ANOVA indicated the significance of Roundup^{0}, time, and also indicated an interaction between the two ($p = .013$). After being run as a 4 group one-way ANOVA, both the Tukey and Bonferroni Post Hoc tests demonstrated significance between treatments ($p < .001$). This suggests that application of Roundup®, time of application, as well as an interaction between Roundup® and time together are significant factors. These data suggest that Roundup® mixed to annual specifications significantly lowers the germination of ostrich fern spores.

BOARD 19 **PREPARATION AND CHARACTERIZATION OF Pd(II) COMPLEXES OF AND F-19 NMR-REPORTER PINCER LIGAND. Heidi M. Fondeur,[1] heidifondeur@hotmail.com, Man lung Kwan,[2] mlkwan@jcu.edu, Charles S. Carfagna,[2] Sara J. Conry,[2] Jennifer E. Marshall,[2] Kenneth M. Poleski,[2] Norris W. Hoffman,[3] nhoffman@jaguar1.usouthal.edu, Rachel K. Traylor,[3] Benjamin F. Wicker,[3] Richard E. Sykora,[3] James H. Davis, Jr.,[3] Gregory A. Khitrov,[4] Alan G. Marshall[4,5], marshall@magnet.fsu.edu, Ronald J. Clark[5], Bridges to Success in Sciences, [1]Cuyahoga Commmunity College, Dept of Chemistry, [2]John Carroll University, Dept of Chemistry, [3]University of South Alabama, Ion Cyclotron Resonance Program, [4]Florida State University,National High Magnetic Field Laboratory, Dept of Chemistry and [5]Florida State University, Dept of Biochemistry.**

The versatility of organopalladium pincer complexes in catalytic organic synthesis has attracted great attention. Although most studies are focused on their catalytic applications, the mechanism of many catalytic processes using such complexes has yet to be determined. We have synthesized a new set of Pd(II) arylbis(phosphinite) ^{19}F NMR-reporter pincer-ligand complexes shown below for K = Tfa (Trifluoroacetate), Cl, Br, I and characterized by NMR and X-ray crystallography. The aryl-F NMR signal should provide useful metrics (e.g. chemical shifts and coupling constants) for correlation with catalytic activity and selectivity as well as in mechanistic studies of these organic transformations. Halide-metathesis equilibria for such reactions have been monitored by both ^{19}F and ^{31}P NMR spectroscopy. Complexes [(F-pincer)Pd-L+]PF6- for L = AsPh3 and Pyridine, have been prepared in 80-90% yield by treating the Pd-Cl species with TIPF6 (Hexafluorophosphino thalium (I)). Activation energies for dissociation of L = AsPh3, Pyr, and NCCH3 have been measured as 12, 8.1, 6.6 average kcal/mol, respectively by Electrospray-Ionization Infrared Multiphoton Dissociation Ion Cyclotron Resonance.

BOARD 20 **REEF MACROBORINGS AND BIOEROSION IN HOLOCENE REEF FACIES ENRIQUILLO VALLEY, DOMINICAN REPUBLIC. B. Ann Hoedt, Ann.Hoedt@otterbein.edu, (Halard Lescinsky, Hlescinsky@otterbein.edu), Dept of Life and Earth Sciences, Otterbein College, Westerville OH 43081.**

Grazing and macroboring are two main components of bioerosion within coral reef systems. Grazing and macroboring abundance were investigayed in five different Holocene (5-8000 ybp) reef facies in Enriquillo Valley, Dominican Republic. Corals were examined along 12 m transects: lagoon (2 transects), branching (6), mixed (4), massive (4), and platy (2); and evaluated for taphonomic grade (surface condition), colony orientation, and encrustation. In addition, 25 coral heads per transect were collected and subsectioned to identify and quantify macroboring traces. Mixed and massive zone corals had 10-20% macroboring bioerosion with few differences between facies. Lithophages (Bivalves) were the most abundant borers in these facies followed by sponge traces, primarily *Entobia mammillata* and *Entobia geometrica*. *Entobia ovula* and barnacle borings were also frequently encountered in both the massive and mixed reef zones. It is hypothesized that bivalve borings will be limited by small substrates particularly in the branching coral zone. Branching and lagoon

facies will probably have high variability of borings and bioerosion between coral pieces, with lagoon samples having the greatest surface bioerosion. It is predicted that these results will be similar to modern, near-shore, high turbidity reefs with a high abundance of boring bivalves and barnacles. If high incidence of boring, and low incidence of surface bioerosion is found, then this would suggest that macroboring rather than grazing may be the most important factor of reef bioerosion in this setting.

BOARD 21 **SOIL VARIATION IN A NEWLY CREATED WETLAND IN LICKING COUNTY, OHIO. Melissa L. Kennedy, Kenned_m@denison.edu, Slayter Box 1894, Denison University, Granville, OH 43023.**

In 1989 the "no net loss" policy emerged from the Clean Water Act. The goal of this policy is to conserve and protect wetlands whenever possible, but it predominantly focuses on creating or restoring wetlands to replace natural wetlands that have been lost to anthropogenic development. The 10 ha wetland in this study is one that was created in the spring of 2006 at Dawes Arboretum, Licking County, Ohio as mitigation for a regional road expansion. The purpose of this study is to spatially analyze abiotic soil characteristics in the created wetland complex. Soil samples were collected at 10m x 10m intervals from four of the five multiple basins present in the complex and physicochemical characteristics were analyzed for basin-to-basin variation. A total of 83 samples were taken from basin one, 46 from basin two, 105 from basin three and 111 from basin five. The physicochemical characteristics measured in this study are pH, bulk density, and percent organic matter. The hypothesis is that all of the basins are uniform in structure during the initial phases of ecosystem assembly, and sites of abiotic variation will impact initial plant establishment and growth. Organic matter and bulk density show some degree of correlation with each other (r =-0.58, significant at 0.01 level), but pH shows a weaker correlation with both organic matter and bulk density (r = -0.37 and r =0.41 respectively, both significant at 0.01 level) . An analysis of variance shows that there is a significant difference in measures of bulk density, percent organic matter, and pH within and among different basins (á=0.05). These results show abiotic variability in pH, organic matter and bulk density in the basins, but no strong differences in depth. Attention to these abiotic factors may improve plant establishment and survivorship in newly created wetlands.

BOARD 22 **A SURVEY OF TURTLES IN METRO PARKS AND RESIDENTIAL PONDS IN CENTRAL OHIO Kurt J Marks, Kurt.Marks@otterbein.edu, (Sarah Bouchard, sbouchard@otterbein.edu), 104 West Columbus St., Canal Winchester OH 43110.**

Recent studies have shown that introduced non-native turtle species, such as red-eared sliders (*Trachemys scripta elegans*), can disrupt native turtle ecology by competing for food and basking areas. Other studies have found that these introduced turtles can establish viable breeding populations. The goal of this study was to survey residential and Metro Park pond ecosystems in Central Ohio for non-native turtle species. Nine ponds were included in the study; five were residential ponds located in housing subdivisions and four were located in Metro Parks. At each of the nine study sites, turtles were trapped using basking and baited hoops traps set in areas where turtles may feed or bask. Traps were set in August 2006 in the early morning or the previous night and were checked once a day for five days at each site. Turtles were identified to species, measured, and marked to prevent recounting. A total of twenty-one turtles were trapped in six of the nine ponds (three residential ponds and three Metro Park ponds). Four native and two non-native species were identified. The non-native species, (*T. s. elegans*) and (*T. s. scripta*) comprised 15% of turtles caught in the Metro Parks ponds, whereas 75% of turtles caught in the residential ponds were non-native. These are common pet store species and were likely released by local pet owners. Future studies should determine if these non-native turtles comprise a viable population and if they are negatively affecting pond ecosystems.

BOARD 23 **THE IMPACT OF VEGETATION STRUCTURE AND COMPOSITION ON GRASSLAND BIRD SPECIES DENSITY ON A RECLAIMED STRIP-MINE IN SOUTHEASTERN OHIO. Adam E. Cirone, acirone@muskingum.edu, Danny J. Ingold, ingold@muskingum.edu, Biology Dept, Muskingum College, New Concord OH 43762.**

Reclaimed strip-mines have been shown to provide suitable nesting habitat for a variety of grassland bird species. The extent to which grasslands dominated by exotic grass species benefit grassland birds versus native grasslands as well as exotic grasslands encroached upon by exotic woody species (e.g., autumn olive, *Elaeagnus multiflora*) is still in question. From mid-May through July 2006, the number of males of several bird species along 250 m transects in ten 250 x 100 m plots (5 on exotic grasslands, 3 on encroached grasslands, and 2 on native grasslands) in the Wilds was quantified (by song and visual observations with a range finder). The Wilds is a reclaimed strip-mine located at the intersection of Guernsey, Muskingum and Noble counties in southeastern Ohio. One-way ANOVAs were used to analyze these data, which detected no significant difference ($P > 0.05$) in the density of Henslow's sparrows (*Ammodramus henslowii*), savannah sparrows (*Passerculus sandwichensis*), bobolinks (*Dolichonyx oryzivorus*) or red-winged blackbirds (*Agelaius phoeniceus*) among these three habitat types. A significant difference was detected in grasshopper sparrow (*A. savannarum*) density in the grassland plots (both exotic and native) lacking woody vegetation versus those with woody encroachment ($F = 8.89$, $DF = 2$, $P < 0.05$). A significantly greater density of common yellowthroats (*Geothlypis trichas*) was detected in plots with woody vegetation versus those (both exotic and native) lacking woody encroachment ($F = 78.55$, $DF = 2$, $P < 0.001$). These data suggest that grassland plots lacking woody encroachment (whether dominated by exotic or native grass species) were beneficial to nesting grassland birds, while plots with woody encroachment were less attractive.

BOARD 24 **HYDROGEN PRODUCTION THROUGH THE ELECTROLYSIS OF WATER. Josh T. Lilly, Jlilly@heidelberg.edu, Terry Lemley, Ph.D., Tlemley@heidelberg.edu, Heidelberg College, 310 E. Market St., Tiffin OH 44883**

The dependence on oil as a source of energy is growing and alternative energy sources that can reduce the use and environmentally damaging effects must be discovered. The only byproduct of the oxidation of hydrogen is water, making it a clean energy carrier. The goal of this research was to determine the efficiency of electrolysis as a method of hydrogen production. The electrolysis cell was filled with 815mL of 0.33M aqueous H_2SO_4, and a regulated input potential of 5 volts was applied. Three different types of experiments were conducted measuring the current passing through the electrolyte, a 24hour measure of the current, and an experiment measuring the hydrogen gas production. Multiple observations of the current show a sharp decrease in current immediately after electrical input, presumably due to a build up of ions around each electrode. A 24hour record of the current revealed a 5.6mA/hour linear increase beginning at thirty minutes and continuing for the duration of the experiment. It was assumed that this observation resulted from an increased concentration of electrolyte in the cell as water was consumed to produce hydrogen and oxygen. While measuring the gas production it was noted that 30mL were produced in ten minutes. The cell produced $1.2x10^{-3}$ moles of hydrogen which would release 343J (286kJ/mol) when recombined with oxygen to form water, while it was determined that 1025J were put into the system. The efficiency of our electrolysis cell was approximately 34% under the given conditions (.975atm corrected for saturated vapor pressure, 21ºC).

BOARD 25 **NATURAL RUBBER TEST FOR ELASTOMERS IN PURE SHEAR. Amy L Blake, alb9@uakron.edu, Glenn S Jansen, gsj3@uakron.edu, (Michelle Hoo Fatt, hoofatt@uakron.edu), Dept of Mechanical Engineering, The Univ. of Akron, 1536 Gulf St., Uniontown OH 44685.**

The long term goal of this research project is to develop constitutive equations and failure criteria for elastomers under high rates of loading. These are rapidly becoming important material criteria for elastomers in rubber isolation bearings and polyurea coatings for concrete walls; both of which are stressed under high shear rates. There has apparently been very little work done to characterize the large strain and tensile properties at high shear rates. The objective of this study is to develop an apparatus and test procedure to characterize natural rubber in pure shear under high strain rates. Natural rubber is one of the most important materials used in industry because of its ability to strain crystallization; which imparts it with the high strength that natural rubber is known. The typical sample used in these experiments will be a 10:1 length to height ratio, which, when pulled in tension, ought to exhibit pure shear characteristics. A mold, a testing apparatus, and a test procedure are being designed for pure shear in natural rubber. The testing apparatus will be a modified Charpy machine with linear sliding grips equipped with load cells and a high speed camera which will be a video extensometer. For each strain rate, between three and five tests will be performed in a sample. From the collected sample data, the median will be used as the in further analysis to compare the stress strain characteristics and fracture mechanics.

BOARD 26 **THE RELATIONSHIP BETWEEN TEMPERATURE ADAPTATION AND MATING SUCCESS IN MALE *DANAUS PLEXIPPUS.* Evan R Slanczka, ESLANCZKA09@wooster.edu, C-2726, 1189 Beall Ave., Wooster OH 44691.**

In ectothermic organisms body temperature regulation is essential for survival. One way is through melanin regulation. In previous experiments it has been shown that monarch butterfly (*Danaus plexippus*) reproductive success is linked to wing melanization. However, due to opposite, significant trends pertaining to percent wing melanization and mating success, it is inconclusive if reproductive success is linked only to wing color. The objective of this experiment was to elucidate these trends. To help understand these trends, it was hypothesized that reproductive success is linked with ability to adapt wing color to temperature. This hypothesis was tested by rearing monarchs in different temperatures with a warm treatment group (77.6^{oF} -84.8^{oF}) and a cold treatment group (62.8^{oF} -72.8^{oF}). Using digital scanners to record their wing melanization as adults, the males' wings were analyzed for color percentages using Adobe Photoshop™ and FoveaPro™. Upon reaching sexual maturity males from the two treatments (n=115) were released into cages with females and their mating success recorded for ten days. It was predicted that individuals raised in the cooler temperature group that had more melanin would mate more than individuals that had less melanin. Likewise, individuals raised in the warm treatment that had less melanin would mate more than individuals that had more melanin. Using weighted linear regression to statistically analyze the results, it was found that separately, neither the cold treatment group ($p=0.481$) nor the warm treatment group ($p=0.154$) supported the hypotheses even though both trends appeared as was hypothesized.

BOARD 27 **AN ASSESSMENT OF THE MUSSEL COMMUNITY OF THE LITTLE MIAMI RIVER SYSTEM. Marshall H. Goodman, marshall.goodman@otterbein.edu, Michael A. Hoggarth, mhoggarth@otterbein.edu, Dept of Life and Earth Sciences, Otterbein College, Westerville OH 43081.**

The mussel community of the Little Miami River system was sampled at 27 locations from 16 June to 23 September 2006. Numbers of extant and extirpated species were determined for each site and mussel length, height, width and age (annular ring method) were taken for each live specimen collected during two 2-hour timed transects and quadrat sampling (40 ¼^2 meter samples). Relationships between extant species and fish anomalies (Ohio EPA 1995, 2000), and densities of mussels and *Corbicula fluminea* (Asiatic clam) were found. Also, number of extant vs. extirpated species and individuals were compared to mussel data collected 15 years prior (Hoggarth 1992). Our data demonstrate a general decline in the distribution and abundance of mussels in this system. The upper East Fork (above William Harsha Lake) and the mainstem, below the mouth of the East Fork, have retained their mussel diversity. The former mussel community within Todd's Fork has been lost and the mussel community in the mainstem, above the mouth of Caesar Creek, largely has been extirpated. The system demonstrates a negative relationship between the number of fish anomalies and extant species of mussels ($r^2 = 0.756$, $p<0.01$) and a negative relationship between mussel and *C. fluminea* densities ($r^2 = 0.544$, $p<0.01$). Mussel age distributions, even where they were abundant, were skewed to the older age classes indicating the potential for further decline. These data are being used to construct a Mussel Index of Biotic Integrity that can be used to document any further decline in this system.

BOARD 28 **MICROBIAL DIVERSITY IN METAL CONTAMINATED SOILS OF KILGORE FARM, DELAWARE CO., OH, USING MICROBIOLOGY AND METAGENOMIC SEQUENCING TECHNIQUES. R. Alexander Mack, alexander.mack@otterbein.edu, Amy E. Jessen-Marshall, ajessen-marshall@otterbein.edu, Simon Lawrance, slawrance@otterbein.edu, 1 Otterbein College, Westerville OH 43081.**

The Kilgore Farm, located in southeastern Delaware Co., OH, was home to ammunition manufacturing facilities during World War II. The destruction and burial of wastes took place on the property in a marked 'burn pit'. The site was used to determine the microbial diversity of the burn pit by using metagenomic sequencing and BLAST searching databases. Organisms from the burn pit and the control sites are being examined in order to determine whether the species differences can be attributed to different levels of metal contaminants in the soils. A total of ten soil samples were taken from three sites within the burn pit and two sites out of the pit with the same soil type. From each site, two samples were taken from depths of 6-12in and 18-24in. Soils were digested with acid for ICP spectrophotometric analysis to determine the metal composition in the samples. Genomic DNA was isolated from the samples using an isolation kit from Epicenter®. Bacterial universal primers were used with *Escherichia coli* DNA and the correct PCR conditions for amplification of the bacterial DNA from soil were determined. Metagenomes of the bacterial DNA were analyzed by Denaturing Gradient Gel Electrophoresis (DGGE) in order to separate the individual organisms. The 16srDNA subunits of the organisms are being sequenced and analyzed in order to determine the bacterial genera present in the soil. The identification of microorganisms is the first step in identifying potential bioremediators of the site.

BOARD 29 **MICROBIAL BIOREMEDIATION: IDENTIFICATION AND BIOCHEMICAL ANALYSIS OF HYDROCARBON DEGRADING BACTERIA. Mina S. Makary, mina.makary@otterbein.edu, (John Tansey, jtansey@otterbein.edu, Amy E. Jessen-Marshall, ajessen-marshall@otterbein.edu), Otterbein College, SMC Box# 12255, One Otterbein College, Westerville OH 43081.**

Hydrocarbon contamination of water and soil ecosystems is a major environmental issue. Current research has focused on identifying and characterizing hydrocarbon-degrading microbes as well as developing new technologies that optimize the use of these microbes in environmental clean up. The purpose of this study is to identify novel microorganisms that degrade hydrocarbons. Soil (N=11) was collected from areas visually contaminated with oil and gas from parking lots on Otterbein College campus. Soil samples (N=4) were serially diluted and inoculated onto hexane and minimal salt media plates to allow for the growth of hydrocarbon-utilizing microbes. Clear zones were observed surrounding all of the bacteria, indicating the ability to degrade the hydrocarbon in the media. Fifteen different bacterial strains were isolated and identified using colony morphology, negative staining, and Gram staining. Five strains were also analyzed by Enterotube® biochemical tests. Overall, the most common bacteria growing on the plates were *Pseudomonas aeruginosa* and *Serratia marcescens*. Ribosomal DNA sequencing of these strains is underway to further identify the species. Using hexane as a hydrocarbon model, five isolates, including *Pseudomonas* and *Serratia* were tested for metabolism of other hydrocarbons, including 1-hexanol, toluene, p-xylene, n-amyl alcohol, iso-amyl alcohol, tert-amyl alcohol, and tween 20. Initial results suggest side chain hydroxyl groups are more easily metabolized based on growth on plates and in liquid culture. Liquid-gas chromatography was used in an attempt to identify hexane metabolites, which are mainly short-chain carboxylic fatty acids. Additional analysis includes the use of mass-spectroscopy to assay the metabolic products of the hydrocarbon degrading microorganisms.

BOARD 31 **MITOCHONDRIAL GENES SUPPORT THE EXISTENCE OF TWO POISON DART FROGS (MANNOPHRYNE, DENDROBATIDAE) FROM TRINIDAD AND TOBAGO. Elizabeth A. Wojtowicz, ewojtowicz@wooster.edu, (Richard Lehtinen, rlehtinen@wooster.edu), College of Wooster, 1189 Beall Ave, Box 3032, Wooster OH 44691.**

Two species of poison dart frogs (family Dendrobatidae) are thought to occur on the Caribbean islands of Trinidad and Tobago. Until 1983, however, only one species was recognized and was thought to occur on both islands (*Mannophryne trinitatis*). In 1983, *Mannophryne olmonae* was described as a new species, different from *M. trinitatis*, that is restricted to Tobago. Some researchers have doubted the validity of *M. olmonae,* which was described on the basis of a few subtle morphological differences. We used molecular genetics to assess whether these species are indeed separate evolutionary lineages. PCR fragments from mtDNA (using primers specific for the 16S and 12S rRNA genes) totaling ~1200bp were sequenced from frog populations in Trinidad (n = 10) and Tobago (n = 9). Preliminary results from phylogenetic analysis of 12S sequences suggest that *Mannophryne trinitatis* and *Mannophryne olmonae* have distinct genetic differences, suggesting each should be recognized as a separate species.

BOARD 32 **WHITE-TAILED DEER (*ODOCOILEUS VIRGINIANUS*) POPULATION ESTIMATION AT THE WILDS TO IMPLEMENT A MANAGEMENT PLAN. Matthew W. Hatfield, hatfield@muskingum.edu, (James L. Dooley Jr., jdooley@Muskingum.edu), Muskingum College, 163 Stormont St., New Concord OH 43762.**

Accurate estimates of white-tailed deer (*Odocoileus virginianus*) populations are critical to developing effective management decisions. White-tailed deer management has been of interest to wildlife managers due to increases in deer abundance and the

recognition of the status of deer as keystone herbivores. Being able to accurately estimate white-tailed deer population size has been difficult, because deer are large, mobile mammals. Distance sampling offers a relatively effective and efficient alternative to traditional capture/recapture approaches in population estimation. Sampling procedures and estimation routines developed by Program Distance were used to sample white-tailed deer abundance across the property of the Wilds in September 2006. The Wilds is a 10,000 acre conservation research and education institution located in southeastern Ohio. Backcountry roads traversing the Wilds property were used as sampling transects. Along each transect an off-road vehicle was driven and a laser range finder was used to determine the linear distance from the transect to the clusters of deer. In addition, important meso-scale habitat characteristics (such as grassland, woodland, and edge forest) were recorded. Estimates of white-tailed deer abundance will be developed across the property with the aim of developing accurate estimates of relative abundance. These data may then allow for planning of future investigations designed to assess the impact of deer foraging on habitat development and change.

BOARD 33 **BURYING BEETLE SURVEYS FOR THE POTENTIAL REINTRODUCTION OF THE AMERICAN BURYING BEETLE (*Nicrophorus americanus*) AT THE WILDS, OHIO. Ryan L. Bechtel, rbechtel@muskingum.edu, Adam Davis adavis@thewilds.org, (James L. Dooley, Jr., jdooley@muskingum.edu), Conservation Science Program, Muskingum College, 163 Stormont St, New Concord OH 43762.**

Insects constitute approximately three percent (3%) of currently listed endangered species in the United States. The American burying beetle, *Nicrophorus americanus*, was listed as an endangered species in July of 1989. American burying beetles are known to be key contributors to ecosystem function and are considered to be habitat generalists. The dramatic decrease in their population is puzzling to entomologists, and reintroduction efforts have been undertaken. The objectives of this research were to survey a number of habitats within the Wilds ecosystem to document species richness and the relative abundance of related burying beetle species. The Wilds is a 10,000 acre conservation research and education institution located in southeastern Ohio. Locations deemed to contain sufficient resources to support related species may be further evaluated for use as release sites for *Nicrophorus americanus*. Baited pit fall traps were set up along 200 meter transects at 20 meter increments. All traps were checked between 6:30 A.M. and 10:00 A.M. to reduce beetle mortality. Burying beetles found in the traps were identified in the field (using a beetle identification book), and then released. Initial analysis of the data suggests that a number of sites within the Wilds' property appear to support robust numbers of congener burying beetle species (*orbicollis* and *tomentosus*) and therefore may hold potential as release sites for the endangered *Nicrophorus americanus*.

BOARD 34 **THE DISTRIBUTION AND ABUNDANCE OF GASTROPODS INFECTED WITH PARELAPHOSTRONGYLUS TENUIS IN DIFFERENT HABITATS AT THE WILDS, OHIO. Ashleigh Lemon, alemon@muskingum.edu, Rachel Hollis, rhollis@muskingum.edu, (Jim Dooley, jdooley@muskingum.edu), Muskingum College, 163 Stormont St., New Concord OH 43762.**

Parelaphostrongylus tenuis is a species of meningeal worm that has been identifies as an important threat to non-native ungulates in North America captive management programs. White-tailed deer (*Odocoileus virginianus*) are the definitive host of *P. tenuis*, carrying the first stage larva (L1). Many terrestrial gastropods (snails and slugs) serve as intermediate hosts, acquiring larvae at the L1 stage which then develop into second and third stage larvae (L2 & L3). Consumption of infected gastropods by ungulates then completes the life cycle. A number of non-native ungulate species suffer neural degeneration and even death when exposed to P. tenuis. This study was conducted at the Wilds which is a nonprofit conservation research and education institution located in southeastern Ohio. The specific objectives of this study were to: 1.) determine which species of gastropods carry *Parelaphostrongylus tenuis* and to 2.) assess which grazing pastures of exotic ungulates and sub-habitats within those pastures have a greater abundance of gastropods infected with *Parelaphostrongylus tenuis*. Squares of plywood were used for collection of gastropods. After field sampling, a digestion process of an acidic solution revealed whether the gastropods were infected. Thus far, our analyses have yielded no indication of infection of gastropods in exotic ungulate pastures.

BOARD 35 **STUDYING AND MAPPING POTENTIAL HABITAT COMPOSITION FOR WOOD FROGS (RANA-SYLVATICA) AT THE WILDS, A RECLAIMED SURFACE MINE. Amos C. Ludwig, aludwig@muskingum.edu, (James L. Dooley, Jr., jdooley@muskingum.edu), Muskingum College, 163 Stormont St., New Concord OH 43762.**

Surface mining practices have extensively altered anuran habitats in southeastern Ohio. In spite of reclamation efforts, anurans such as the wood frog (*Rana sylvatica*), have suffered widespread population declines. The Wilds is a non-profit conservation research and education institution located in southeastern Ohio on land that is a reclaimed surface mine. Wood frog population declines at the Wilds suggest habitat alteration and/or environmental pollution. The objective of this study is to survey and characterize potential wood frog habitats at the Wilds. Wood frog terrestrial and aquatic habitats were assessed based on factors described in the literature as significant in influencing survivorship and reproductive success. The significant terrestrial factors include canopy cover, soil saturation, debris for overwintering and buffer distance to breeding habitat. The aquatic factors include pool depth and area, absence of fish, branches for oviposition, neutral pH and absence of toxic metals. GPS coordinates of the aquatic and terrestrial habitats were gathered and put onto an aerial photograph of the Wilds using GIS. These data will be analyzed with the aim of ranking suitable sites for either additional restoration or potential release of wood frogs.

BOARD 36 **THE EFFECTS OF ANTIBIOTICS ON THE GASTROINTESTINAL MICROFLORA IN SLIDER TURTLES, *TRACHEMYS SCRIPTA.* Molly A. Myers, molly.myers@otterbein.edu, (Sarah Bouchard, sbouchard@otterbein.edu, Amy Jessen-Marshall, AJessen-Marshall@otterbein.edu), 8641 Renaa Ave., Galloway OH 43119.**

Vertebrate herbivores do not have endogenous enzymes capable of breaking down the â-1,4- linkages of cellulose, the major component of plant cell walls. Therefore, they must rely upon microbial gut-symbionts that ferment cellulose and produce short-chain fatty acids that the herbivore can use as an energy source. The main objective of this study is to determine which antibiotics will successfully destroy the microbial symbionts of juvenile freshwater turtles, *Trachemys scripta*. Destruction of these microbial gut symbionts will enable the exploration of their importance and potential sources of inoculation. Three possible antibiotic treatments (Streptomycin with Bacitracin, Chloramphenicol with Bacitracin, and Enrofloxacin) were considered for this study. An antibiotic screening was conducted on wild turtle fecal samples to determine which antibiotics were potentially the most effective. Based upon screening results, we hypothesized that Enrofloxacin would most likely result in gut sterilization. Twenty four turtles, inoculated with feces from wild turtles, will be assigned to one of four possible treatments (n=6 per treatment) in which Enrofloxacin is (1) administered orally in a gelatin based food, (2) introduced directly into tank water, but not in food (3) administered both in food and directly in tank water, and (4) not administered in either food or water. Successful completion of this study will lay the methodological foundation for future studies of chelonian microbial symbionts.

BOARD 37 **THE EFFCTS OF PLANT AND ANIMAL DIETS ON MICROBIAL GUT SYMBIONTS IN JUVENILE POND SLIDER TURTLES, *TRACHEMYS SCRIPTA*. Megan J. Myers, megan.myers@otterbein.edu, (Sarah S. Bouchard, sbouchard@otterbein.edu, Amy Jessen-Marshall, ajessen-marshall@otterbein.edu), 8641 Renaa Ave., Galloway OH 43119.**

The gastrointestinal tracts of vertebrate herbivores are populated with bacteria that ferment cellulose, converting it to short-chain fatty acids from which the herbivore absorbs energy. In herbivorous turtles, such as the yellow-bellied slider, *Trachemys scripta,* these microbes play a critical role in the digestion of plant diets. High concentrations of short- chain fatty acids have also been found in the large intestines of turtles consuming shrimp diets. Little is known about microbial function on such diets, which do not contain cellulose. One possibility is that the microbial symbionts are digesting chitin, a carbohydrate found in invertebrate exoskeletons. In this study, the effect of plant and animal diets on gastrointestinal microbial composition is assessed in *T. scripta*. Additionally, we will determine if bacteria present in turtles fed the animal diet are chitinolytic. Juvenile turtles (n=16) were inoculated with gastrointestinal bacteria by feeding feces from wild caught turtles. A feeding trial was conducted with eight turtles (n=8) fed the plant, *Vallisneria americana*, and eight turtles (n=8) fed crickets, *Acheta*

domesticus, for one month. Fecal samples were collected from each turtle, and bacterial populations were isolated. Studies are currently taking place to identify bacteria and determine substrates for fermentation. This research is especially relevant to juvenile turtle nutrition because many turtle species undergo an ontogenetic diet shift from carnivory to herbivory. The results of this study will provide a better understanding of how the diet shift influences gastrointestinal microbial populations and will help demonstrate the importance of these populations to different turtle life stages.

BOARD 38 IDENTIFICATION AND COMPARISON OF WILD FRESHWATER TURTLE MICROBIAL GUT SYMBIONTS. Denise L. Bunger, denise.bunger@otterbein.edu, (Sarah Bouchard, sbouchard@otterbein.edu, Amy Jessen-Marshall, ajessen-marshall@otterbein.edu), SMC 10723, One Otterbein College, Westerville OH 43081.

Herbivorous vertebrates require microbial gut symbionts to ferment plant cell walls. Although these symbionts are fairly well studied in mammals, few studies have been done in reptiles. The purpose of this research is to describe microbial gut populations in wild, freshwater turtle species, and to identify a possible relationship between microbial populations and diet. Turtles were trapped using floating basking traps and hoop traps at Otterbein Pond in Westerville, OH. A total of thirty turtles were sampled: ten painted turtles, *Chrysemys picta,* twelve map turtles, *Graptemys geographica*, seven red-ear sliders, *Trachemys scripta elegans*, and one yellow-bellied slider, *Trachemys scripta scripta*. A sterile plastic pipet tip was inserted into the cloaca of each turtle to obtain a bacterial sample from the large intestine. Bacteria were then inoculated on Tryptic Soy Agar (TSA) plates and grown in candle jars at room temperature, ensuring an anaerobic environment. Colonies grown on TSA plates were then isolated and identified as gram-positive or negative using Phenylethyl Alcohol (PEA) and Eosine and Methylene Blue (EMB) plates respectively. Colonies were then isolated from these plates and inoculated in enterotubes, designed to perform multiple biochemical assays at once. These test results were then used to help determine the identification of bacteria. Initial analyses indicate that approximately five unknown species were found. Further biochemical assays, as well as DNA sequencing, will be performed to identify bacteria to genus and species. Additionally, we will determine if any relationship can be established between turtle diet or species and bacterial species.

BOARD 39 **COMPLETE 1:100,000-SCALE COVERAGE OF THE SURFICIAL GEOLOGY OF OHIO'S LAKE ERIE COAST. Douglas L. Shrake, doug.shrake@dnr.state.oh.us, E. Mac Swinford, Gregory A. Schumacher, Glenn E. Larsen, Erik R. Venteris, Richard R. Pavey, ODNR, Division of Geological Survey, 2045 Morse Road C-1, Columbus OH 43229-6693.**

The Ohio Department of Natural Resources, Division of Geological Survey has completed the five 1:100,000-scale surficial geology maps covering Lake Erie's coastline. The maps, from west to east, are the Toledo, Lorain/Put-in-Bay, Cleveland South, Cleveland North, and Ashtabula 30 x 60 minute quadrangles. Surficial geology maps characterize the distribution and thickness of Ohio's surficial deposits from the surface down to the uppermost bedrock unit. Data from county soil maps, water wells, ODOT and EPA geotechnical borings, bedrock geology and topography maps, and field observations were collected, and recorded on 1:24,000-scale topographic quadrangles. The map interpretations were originally drawn on Mylar overlays that were scanned and digitally compiled at the 1:100,000-scale. The vertical sequence of lithologic materials from the surface to bedrock is depicted within a polygon of probability by a descriptive stack. The resulting maps show the lateral and vertical variations of unconsolidated material and the underlying bedrock lithology for a polygon and between adjacent polygons. By using these five surficial geology maps, in combination with Ohio's new 1:500,000-scale bedrock geology map, it is possible to determine the composition of the unconsolidated material and the bedrock at any location along Ohio's Lake Erie coast. These maps will enhance the understanding of the geologic framework for use in land-use planning and coastal-erosion management both along Lake Erie's coastline and within Ohio's northern tier of counties.

BOARD 40 **A COMPARISON OF CONE-IN-CONE AND CONCRETIONS AS VERTEBRATE FOSSIL–BEARING CARBONATE SEDIMENTARY STRUCTURES IN THE LATE DEVONIAN (FAMENNIAN) CLEVELAND SHALE OF NORTHERN OHIO. Douglas W. Dunn, ddunn@cmnh.org, Evan E. Scott, Cleveland Museum of Natural History, Dept of Invertebrate Paleontology, 1 Wade Oval Dr, Cleveland OH 44106-1676.**

Examination of 437 Cleveland Museum of Natural History Vertebrate Paleontology Department specimens from cone-in-cone and concretions and their catalog records shows that compared to the dolomitic concretions in the Late Devonian (Famennian, IIf) Cleveland Shale of northern Ohio, the formation's cone-in-cone in Cuyahoga and Lorain Counties yields fewer occurrences of vertebrate fossils, fewer taxa, and a lack of some of the smaller taxa found in the Cuyahoga County concretions. Taxa from cone-in-cone layers and lenses include specimens of the pachyosteomorphs *Bungartius perissus* (1—number is number of specimens in cone-in-cone; a second number represents specimens in concretions), *Dunkleosteus terrelli* (15, 116), *Heintzichthys gouldi* (1, 10), *Mylostoma* (1, 1), *Stenosteus glaber* (1, 0), *Titanichthys* sp. (8, 67), the cladodonts *Cladoselache* sp. (5, 44) and *Ctenacanthus compressus* (1, 9), and the paleoniscoid *Tegeolepis clarki* (1, 2). Along with the above, additional taxa from concretions include the pachyosteomorphs *Holdenius holdeni* (2), *Paramylostoma arcualis* (2), the cladodont *Stethacanthus* (1) and the coronodontid *Diademodus hydei* (1). Cone-in-cone occurs mostly in Lorain County, west and southwest of the three concretion zones in Cuyahoga County. Geographic location of these two different sedimentary structures exists on a near (Cuyahoga County) to further off shore (Lorain County) gradient, possibly related to differences in various environmental factors (water depth, oxygen content, ph, salinity, etc.) present at deposition time. Continued collection/analysis of Cleveland Shale cone-in-cone, concretions and their preserved fauna may help determine why this gradient exists.

BOARD 41 **2006 SUMMER REPTILE SURVEY OF THE SUNNYBROOK PRESERVE, GEAUGA COUNTY, OHIO. R. Chris Stanton, cstanton@bw.edu, April M. Sidoti, asidoti@bw.edu, Baldwin-Wallace College, Dept of Biology, 275 Eastland Road, Berea OH 44017.**

When it comes to the conservation of biological diversity, reptiles are often overlooked because of the negative stereotypes that are associated with them. However, reptiles play important roles in ecosystems and surveys of their populations are necessary to assess their status. This reptile survey was conducted in the summer of 2006 for the Geauga Park District at the Sunnybrook Preserve located in Chesterland, Ohio. The objectives of the survey were to determine which reptile species are present at the Sunnybrook Preserve, along with their population density, gender ratio, and movement within the preserve. The preserve was visited 22 times between May and September in order to search for reptiles. Artificial cover objects were used to increase capture efforts and the Lincoln-Peterson formula was used to calculate the population estimates of the found species. A total of 188 reptiles were captured, belonging to four species of snakes. The population estimates calculated for each species were as follows: 288 eastern garter snakes (*Thamnophis sirtalis*), 240 northern brown snakes (*Storeria dekayi*), and 24 eastern milk snakes (*Lampropeltis triangularum*). One northern water snake (*Nerodia sipedon*) was also found on the preserve, but a population estimate could not be calculated based on one individual. The 2006 Ohio Reptile Atlas lists these four species, along with the black rat snake (*Elaphe obsoleta obsoleta*), the eastern ribbon snake (*Thamnophis sauritus*), and the midland painted turtle (*Chrysemys picta marginata*) as occurring in Geauga County. However, none of these latter three species were found on the preserve during the sampling period.

BOARD 42 **DOPAMINE RECEPTOR DRD2 SINGLE NUCLEOTIDE POLYMORPHISMS AND ALCOHOL DEPENDENCE. Hayley J. Lawrance, hayley0241@hotmail.com, (Simon K. Lawrance, slawrance@otterbein.edu), Dept of Life Science, Otterbein College, Westerville OH 43081.**

Alcoholism is a disease that is characterized by physical and emotional dependence on alcohol. It has both genetic and environmental components. The goal of this research is to determine if there is a link between the dopamine d2 receptor (DRD2) gene and alcoholism. The hypothesis that polymorphisms in DRD2 are associated with alcoholism is controversial, with some studies supporting a link and others not. The recent publication of the NCBI "HapMap," which provides a complete catalogue of single nucleotide polymorphisms in the human genome, provides an opportunity to test the hypothesis more rigorously. Therefore, the hypothesis of this study is that polymorphisms in the DRD2 gene are associated with the disease of alcoholism. A sample of approximately 100 Otterbein College students will be surveyed using screening instruments that are designed to identify problem drinking and alcoholism, e.g. the AUDIT, Alcohol Use Disorders Identification Test (Enoch and Goldman, 2002). Epithelial cheek cells will be collected and extracted using the Epicentre Buccal Swab DNA Extraction Kit. The polymerase chain reaction (PCR) will be used to amplify the DRD2 gene. PCR products will be

genotyped for DRD2 single nucleotide polymorphisms (SNPs) using the Applied Biosystems SNPshot kit and analyzed on an Applied Biosystems Genetic Analyzer. The survey and genotyping data will be analyzed statistically using the T-Test. Correlation of alcoholism and DRD2 SNPs may support the hypothesis that this gene plays a significant role in the disease process. This will provide insight to genetic testing for the risk of alcoholism, possible prevention methods, and treatment.

BOARD 43 **FOREST FLOOR INVERTEBRATE COMMUNITIES IN PINE VERSUS MIXED HARDWOOD STANDS IN CUYAHOGA COUNTY, OH. Sarah E. Osicka, sosicka@bw.edu, R. Chris Stanton, cstanton@bw.edu, Brian J. Tornabene, btornabe@bw.edu, Baldwin-Wallace College, Dept of Biology, 275 Eastland Road, Berea OH 44017.**

The forest floor invertebrate communities of northeastern Ohio have been changing in response to numerous environmental factors, such as urban development, pollution, and invasion of exotic species. However, these communities have been poorly studied and the effects of these disturbances are largely unknown. In order to understand the current composition of local communities, 10,789 forest floor invertebrates were collected using pitfall traps during the summers of 2005 and 2006 in hardwood and pine-dominated stands in the Cleveland Metroparks. These stands consisted of native hardwood species and planted pines estimated at 50 years or more in age. The objectives were to document invertebrate species diversity in both stands, determine differences in the communities of each stand, and identify any unusual aspects of these communities. It was hypothesized that invertebrate diversity would be greater in the deciduous stands compared to the coniferous stand due to higher soil moisture levels, higher soil pH, and greater leaf litter depth. The invertebrates that were collected have been identified to "groups" (such as spiders, springtails, and beetles) and analyzed using the Shannon Index. In 2005, 20 groups of invertebrates were collected in the hardwood stand, resulting in an average Shannon score of 1.89. A total of 17 groups were collected in the pine stand, resulting in an average Shannon score of 1.69. In 2006, 16 groups of invertebrates were captured in both stand types, resulting in an average Shannon score of 1.85 for hardwood but 2.15 for pine. The difference in Shannon scores between years in the pine stand was due to a decline in the number of spiders and harvestmen collected (from a combined total of 1913 individuals in 2005 to 185 individuals in 2006). The cause for this decline may have been due to moisture levels, which were higher in 2006. The dominant groups in both communities, for both years, were sowbugs (2,317), springtails (2,277), and spiders (1,130). The dominant invertebrate species in these stands, representing 21.4% of all invertebrates collected, was the exotic European sowbug (*Oniscus asellus*).

BOARD 44 **A COMPARATIVE LIMNOLOGICAL INVESTIGATION OF TWO RESERVOIRS IN CLARK AND HOCKING COUNTIES, OHIO. Justin L. Tank, s09.jtank@wittenberg.edu, David A. Wallingford, s08.dwallingford@wittenberg.edu, Karell G. Pelle, s07.kpelle@wittenberg.edu, Stephanie L. Von Moll, s07.svonmoll@wittenberg.edu, Jana M. Venema, s07.jvenema@wittenberg.edu, Laura A. Matlock, s09.lmatlock@wittenberg.edu, Horton H. Hobbs III, hhobbs@wittenberg.edu, Dept of Biology, Wittenberg University, PO Box 720, Springfield OH 45501-0720.**

During early autumn, an examination of the biological and physicochemical characteristics of two lentic ecosystems in southern Ohio was conducted. The comparison consisted of two small reservoirs found on different sides of the Wisconsian Glacial boundary: Clarence J. Brown Reservoir (Clark County, Great Miami River watershed; glaciated carbonate bedrock, depth = 12m) and Rose Lake (Hocking County, Salt Creek watershed; unglaciated non-carbonate bedrock, depth = 13 m). Differences in the limnological makeup of these two systems were observed focusing on plankton counts and several physicochemical properties including temperature, specific conductance, alkalinity, water hardness, pH, nitrate-nitrogen, orthophosphate, and dissolved oxygen. Notably, during analysis of data, the soil makeup and bedrock in these overlying areas was investigated to determine any relation to the chemical data obtained. Overall, the biomass of phytoplankton and zooplankton found in C.J. Brown Reservoir was nearly 5 times greater than that of Rose Lake depending on depth. The biomass of Rose Lake was dominated by the plankters *Eudorina* sp. and *Peridinium* sp. while *Spirogyra* sp. and *Anabaena* sp. were prevalent in C.J. Brown Reservoir. Furthermore, analyses of physicochemical data illustrated that as depths increased, Rose Lake exhibited distinct stratification patterns for physicochemical properties which follows temporal biomass changes, whereas these patterns were not present in C.J. Brown Reservoir. Rose Lake possessed characteristics of an oligotrophic lake with a large photic zone and low plankton count. However, C.J. Brown Reservoir displayed characteristics of a more eutrophic lake with a small photic zone and high plankton count.

BOARD 45 **SITE FIDELITY IN CHITONS ON SAN SALVADOR, THE BAHAMAS. Colleen E. Kannen, s08.ckannen@wittenberg.edu, Alison G. Stalzer, s08.astalzer@wittenberg.edu, Joseph M. Filicko, s07.jfilicko@wittenberg.edu, 501 N. Wittenberg Ave, Springfield OH 45501.**

Limpets *(Littorina* spp.*)* exhibit site fidelity as a predatory avoidance strategy and to forage more efficiently. Other tropical marine gastropods likely do this as well. This study on San Salvador, a sub-tropical island in The Bahamas, investigated whether the fuzzy chiton, *Acantopleura granulate*, exhibited similar site fidelity. Chitons are one of the oldest representatives of the mollusk family, bear 8 flexible plates on the anterior side of their body, and occupy limestone rocky intertidal zones. 64 chitons were located over a 13 day period, from 30 May 2006 to 12 June 2006, at three different locations by uniquely marking each with paint. All chitons were originally marked in a prior depression and during the research period 19 chitons never left their primary depression in the rock during the entire study period, 34 chitons left and returned, 4 left their original position and remained in the study site but not in their original position, and 9 chitons left their original position and were never found. Like limpets which displayed an 85% return rate during a 6 day experiment, the fuzzy chiton had a 72.4% return rate after leaving their spot and returning. This high return rate means that chitons also are utilizing site fidelity as a survival strategy.

BOARD 46 **CLUSTERING BEHAVIOR OF THE HERMIT CRAB, *CLIBINARIUS TRICOLOR*, ON SAN SALVADOR, THE BAHAMAS. Zachary D. Bozic, s08.zbozic@wittenberg.edu, Lisa. M. Martorano, s08.lmartorano@wittenberg.edu, Jessica A. Schultz, s07.jschultz@wittenberg.edu, Katherine R. Seitz, s07.kseitz@wittenberg.edu, Kathleen A. Reinsel, kreinsel@wittenberg.edu, 930 North Fountain Ave., Springfield OH 45504.**

Clustering, a common animal behavior, is defined here as groups of 50-5000 individuals living in contact with each other within an area of one square meter. Tricolor hermit crabs, *Clibanarius tricolor,* were observed forming aggregations in low tidal areas on San Salvador, The Bahamas, in June 2006. We hypothesized that no hermit crabs would remain the same cluster after a 24-hour period. Over two weeks, piles of hermit crabs were selected haphazardly from Singer's Point and Bonefish Bay. Each crab in the pile was removed from the site, marked with a permanent marker, counted, and returned to its original location. After 24 hours, the sites were revisited and the remaining marked crabs were counted. Data were recorded indicating whether the crabs were within a 40 cm radius or within a 1 square meter quadrant centered on the cluster. Of the 1694 marked hermit crabs, 500 individuals stayed in the 40 cm radius and 845 remained in the one square meter area following the 24-hour period. Therefore, we rejected our hypothesis. This suggests that tricolor hermit crabs do not always stay in a particular cluster, but can freely move distances greater than 1 meter in 24 hours.

BOARD 47 **AN ANALYSIS OF CHLOROPHYLL CONCENTRATION IN RELATIONSHIP TO WATER DEPTH, AND TURBITY, IN *THALASSIA TESTUDINUM IN BELIZE REEF ENVIORNMENTS.* Dominic M. DePompei, Dominic.DePompei@otterbein.edu, (Halard Lecinsky, Hlecinsky@otterbein.edu), Otterbein College, Westerville OH 43081.**

Sea grass chlorophyll absorbance offers an excellent, non destructive model for monitoring near shore and reef water quality. Turtle grass (*Thalassia testudinum)* and coral-symbiont photosynthesis in tropical reef environments is super saturated with light in the shallowest sites. This study will identify the lower limit of photosynthetic saturation in turtle grass for turbid and non turbid water in terms of both depth and ambient light illumination. Three reef environments of the central Belize Barrier Reef system will be compared: windward, leeward and lagoon patch reefs. At each site, 15 leaves of turtle grass will be harvested for chlorophyll concentration and ambient illumination measured at each depth. The chlorophyll absorbency of each leaf will be measured 3 cm from the leaf petiole using a Minolta Chlorophyll Meter SPAD-502. Preliminary results indicate a correlation between the water depth and leaf length, showing chlorophyll absorption decreasing from root to shoot. The comparison of the light saturation depth in turbid and clear waters should reflect the ambient light concentration in those waters. Below saturation depth the turtle grass

photoacclimates to low light by increasing area specific chlorophyll content.

BOARD 48 **HOW DO BRITTLE STARS, *OPHICOMA ECHINATA* AND *OPHIODERMA APPRESSUM*, FIND DARK PLACES? Christina Hughes, s07.chughes@wittenberg.edu, Kelly McMurray, s07.kmcmurray@wittenberg.edu, Jennifer Mulligan, s07.jmulligan@wittenberg.edu, Dr James M. Welch, jwelch@wittenberg.edu, Wittenberg University, 615 Woodlawn Avenue, Springfield OH 45504.**

During the day, brittle stars (Echinodermata: Ophuroidea) hide under rocks and in dark crevices. The objective of this study was to determine how they found these dark locations. It was hypothesized that both *Ophiocoma echinata* and *Ophioderma appressum* would preferentially move towards larger, darker objects. Experimental trials (N = 397) were performed at North Point and Bonefish Bay, located on the lee side of San Salvador, The Bahamas. The trials were run on a sandy bottom in shallow water (~ 30cm deep). The movement of brittle stars was tested in response to two sizes (large and small) and three colors (red, black, and blue) of plastic containers. The containers were placed 30cm apart; the brittle stars were placed halfway between them and their movements observed. Each brittle star was tested three times and their containers were reversed to minimize the effect of directional flow. The species did not show a preference for any color of container: *O. echinata* (χ^2_2 = 0.06, p = 0.81), *O. appressum* (χ^2_2 = 0.05, p = 0.82), nor did they appear to show a size preference between the containers: *O. echinata* (χ^2_1 = 0.28, p = 0.60), *O. appressum* (χ^2_1 = 0.12, p = 0.73). The only preference noted in our experiment was that brittle stars preferentially moved down-current as opposed to up current or cross current (χ^2_2 = 67.7, p <<0.001). We concluded that either brittle stars do not use visual cues or our boxes were too far apart for the brittle stars to react to them.

BOARD 49 **CORAL REEF MICROBORING TRENDS: ENRIQUILLO VALLEY, DOMINICAN REPUBLIC. Avinash C. Minhas, Avinash.Minhas@otterbein.edu, (Dr. Halard Lescinsky, Hlescinsky@Otterbein.edu), The Dept of Life and Earth Sciences, Otterbein College, Westerville OH 43081.**

One important type of coral reef bioerosion is microboring by photosynthetic green algae, fungi, and cyanobacteria. The ultimate goal of this study is to characterize microboring patterns in different reef facies and to relate these to exposure time of coral skeleton prior to burial. Four facies were defined within the Enriquillo Valley Holocene (5000-8000 year old) reef in the Dominican Republic. Three 12 m transects were made in sections within branching, mixed, massive, and platy coral zones from five localities. Each coral along the transect was characterized by orientation, taphograde, and encrustations. Transect results suggest that 71.1% of the coral colonies were preserved in life position with little surface alteration, suggesting high live coral cover in the Holocene reef. Corals of three taphograde from each transect were collected for microboring analysis back in the lab. Samples will be vacuum impregnated with resin and ichnotaxa will be identified and the relationship between exposure time and microboring bioerosion will be quantified. Our initial observations of high live coral cover contrast dramatically with relatively poor conditions in modern degraded Caribbean reefs, suggesting that the reef was in good health prior to its burial.

BOARD 50 **A STUDY OF NUCLEUS ACCUMBENS VOLUMES AND BODY MASS INDEX. Shannon L. Kesl, s07.skesl@wittenberg.edu, Rachel L. Clark-Haggy, s07.rclarkhaggy@wittenberg.edu, Cathy L. Pederson, cpederson@wittenberg.edu, Dept of Biology, Wittenberg University, P.O. Box 720, Springfield OH 45501.**

Obesity is a growing health epidemic in the United States, but the cause of overeating habits remains a mystery. It has been shown that food intake is directly related to body mass index (BMI). This experiment was designed to show a relationship between BMI and the volume of the nucleus accumbens, a brain area that is related to the feeling of satiety. It was hypothesized that BMI would be inversely proportional to the volume of the nucleus accumbens. To test this hypothesis, a group of 20 women were divided into two groups (n=10), one group with a BMI< 20.5 and a second with a BMI> 30.0 Univariate analysis was run on the participants to ensure no significant differences (p> 0.05) in variables including age, history of abuse, alcoholic drinks per year, cocaine use, years of education, and Wonderlic Personnel Tests (a brief measure of intelligence). Each participant's nucleus accumbens was viewed using 3-D Brain station (Locates Assoc., Westminster, MD), a software program that measures the volume of brain regions. Using coronal view, the nucleus accumbens was traced at each depth in which it was visible on the Magnetic Resonance Imaging (MRI) scan. Each slice was traced twice, and the average of each slice was calculated. These average values were summed to determine the total volume of the nucleus accumbens. There was no difference in volume of nucleus accumbens between the high and low BMI groups (F= (1, 18) =208.80, p=0.89), thus disproving the hypothesis.

BOARD 51 **ASSESSING THE VOLUME OF THE CORPUS CALLOSUM IN A COMMUNITY BASED SAMPLE OF WOMEN WITH A HISTORY OF CHILDHOOD ABUSE. Jana M. Venema, s06.jvenema@wittenberg.edu, Cathy L. Pederson, cpederson@wittenberg.edu, Stephanie A. Little, slittle@wittenberg.edu, Robin E. Osborn, robin089@yahoo.com, Wittenberg University, Dept of Biology, P.O. Box 720, Springfield OH 45501.**

Child abuse is an extensive problem in the United States. Not only does abuse during childhood have harmful psychological effects but it may interfere with the development of certain brain structures as well. The corpus callosum, a bundle of myelinated axons that allow for communication between cerebral hemispheres, is sensitive to physiological stress responses during childhood. In our community-based sample of women, possible volumetric differences in the corpus callosum were evaluated by tracing magnetic resonance imaging of the corpus callosum in the horizontal view using the software package 3D-BrainStation (Version 14.0, Loates Associates, Westminster, MD). Participants were divided into three groups including women who were prepubescently abused physically, emotionally or sexually (n=18), women who were prepubescently abused and developed post-traumatic stress disorder (PTSD) (n=21), and a control group containing women who were not prepubescently abused (n=18). The groups were carefully matched for body mass index, drug, alcohol and tobacco use, education, and intelligence, which was determined using the Wonderlic Personnel Test. Using univariate analysis of variance, there were no significant differences between groups on any of the demographic variables (p>.05). Three tracings were performed on alternate slices and the averages summed and multiplied by two to yield the total corpus callosum volume. There were no significant differences in corpus callosum volume observed between the abuse only, abuse and PTSD, and control groups (F(2,60)=2.55, p=.09). Based on these findings, women who were abused or developed PTSD are no more likely than others to have a reduced corpus callosum volume.

BOARD 52 **CAN PERSONALITY TRAITS PREDICT PHYSIOLOGICAL RESPONSES? Leslie E. Prince, lprince@wooster.edu, (Sharon E. Lynn, slynn@wooster.edu), 1189 Beall Ave, Box 2499, Wooster OH 44691.**

Defining personality or coping styles, which relate to a variety of behavioral or physiological responses, is useful when studying and comparing species. Behavioral aspects of personality could be shyness or boldness towards novel objects whereas stress responsiveness is a physiological indicator of personality. The goal of this study was to determine whether personality was related to physiological stress responses in bluebirds, *Sialia sialis*. A novel object test was used to measure the shyness or boldness of bluebirds nesting in manmade boxes in Huron and Ashland counties. When a novel object was placed at the nest entrance, birds that approached the nest more and entered less were considered shy compared to bold birds that entered more. At another time, a standardized Capture-Handle Protocol was used to assess birds' physiological responses to stress. When an individual is stressed the hormone corticosterone (CORT) is released into the bloodstream. A series of blood samples (3, 15, 30, and 60 minutes after capture, ~40 µl) were taken to measure stress responsiveness for both shy (n=8) and bold (n=7) birds. Enzyme-linked immunoassays were used to determine the amount of CORT present in the samples. The hypothesis was that birds shyer of the novel object would have higher corticosterone responsiveness compared to bold birds. Bold and shy birds did not have significantly different CORT responses to a standardized stressor. This indicates that breeding bluebird's personality (as measured by response to a novel object) did not correlate with stress responsiveness (repeated measures ANOVA: P= 0.973, P= 0.614).

BOARD 53 **PERINATAL POLYCHLORINATED BIPHENYL EXPOSURE DISRUPTS DEVELOPING MOTOR SKILLS AND HORMONAL REGULATION IN SPRAGUE-DAWLEY RATS: A POSSIBLE MODEL FOR AUTISM. Dena K. Krishnan, dkrish@bgsu.edu, Trang L. Tran, ttran@bgsu.edu, Howard C. Cromwell, hcc@bgsu.edu, Lee A. Meserve, lmeserv@bgsu.edu, Dept of Biological Sciences, Bowling Green State University, Bowling Green OH 43403-0212.**

Several studies have shown that perinatal exposure to xenobiotic mixtures such as polychlorinated biphenyls (PCBs) cause physiological and behavioral disruption. This study demonstrates that the PCB-exposed rat is a relevant model for understanding motor and social deficits in childhood developmental disorders like autism and Asperger's syndrome. PCB 47/77 at 0 ppm (control), 12.5 ppm, or 25 ppm (w/w) of the diet was fed to pregnant Sprague-Dawley rats (n=4/ treatment group) throughout gestation and until rat pups were weaned, impacting offspring both directly in rat chow and indirectly through placental and lactational transfer. The motor ability of offspring (n=20/ treatment group) was tested at 14, 30, and 60 days of age with measures of strength, coordination, arousal, stereotypical fixed action patterns, and locomotor activity. Circulating levels of the hormone vasopressin, involved in the regulation of social behavior, were measured at 29 days of age. PCB-exposed rats display altered rates of movement in the open field, inability to complete grooming chains, inability to complete the hang test and negative geotaxis response in comparison to controls. Most notably, PCB 25 ppm animals show a developmental delay in the ability to complete syntactic chain grooming, with a significant 0% completion rate in comparison to the normal 20% completion rate elicited by controls. These consequences likely stem from neuroendocrine disruption as suggested by preliminary results in alteration of circulating vasopressin concentration. The different results in animals given 12.5 ppm and 25 ppm PCB may allow use of this system to serve as a model to observe a range of behavioral severity much like that seen in the broad autistic phenotype.

BOARD 54 **BIOMASS ALLOCATION AND GROWTH RESPONSE OF WEED VS. NON-WEED SPECIES IN RESPONSE TO NITROGEN-SULPHUR-PHOSPHOROUS NUTRIENT INTERACTIONS. Natalie M. Jawyn[1], njawn@wooster.edu, (Dr. Larry Phelan[2], phelan.2@osu.edu, Dr. Loren Byrne[1], lbyrne@wooster.edu), [1]College of Wooster, 1189 Beall Ave., Box 1933, Wooster OH 44691, [2]Ohio State Agricultural Research and Development Ctr.**

Invasive weeds are costly to agricultural production. Establishing a relationship between biomass allocation based on nutrient availability will provide greater precision in predicting species that will have the highest environmental impacts. The objective of this study is to examine how variation in the availability of essential anionic macronutrients, nitrogen, sulphur, and phosphorous, will affect biomass allocation of three pairs of congener plant species: *Ambrosia trifida, Ambrosia artemisiifolia, Avena sativa, Avena fatua,* and *Solanum ptycanthum, Solanum lycopersicum*. The hypothesis of this analysis is that biomass allocation (root:shoot allocation) will vary among the three pairs and within each pair of congenger species. It is hypothesized that reduced nutrient availability leads to a higher root:shoot ratio and that increased nutrient availability leads to a lower root:shoot ratio. One species of each pair is a weed (*Ambrosia trifida, Avena fatua, Solanum ptycanthum)* while the other species is a crop (*Avena sativa, Solanum lycopersicum)* or a less invasive weed (*Ambrosia artemisiifolia)*. The six species will be grown hydroponically, each in solutions of twelve different nutrient ratios. The nutrient ratios will be determined using a previously published mixture-model design. Each species-nutrient level combination will be replicated six times in randomized blocks (N=432). After reaching maturity, the plants will be dried and their dry shoot mass and dry root biomass will be measured. The data will be analyzed using T-tests for each of the pairs of congener species and ANOVA over all treatments. No initial observations are available at this time.

BOARD 55 **DOPAMINE RECEPTOR DRD4 SINGLE NUCLEOTIDE POLYMORPHISMS AND SENSATION-SEEKING. Rachelle R. Ramsey, rachelle.ramsey@otterbein.edu, (Simon K. Lawrance, slawrance@otterbein.edu), Otterbein College Dept of Life & Earth Sciences, One Otterbein College, Westerville OH 43081.**

A perennial question is whether personality traits or life tendencies are due more to our nature or the nurturing that we have received. Our genes have an influence on not only our physical features, but also on our personalities, attempting to discover specifically which genes influence specific traits has become a main focus of biomedical research over the past two decades. This project will attempt to determine if different levels of sensation-seeking in humans are related to differences in the single nucleotide polymorphisms (SNPs) of the dopamine receptor (DRD4) gene. The HapMap characterizes sequence variants, their frequencies, and correlations between groups of SNPs and will be used to determine the common patterns of DNA sequence variation on the DRD4 gene. Cheek swab DNA samples and Zuckerman's (1994) Sensation Seeking Scale V (SSSV) will be collected from a sample population of 100 college students. Polymerase chain reaction will then be used to amplify the dopamine receptor gene and each DNA sample will be genotyped by using the single base extension technique. The data will be statistically tested for a significant correlation between the SNPs of DRD4 and sensation-seeking aspect of personality.

BOARD 56 **EFFECTS OF PERINATAL PERTURBATIONS ON SOCIAL COMMUNICATION IN THE RAT MODEL. Travis J. Beckwith, tbeckwi@bgnet.bgsu.edu, Ashley M. McFarland, amcfarl@bgnet.bgsu.edu, Megan Greenwald, mgreenw@bgnet.bgsu.edu, Kelley Harmon, kharmon@bgnet.bgsu.edu, (Lee A. Meserve, lmeserv@bgnet.bgsu.edu, Howard C. Cromwell, hcc@bgnet.bgsu.edu), Depts of Psychology and Biology, Bowling Green State University, Bowling Green, OH 43403.**

The goal of this study is to examine the influence of altered perinatal development on the production of ultrasonic signals emitted by rats in social situations. Rodents use ultrasonic vocalizations (USVs) during positive and negative social encounters to communicate with conspecifics and other organisms. Rat pups emit 20 kHz frequency calls during isolation distress when they have been separated from the dam and emit a higher frequency call (50 kHz) during positive social encounters. Different USV signals are measured in rat pups perinatally exposed to either polychlorinated biphenyl (PCB) or environmentally-induced stress. Comparisons are made with USV signals from control animals not exposed to PCBs or early stressors. PCB was ingested by the dam during gestation and prior to pup weaning (N = 12). Prenatal stressors were used on the dam during the third week of gestation and included unpredictable handling, injection with isotonic saline (i.m.), and novel environment exposure (N = 7). USV signals were recorded during 1) isolation distress, 2) conditioned odor preference, and 3) social recognition tests. For (1), the number of USV signals was measured during a one minute rat pup isolation experience at postnatal day 10. For (2), the USV levels were examined during a place preference test on postnatal day 12 in which rat pups can choose to remain in a maternal odor-paired environment and (3) includes measuring the amount of time the rat pup spends investigating a novel or familiar conspecifics on postnatal day 22. Results are analyzed using inferential statistics including analysis of variance and post-hoc T-tests. The results have implications for the understanding for how environmental stressors can alter social communication.

BOARD 57 **REGULATION OF P21 IN PTEN-DEFICIENT CELLS. Alexa R. Lindley, lindle_a@denison.edu, (Lina I Yoo), Slayter Box #2094, Main Street, Denison University, Granville OH 43023.**

PTEN is a protein that regulates growth factor signaling in cells by deactivating AKT, a protein that induces pathways leading to cell proliferation, survival and growth. Because of its role in regulating cell proliferation, PTEN is an important tumor suppressor gene, which is mutated in many cases of prostate carcinomas as well as cancers in other tissues such as breast, lung, endometrieum, and bladder. Previous research has shown that PTEN-deficient mice that develop bladder carcinoma appear to have a mechanism that inhibits the development of their cancer, and there is evidence that p21 is involved in this mechanism. In order to study p21 in cells that do not express PTEN, RNA interference was used to knockdown PTEN in 293 cells. By inserting short hairpin RNA into the pSRP vector, a plasmid that appears to express RNA and to be capable of decreasing PTEN expression in cells was created. This technique allowed western blotting to be performed to examine gene expression in PTEN-expressing and PTEN-deficient cells in order to investigate which proteins may work to stop cancerous growth.

BOARD 58 **THE ROLE OF EPITOPE SPECIFIC CD8+ T CELLS IN T1 BLACK HOLE FORMATION AND MOTOR DYSFUNCTION IN AN ANIMAL MODEL OF MULTIPLE SCLEROSIS.** **Amanda K. Applegarth[1,2], amanda.applegarth@otterbein.edu, Aaron J. Johnson[2], johna4@uc.edu, Istvan Pirko[2], Istvan.Pirko@uc.edu, [1]Dept of Life and Earth Science, Otterbein College, Westerville OH 43081, [2]Dept of Neurology, University of Cincinnati College of Medicine, Cincinnati, Ohio.**

The presence of MRI T1 black holes, a type of brain lesion, in MS patients correlates with disability through an unknown mechanism. A murine model of T1 black hole formation using the Theiler's murine encephalitis virus (TMEV) was developed. In the TMEV model previous studies have determined that CD8 T cells are mediating T1 black hole formation. Injection of the $VP2_{121-130}$ peptide prior to infection with TMEV causes a depletion of $VP2_{121-130}$ specific CD8 T cells and preservation of motor function. The purpose of this pilot study was to determine if these D^b: $VP2_{121-130}$ specific CD8 T cells contributed to T1 black hole formation in our IFN-ãR-/- mouse model system. It was hypothesized that antigen specific CD8 T cells would contribute to T1 black hole formation in the TMEV infected IFN-ãR-/- mice and these T1 black holes would correlate with disability. By treating mice with $VP2_{121-130}$ peptide prior to and during TMEV infection expansion of D^b: $VP2_{121-130}$ epitope specific CD8+ T cells was inhibited. The total volume of T1 black holes per mouse was measured using T1-weighted MRI brain scans and Analyze 7.0 at days 14 and 49. Rotorod was used to assess motor dysfunction twice a week. At days 14 and 49 no correlation could be seen between T1 black hole lesion volume and motor dysfunction. Injector error and age effect of the mice were considered to skew the results.

BOARD 59 **FUNCTIONAL NEURO-ANATOMICAL/ PHYSIOLOGICAL INVESTIGATION OF REWARD PROCESSING IN *RATTUS NORVEGICUS.*** **Ethan J. Miller[1], ejmille@bgnet.bgsu.edu, Scott C. Molitor[2], smolitor@eng.utoledo.edu, (Howard C Cromwell[1], hcc@bgsu.edu), [1]J.P. Scott Center for Neuroscience, Mind & Behavior at BGSU, Bowling Green OH 43403, [2]University of Toledo, Dept of Bioengineering.**

The purpose of this study is to further examine neural pathways involved in reward processing and hunger. The nucleus accumbens, particularly the shell, has afferent connections into the lateral hypothalamus. Direct stimulation of the lateral hypothalamus results in feeding behavior, as well as other appetitive behaviors. Increased food intake has been observed when those afferent pathways are pharmacologically stimulated. Examination of this neural pathway was performed by local injections of tract tracers into both nucleus accumbens and lateral hypothalamus according to standard stereotaxic methods. A survival time of 7-10 days was used to allow the uptake of the tract tracers. An anterograde tracer [Fluoro-Ruby (FR)] and a retrograde tracer [Fluoro-Gold (FG)] were used to microscopically visualize the pathways in 40µm coronal slices (N=4). In addition, electrophysiological procedures carried out by intracellular current-clamp recordings. A stimulating electrode is placed in the nucleus accumbens or lateral hypothalamus and a recording electrode in the complementary structure. Consequential post-synaptic activation in the form of graded/action potentials are observed as indications of direct or indirect neural connectivity (N=5). Initial observations reveal successful uptake of the different tracers into the dendrites (FR)/ axon terminals (FG), and that the electrophysiological procedures are viable methods for monitoring neural activity. This study is a descriptive and exploratory investigation. In place of inferential statistical procedures, analyses include a full complement of descriptive statistical procedures, including but not limited to, analysis of amplitude and latency of post-synaptic activation. Implications include a greater understanding of basic functional neuroanatomy of brain and reward systems of *rattus norvegicus*.

BOARD 60 **INVESTIGATING THE RELATIONSHIP BETWEEN *DANAUS PLEXIPPUS* AND *LESPESIA ARCHIPPIVORA.*** **Natalie M. Cope, ncope@wooster.edu, (Michelle J. Solensky, msolensky@wooster.edu), Box C-1354, 1189 Beall Ave., Wooster OH 44691.**

The purpose of this study is to examine the tri-trophic interaction between monarch larvae (*Danaus plexippus),* a tachinid fly parasitoid (*Lespesia archippivora*), and the monarch host plant, *Asclepias syriaca*. This tri-trophic approach is useful because both host plant chemistry and monarch larval biology and behavior can affect parasitoid host location, oviposition preferences, and habitat selection. Approximately 96 monarch larvae and eggs were collected from *A. syriaca* plants in Columbiana, Mahoning, Wayne, Holmes, and Stark counties. A brief description of the habitat, GPS coordinates and elevation were recorded, as well as the date of collection, location of the patch, larval developmental stage (instar), and larval position on the plant and location on the leaf. Plant height, plant height relative to surrounding vegetation, plant damage, *A. syriaca* density in the surrounding area, and monarch larva density at the site were all measured. After collection from the field, monarch larvae were reared in the laboratory where the fate of each larva (healthy adult, parasitized by tachinid fly, died of unknown cause) was recorded. If parasitoids emerged from a host, length, width, and weight of the pupal case, as well as the number of parasitoid larvae that emerged from each host were recorded. The effect of host and habitat characteristics on whether each host larva was parasitized (yes/no) will be measured using chi-square analyses for categorical independent variables (larval instar, position on plant and location on leaf, plant damage and relative height) and logistic regression for continuous independent variables (plant height and density and monarch larval density).

BOARD 61 **EFFECTS OF RESPIRATORY MUSCLE TRAINING ON FORCED EXPIRATORY VOLUME AND PEAK FLOW IN COMPETITIVE MALE TRACK ATHLETES.** **Steven J. Beeley[1], steve.beeley@otterbein.edu, (Mary D. Gahbauer[2], mgahbauer@otterbein.edu), [1]150 W. Main St., Westerville OH 43081, [2]Dept of Life and Earth Science, Otterbein College, Westerville OH 43081.**

In competitive exercise it is crucial that the volume of air per unit time passing through the alveoli is maximized to potentiate oxygen use and benefit athletic performance. Expand-A-Lung™ (Miami, FL) is a respiratory training device that purports to increase ventilation by providing resistance to airflow during a specified daily training session, but there is little scientific research to support this claim. The hypothesis of this study is that training of ventilatory muscles against resistance using Expand-A-Lung™ in male track athletes will produce an increase in peak expiratory flow rates (PEFR) and forced expiratory volume in one second (FEV_1), when compared with those of control athletes. Fifteen male track athletes were the experimental group and fifteen age–matched male track athletes comprised the control group. Baseline ventilatory data were collected: FEV_1 and Vital Capacity (VC) using respiratory transducers (Biopac Student Lab Inc., Goleta, CA), and PEFR using a professional peak flow meter (Wright™, Louisville, CO). A training regimen for using Expand-A-Lung™ was developed. All subjects performed their daily track routines, and the experimental group additionally used Expand-A-Lung™ daily. Data collection was repeated after two and four weeks. Analysis by repeated measures ANOVA compared the means of the experimental group's ventilatory function with those of the control group at baseline, two and four weeks. No significant increase in FEV_1/VC or in PEFR was observed with the use of Expand a Lung ™ over two or four weeks.

BOARD 62 **LANDSCAPE POSITION INFLUENCES THE DISTRIBUTION OF GARLIC MUSTARD, AN INVASIVE PLANT.** **Kevin J. Burls, burlskj@muc.edu, Dr. Charles A. McClaugherty III, mcclauca@muc.edu, 1972 Clark Ave., Box 341, Alliance OH 44601.**

This research investigates patterns in the distribution and abundance of garlic mustard (*Alliaria petiolata* [Bieb.] Cavera & Grande), an invasive biennial, with respect to historical land use, and examines environmental conditions to look for underlying mechanisms in distribution patterns. Sixty 100m x 25m currently forested plots along existing trails or roads were selected in the Cuyahoga Valley National Park using GIS. Plot stratification was based on 1959 land use, with thirty plots in agricultural use at that time and thirty under forest cover. Plots were analyzed for garlic mustard understory population distribution, maximum area covered, abundance, and maximum incursion distance. Environmental characteristics such as distance from streams and canals, elevation, canopy cover, polygon area, area:perimeter ratio, slope, and aspect were also examined using GIS. Historical land use is not significantly correlated to garlic mustard presence (p=.301, n=60), abundance (p=.113, n=28), maximum area covered (p=.813, n=28), or maximum incursion distance (p=.869, n=28). Plot distance from streams and plot elevation are both significantly correlated to the presence of garlic mustard (r^2=.235, p=.04 and r^2=.257, p=.016, n=60 respectively) and are related to each other (r^2=.176, n=60). These results differ from studies done with garlic mustard in New England where historical land use appears to be a larger factor in distribution. These results suggest the importance of landscape corridors in biological invasions and can be used to

supplement the efforts of land managers in controlling the spread of invasive species in this region.

BOARD 63 **SALAMANDER SPECIES DIVERSITY ON DISTURBED AND UNDISTURBED PORTIONS OF A RECLAIMED STRIP-MINE IN SOUTHEASTERN OHIO.** **John M. Treasure, johnt@muskingum.edu, Danny J. Ingold, ingold@muskingum.edu, Biology Dept, Muskingum College, New Concord OH 43762.**

Data on salamander species diversity and habitat preference on reclaimed strip-mines is generally lacking. In particular, little has been reported on the diversity and abundance of salamander species on undisturbed remnant forest patches surrounded by larger reclaimed forests and grasslands. From late July through October 2006, 18 circular plots (each ~ 75 square m in size) were searched for salamanders on the Wilds, a reclaimed strip-mine in Muskingum County, Ohio. Eight plots were located in forested areas that had been previously strip-mined, while the other 10 were in undisturbed patches of forest surround by reclaimed lands. Seven species of salamanders were found on undisturbed plots while only two species were detected on previously-mined forest plots. More salamanders of all species combined were found on undisturbed versus disturbed plots (N = 60 vs. 7 respectively). Red-backed and mountain dusky salamanders (*Plethedon cinereus* and *Desmognathus ochrophaeus* respectively) were the most abundant species (both in terms of numbers and density) on the undisturbed plots. Red-backed salamanders and red-spotted newts (*Notophthalmus viridescens*) were the only species found on the disturbed plots. The abundance of both red-backed and mountain dusky salamanders were greater on undisturbed vs. disturbed plots (N = 24 vs. 4 and N = 20 vs. 0 respectively). These findings suggest that forest patches growing on areas that were previously strip-mined provide less desirable habitat for salamanders when compared to remnant forest patches surround by reclaimed lands.

BOARD 64 **THE VALUE OF MANURE AS A NUTRIENT SOURCE FOR CORN PRODUCTION.** **Alan P. Sundermeier, sundermeier.5@osu.edu, Ohio State University Extension, 639 South Dunbridge Road, Suite 1, Bowling Green OH 43402.**

Manure can be utilized as a nutrient source for corn production. Quantifying the value of manure is the objective of this study. Once this value has been determined, the use of manure in corn production systems can replace the use of inorganic nitrogen fertilizer. Also, livestock producers will be able to determine a value to manure when selling to other corn producers. Field plots were established in 2006 in Wood County, Ohio. Plot size was 40 feet by 500 feet each entry. All entries were replicated three times in a randomized design. Following the 2005 soybean harvest, liquid dairy manure was injected into selected entries at a rate of 7,000 gallons per acre. Approximate nutrient content of manure applied was 172 pounds per acre of total nitrogen. No additional nitrogen was applied to any of the entries. Corn yield data was collected from each entry. The average of three entries with no manure applied was 110.9 bushels per acre of corn compared to the average of three entries with manure was 136.9 bushels per acre. These results indicated a significant statistical difference (F value .05) of 26.0 bushels per acre benefit for manure application. Using a market price of corn at $3.50 per bushel results in a value of $91.00 per acre for manure application on corn.

BOARD 65 **WOODY PLANT SPECIES COMPOSITION ACROSS A NORTH-SOUTH GRADIENT ON A RECLAIMED STRIP-MINE IN SOUTHEASTERN OHIO.** **G. Bradford McBride, gmcbride@muskingum.edu, Danny J. Ingold, ingold@muskingum.edu, Biology Dept, Muskingum College, New Concord OH 43762.**

Strip-mining in the eastern United States has lead to the transformation of large tracts of forests and agricultural land to artificial grasslands dominated by exotic grasses and usually only a few woody plant species. However, in the wake of strip-mining, small patches of undisturbed forests, not readily accessible to mining efforts, were occasionally left behind. In this study woody tree species density, frequency, coverage and importance values were quantified on 40 circular plots (50 m^2) across a north-south gradient at the Wilds in Muskingum County, Ohio. The purpose of this study was to determine whether differences occur in woody plant species composition in disturbed (presence of mine spoils) versus remnant forest patches in north, central and southern plots. Reclamation at the Wilds occurred earliest on the northern sites (1940s and 50s) and most recently on the southern sites (1970s and early 80s), with scattered woodlots left behind. Although both disturbed and remnant forest patches were found on all three areas, randomly chosen plots on the north and central locations had a greater frequency of disturbance (north = 60%, central = 60%, south = 20%). Importance values (relative density + relative frequency + relative coverage) from each region indicated that sugar maples (*Acer saccharum*) and silver maples (*A. saccharinum*) were the dominant species on northern plots, while tree-of-heaven (*Ailanthus altissima*) was the dominant species on central plots. On southern plots where disturbance was less frequent, sugar maples, American beech (*Fagus grandifolia*) and tulip poplars (*Lireodendron tulipifera*) were the dominant species. These data suggest that the woody plant species composition and importance on a reclaimed strip-mine differ not only between forest patches that were previously disturbed versus "islands" of land that were left un-mined, but also across a north-south temporal gradient of disturbance.

BOARD 66 **SPATIAL ANALYSIS OF OHIO WETLAND MITIGATION BANKS.** **Jordan W. Mora, mora_j@denison.edu, (Douglas J. Spieles, spielesd@denison.edu), Slayter Union Box 2236, Denison University, Granville OH 43023.**

Mitigation wetlands are intended to replace wetland area lost to development, but the success of mitigation wetlands in reaching the mandated performance remains in question. One method of improving the diversity and size of the ecosystem is to consolidate replacement obligations in large, off-site wetlands called mitigation banks. Previous evaluations of mitigation banks focus on temporal analyses of community change and disregard spatial scale. This study combines three spatial scales in an effort to evaluate the characteristics of the surrounding landscape, the spatial arrangement within wetland mitigation bank ecosystems, and the degree to which these replacement wetlands provide suitable habitat for waterbirds. The objectives are as follows: 1) determine whether the wetland was created in a suitable area with substantial buffer zone of at least 50m, a low relative rate of urbanization, connectivity to natural areas, and low road density; 2) determine the overall trends of wetland mitigation bank ecosystems using the individual criteria of the Ohio Rapid Assessment Method for Wetlands; 3) within the wetland, determine the patterns of habitat quality and diversity based on the Habitat Suitability Models for eight waterbird species. Fifteen active mitigation banks distributed throughout central and northern Ohio are included in this study. USGS Digital Ortho-Quadrangles from1994 to 2001 and recent aerial photos from 2004 to 2006 are used to compare landscape-level variables. Field observations and an analysis of the ecosystem-level spatial composition using the aerial photos are needed to complete the Habitat Suitability Models and Ohio Rapid Assessment Method for Wetlands.

Pre-College Posters - Session B
10:00 – 11:30 AM

BOARD 67 **THE DEVELOPMENT OF A METHOD FOR THE DETECTION OF CREATINE KINASE.** **Caitlin M. Mann, rincenacrunne@ameritech.net, Chung Chuin Liu, clx9@po.cwru.edu, 95 Buckingham Rd., Rocky River OH 44116. (Hathaway Brown School)**

Creatine kinase (CK, EC 2.7.3.2) is an enzyme that aids in catalyzing the reaction that produces adenosine diphosphate, ADP, from adenosine triphosphate, ATP, in the human body. Elevated levels of CK can indicate diseases of the skeletal muscle, and lowered levels can indicate liver diseases. The goal of this research project was to develop a simple, cost-effective method for accurately detecting levels of creatine kinase. Through the following three reactions, the levels of CK can be detected indirectly. First, CK catalyzed the reaction of creatine and ATP producing creatine phosphate and ADP. The formed ADP reacted with phosphoenolpyruvate and produced ATP and pyruvate by using pyruvate kinase. This pyruvate was oxidized with pyruvate oxidase and a phosphate solution, producing acetyl phosphate, hydrocarbonate, and hydrogen peroxide. The produced hydrogen peroxide was detected by a micro sensor. After five minutes of incubation needed to carry out these reactions, an applied voltage of a micro sensor oxidized the hydrogen peroxide, scanning it at 10mV/second, yielding an oxidation current peak at +0.2 volts versus the Ag(AgCl) reference electrode. This was done three times in succession adding 30U of CK each time, and in each, the hydrogen peroxide levels began to peak at the same potential (+0.2 volts). The peak current increased each time, for more CK was added into the test medium (had to add at least 5U CK to work). These results (after testing over twenty times) show that it will be possible to use the levels of hydrogen peroxide produced from the third reaction to quantify the levels of creatine kinase indirectly in future work.

BOARD 68 **WRITING CHARACTERISTICS THAT ALLOW A PROFICIENT READER TO MORE EASILY READ MISSPELLED WORDS. Gregory T. Phillip, omallema@bp.com, 2714 West Park Blvd., Shaker Hts. OH 44120. (Shaker Heights High School)**

How can a proficient reader easily read the following sentence: Deos seplilng cuont? The following hypotheses were tested: (1) a short misspelled word is easier to read than a long misspelled word; (2) a misspelled word in the context of a sentence is easier to read than one that stands alone; and (3) a misspelled word with the first and last letters in the correct positions is easier to read. To test these hypotheses, a survey sheet was constructed that included correctly spelled and misspelled words of varying length presented by themselves and within sentences. Thirty five students were asked to identify the words. Experimental controls included testing only 7th and 8th graders to assure similar reading proficiency and the elimination of subjects deemed not proficient readers because they could not quickly read a test sentence. Testing results showed that the length of the misspelled word and the misspelled word being in context did not affect the proficient reader's ability to read the word. Words of 4, 6, 8, and 10 letters long were all read with 76-78% accuracy and words in and out of context were read with 76-77% accuracy. Keeping the first and last letter in the correct place did affect the proficient reader's ability to read the misspelled word. Words with the first and last letters in the proper location were correctly read 86% of the time while words with the first and last letters misplaced where correctly read only 68% of the time.

BOARD 69 **THE EFFECT OF SALINITY ON THE HEAT TRANSFER RATE OF WATER IN RELATION TO THE FORMATION OF EL NIÑO. Lali J. Reddy, lollipop603@aol.com, 504 Greenbrier Ct., Steubenville OH 43952. (Catholic Central High School)**

El Niño is an interference of the ocean-atmosphere system in the Tropical Pacific that has significant consequences for weather around the globe, specifically the northern hemisphere. Salinity is the totality of dissolved salts that are found in water. Heat is the energy transferred between objects because of a difference in their temperatures. The specific heat capacity of a substance is the quantity of heat required to raise a unit mass of homogeneous material 1° K or 1° C in a specified way given constant pressure and volume. The effect of high and low salinity on heat energy absorption was determined. It was hypothesized that the salinity of the water and the heat transfer rate would be inversely proportional to each other. Nine 600-mL beakers were filled with 500 mL of water and ppt (parts per thousand) salts between 0-80 (with increments of 10) were mixed within each beaker respectively. Each beaker was heated for five minutes and the temperatures were measured before and after heating. Before heating, the average temperature for all nine beakers was approximately 22.76° C. After heating, the average temperature for all nine beakers was approximately 55.15° C. The heat transfer and the heat transfer rate were calculated using the formula: specific heat capacity=energy transferred as heat/mass x change in temperature. The average heat transfer rate in joules per minute for the nine beakers, in ascending order, is as follows: 16, 918; 13, 336; 12, 000; 11,703; 11, 914; 11, 918; 11, 820; 12, 716; 12, 535. In conclusion, the salinity of the water and the heat transfer rate are inversely proportional. With lower salinity there is a higher chance that the heat will escape into the atmosphere, causing fluctuations in the weather patterns.

BOARD 70 **VISUAL ACUITY AND PINHOLE VISION. Travis M. Ell, travell7288@hotmail.com, 2515 Aubrey Court, Circleville OH 43113. (Teays Valley High School)**

Throughout history, man has tried discovering ways to increase one's vision. Some people believe use of pinhole glasses will enhance and/or increase their vision. The goal of this experiment is to determine whether any particular eye disorder would benefit from the use of these glasses while comparing age ranges of 11-15 year olds to 35-50 year olds. From a distance of 6.096-meter (20 feet), 200 subjects were asked to read an eye chart without their corrective lenses. Next, they put the pinhole vision glasses on and read the same eye chart. Finally, subjects replaced the pinhole glasses with their own and read the chart again at a range of 60.96-meters. The 100 suffering from Myopia were able to read the eye chart at a range of 6.096-meters without corrective lenses. Their original visual acuity doubled wearing pinhole glasses. Wearing their corrective lenses, each was able to read the eye chart from a range of 60.96-meters. Hyperopia subjects without corrective lenses were able to read the eye chart from a range of 30.48-meters. Pinhole glasses decreased their ability to see accurately. Of the subjects tested, 98 percent were found to have had perfect corrected vision. These findings indicate those with Myopia were better suited for pinhole vision glasses verses Hyperopia. Decreased natural vision was experienced in 27 percent of those with Hyperopia, while natural vision increased in 97 percent of Myopia subjects.

BOARD 71 **COUNTER CLEANERS/ ANTIBACTERIAL WIPES. Toral S. Vaidya, pvaidya744@aol.com, 744 Courtwright Blvd, Mansfield OH 44907.**

The project was to answer the question of which antibacterial wipe works the best to kill bacteria on surfaces. Six antiseptic wipe brands were tested to determine which one was the most effective. The hypothesis stated that Lysol â would work the best to kill bacteria on the surface because it contains two forms of ammonium chloride (quaternary ammonium chlorides). The brands tested were Windexâ with Vinegar, Scrubbing Bubblesâ, Pro Sprayâ, Cloroxâ, Lysolâ, Thievesâ, and a dry paper towel wipe. Samples were tested on separate 6 x 8 cm square for each brand by wiping the designated square for 10 seconds. Counter surfaces were swabbed and plated, then wiped with the specific brand, allowed to dry, and swabbed and plated again. Three trials were performed, each following the same procedure. The swabbed agar plates were placed in an incubator at 36° C for 48 hours and then observed by counting the staphylococcus bacterial colonies grown on the plates. Results showed that Thieves â eliminated 100% of the bacteria, Lysol 98%â, Clorox â 94%, Windex â with Vinegar 83%, Pro Spray â 37%, Scrubbing Bubblesâ 29%, control 7%, and dry wipe eliminated 0%. Thieves â wipes worked the best of all wipes and contained pure grain alcohol, deionized water, coconut oil, soy lecithin, and essential oils which were clove, lemon, cinnamon bark, eucalyptus, and rosemary. Thievesâ was effective in killing bacteria because it contained pure grain alcohol (95% alcohol) and the essentials oils, both of which have excellent antibacterial activity. Alcohol in the concentration of 70-92% rapidly kills bacteria. Lysolâ, the second most effective wipe contained quaternary ammonium, another proven antibacterial agent.

BOARD 72 **THE BRILLIANCE OF LEDS: IS MORE CURRENT BETTER? Cherylyn M. Geers, cherylyn@one.net, 3721 Dust Commander Dr., Hamilton OH 45011-5525. (Homeschool)**

This project was designed to investigate LEDs (light-emitting diodes), including the relationship of LED light intensity to LED voltage and current. Blue and red LEDs were tested to see if this relationship was different. In order to conduct this experiment, a multi-meter attachment to measure light intensity, Extech model 401020, was used. A variable power supply, resistor, and LED were assembled into a series circuit. The variable power supply was set in increments of one from 0 to 12 volts volt for the blue LED and 0 to 10 volts for the red in one volt increments. Each color LED was tested five times at each of the voltages. Four multimeters were used to measure the voltage of the power supply more accurately, LED voltage, current, and light intensity. The variable power supply was set to multiple voltages. The voltage and light intensity of the LED, as well as the current, were then measured. The averages for the red LED went up to 10 lux for the light intensity, 27.3 mA for the current, and 1.99 volts for the LED voltage. For the blue LED, the averages went up to 11.4 lux for the light intensity, 27.2 mA for the current, and 4.38 volts for the LED voltage. When an increase in voltage or current was applied to a red or blue LED, an increase in light intensity was observed. No light was detected from the red LED until the voltage applied to it was two volts. Similarly, no light was detected from the blue LED until the voltage applied was four volts. This explains the reasons for the voltage ratings on the LEDs. Also, the difference of two volts caused the readings for the blue LED that was tested to be approximately two volts greater than those of the red LED.

BOARD 73 **THE EFFECT OF PHEROMONE CONCENTRATION ON ODOR TRACKING ABILITY IN THE AMERICAN COCKROACH, *PERIPLANETA AMERICANA*. Caitlin R. Duffy[1], cduffy08@hb.edu, Jennifer L. Avondet[2], javondet@hotmail.com, Mark A. Willis[2], maw27@case.edu, [1] 19600 North Park Blvd, Shaker Heights OH 44122, (Hathaway Brown School), [2]Case Western Reserve University, Dept of Biology, 2080 Adelbert Rd., Cleveland OH.**

The effect of concentration on an insect's ability to track a pheromone source has been shown in the moths, *Grapholitha molesta* and *Lymantria*, that as the concentration of pheromone increases, the insects show negative chemotaxis (orientation toward a chemical stimulus). The present experiment was conducted on the American cockroach, *Periplaneta americana*, because they are known to track wind-borne plumes of female sex attractant pheromone to

locate mates. Preliminary work with non virgin male cockroaches (n=39) found no response to pheromone, periplanone B, below a concentration of 0.001 ng and the cockroaches' response at 100 ng (the stock concentration) was similar to that seen at 10 ng. In the experiment five concentrations of the pheromone were tested, our "standard" concentration of 0.1 ng, two concentrations below the normal concentration (0.003 ng and 0.01 ng), and two concentrations above the normal concentration (1 ng, and 10 ng). Based on past experiments in the literature, it was expected that the number of cockroaches to successfully locate the odor source would increase as the concentration increased from 0.003 ng to 0.1 ng, but as the concentration increased past 0.1 ng to 10 ng, there would be a decrease in response to the odor. In the final experiment virgin male cockroaches n=85 were observed in a wind tunnel and video recorded for computer analysis. Required analyses are qualitative, and indicate that of the n=85 virgin males tested among the five concentrations, in the two highest concentrations there was an increase in the number of successful plume tracks, and the cockroaches tracked the plume faster; while in the two lower concentrations, they tracked the plume slower and fewer individuals located the odor source. These results thus far show that for *Periplaneta americana* concentration had a different effect than was predicted; and different than effects observed in other insects.

BOARD 74 **THE ENZYMATIC BROWNING OF APPLES. Mitchell A. Poole, debbie@poolefamily.us, 1536 Georgetown Rd., Loveland, OH 45140. (St. Andrew School St Elizabeth Ann Seton School)**

This experiment tested how to prevent apples from browning while tasting acceptable. The hypothesis was that a 25% solution of lemon juice and water would most effectively inhibit browning versus 100% apple juice, 100% orange juice, 2 Tablespoons and 2 teaspoons of Fruit Fresh® diluted in ¾ cup water, ¼ cup sugar diluted with 1 cup water, 100% water, covering in plastic wrap, and a non-treated control. N=20 apples were sliced and each slice was dipped in treatment or wrapped. Start time and time to brown were recorded using a browning scale photograph. A blind taste test was conducted with N=30 of boys and girls ages 10-16. Participants tasted treated apple slices and recorded if it tasted acceptable. The average time to brown was Fruit Fresh® 0:40:51, orange juice 0:12:32, 25% lemon juice 0:11:32, apple juice 0:10:50, water 0:10:50, sugar water 0:09:53, wrap 0:05:40 and non-treated control 0:04:00. A second trial on N=10 apples tested 25%, 50%, 100% lemon juice concentrations, Fruit Fresh®, and non-treated control. Average time to brown for N=10 apples was 100% lemon juice 1:33:11, Fruit Fresh® 1:09:38, 50% lemon juice 0:48:27, 25% lemon juice 0:32:52 and control 0:11:56. Acceptability of taste was apple juice 100%, sugar water 96.7%, orange juice 96.7%, control 93.3%, water 93.3%, Fruit Fresh® 80%, 25% lemon juice 76.7%, 50% lemon juice 56.7%, and 100% lemon juice 50%. The hypothesis was not supported. The 25% lemon juice did not prevent browning better than Fruit Fresh®. Higher lemon juice concentrations did not taste acceptable.

BOARD 75 **DOES ORGANIC MATTER IN TOPSOIL REDUCE THE EFFECTS OF ACID RAIN? Rebecca K. McGrail, jmcgrail@jcc.edu, 366 Westwood Drive, Steubenville OH 49353. (Steubenville Catholic Central High School)**

The research goal of this study was to determine if organic matter in topsoil can reduce the effects of acid rain. It was hypothesized that pelletized lime would reduce the effects of acid rain greatest. It is believed that pelletized lime, because it is an alkaline, will neutralize acidic soil. The buckets were labeled Control 1-3, Cow Manure 1-3, Chicken Manure 1-3, Peat Moss 1-3, and Pelletized Lime 1-3. Each bucket contained 446 grams of washed pea gravel. 2,000 grams of topsoil were placed on top of the gravel. 500 grams of respective organic matter was then mixed thoroughly throughout the soil. When needed, water each bucket with 350 milliliters of a 10% acid rain solution. The day after watering, the pH of each soil was checked. After eight weeks it was discovered that soil will only turn acidic with plant growth. As a result, five grams of grass seed were placed in each bucket after being watered with 350 milliliters of rainwater. Every bucket was placed in a plastic bag, placed in a room at 20_ C, and covered with a towel until the grass sprouted. The results showed that the topsoil with peat moss retained a pH of 7.0 the longest. However, the manure groups had healthier grass, which was determined by color and height. In conclusion organic matter in topsoil reduces the effects of acid rain. The peat moss neutralized the effects of acid rain the longest, leading to the rejection of the hypothesis.

BOARD 76 **EFFECT OF MEMBRANE TRANSPORT CHARACTERISTICS ON DIRECT METHANOL FUEL CELL PERFORMANCE . Claire Pavlak[1], cpavlak8@aol.com, Ryszard J. Wycisk[2], rjw19@case.edu, Jun Lin[2], jxl109@case.edu, Peter N. Pintauro[2], pnp3@po.cwru.edu. [1]2801 Kingsbury Dr., Rocky River OH 44116, [2]Dept of Chemical Engineering, Case Western Reserve University. (Hathaway Brown School)**

The direct methanol fuel cell (DMFC) is an alternative energy source for portable electronics that is approaching its commercialization stage. Many research groups claim to have developed membrane materials with attractive DMFC properties (i.e. a low methanol crossover and high proton conductivity). It is difficult, however, to unequivocally select the material that will give the best power output in a given DMFC system. For the same class of sulfonated copolymers, it is not obvious whether the derivative with a lower or higher sulfonation degree would work best (a membrane with fewer sulfonic acid ion-exchange sites will have a lower methanol permeability but also a lower proton conductivity). There is also the issue of membrane thickness; a thin membrane may generate a higher maximum power (due to lower electrical resistance), but might be operationally unstable, while a thicker membrane could allow for more stable operation with a moderately high power output at high voltage. This research is directed toward understanding which membrane property controls DMFC performance: ionic (protonic) resistance or methanol crossover flux. For the tests, a series of membranes was fabricated from sulfonated poly(ether ether ketone) (SPEEK). Films were solution cast with an ion-exchange capacity of 1.2-1.7 mmol/g and a thickness of 40-200 μm. The membrane proton conductivity was 0.02-0.09 S/cm and the methanol permeability was $2 \cdot d10^{-7}$-$3 \cdot d10^{-6}$ cm^2/s. Fuel cell tests were performed with 5 cm^2 DMFC test fixtures at 60 and 80°C. In general, fuel cell performance of the SPEEK membranes compared favorably with Nafion® 112 and 117 reference materials. It was found that membranes with lower conductivity outperformed those with higher conductivity (at a similar area resistance) and were characterized by better stability due to lower methanol crossover.

BOARD 77 **EFFECTS OF CHANGES IN CONTEXT ON THE SPATIAL MEMORY OF RATS. Kate L. Schmidlin, klschmidl@sbcglobal.net, 1935 Kimberly Drive, Kent OH 44240. (Theodore Roosevelt High School)**

Rats have been used to study how mammals learn and respond to their environment. The purpose of this study was to determine whether changes in context of the rats' environment will affect the time it takes them to find the platform in a Morris maze. A Morris maze is a circular water tank, 122 cm in diameter with a 41 cm depth of water and a 15 x 15 cm platform just below the surface where a swimming rat can escape from the water. The Morris maze was in a room with bright posters and other visual cues. Sixteen male hooded rats were given experience in finding the platform from 3 release points around the tank. The rats were released from the 3 points again and the time each took to find the platform was recorded. Eight randomly chosen rats were given a change in context in two experiments. In the first, a loud noise was added while the rats swam to the platform. In the second, the posters and other visual cues in the room were removed. It was hypothesized that the changes in context would reduce the rats' spatial memories and extend the time required to find the platform. A t-test showed there was no significant difference ($p > 0.10$) in the time to find the platform between the control group and the experimental group exposed to noise from two of the three release points. There was no significant difference ($p > 0.10$) in the time to find the platform between the control group and the experimental group with removal of visual cues. However, the rats that were in both experimental groups found the platform more slowly than those exposed only to removal of visual cues in the second experiment (29.25 sec. vs. 6.5 sec.; $t = 4.10$, $p < 0.01$), indicating a possible cumulative effect.

BOARD 78 **REPLACING PETROLEUM FUEL WITH ALCOHOL BLENDED WITH ORANGE OIL AND PINE OIL. Raymond Tan, ztan@cinci.rr.com, 8308 Cherrydale Ct., Mason OH 45040. (Mason High School)**

The purpose of this study was to determine the combustion behavior of fuel alcohol following the addition of orange oil (limonene) and pine oil (turpentine). Limonene (1-methyl-4-prop-1-en-2-yl-cyclohexene) is produced from citrus fruits such as orange peel. It was hypothesized that the addition of either limonene or turpentine would make the fuel burn brighter, with higher flames, and higher flame temperatures, without negatively impacting the fuel flow or

injection properties such as the kinematic viscosity. The combustion experiment was performed with oil lamps containing alcohol mixed with 0%, 5%, 10%, 20% and 30% limonene and turpentine respectively. The combustion patterns were observed and recorded with a digital camera. The flame temperatures were measured with a thermocouple. The effect on the fuel mixture density and kinematic viscosity was also tested. It was found that the addition of limonene or turpentine indeed made the fuel burn brighter, with higher and more vigorous flames. The open flame temperatures however did not vary beyond standard deviations from the alcohol readings. Combustion of 30% limonene generated smoke and soot. Turpentine burned cleanly at 30% addition, but its kinematic viscosity was increased from 1.48 mm2/s to 1.58 mm2/s which might limit further addition levels. In consideration of all the findings, it is recommended that up to 20% limonene or 30% turpentine be added to the alcohol as an improved biofuel.

BOARD 79 **GENDER DIFFERENCES IN THE DIAMETER OF CORONARY ARTERIES. Isabel Pereira de Almeida, ialmeida@askanywhere.com, 1209 Lyn Rd., Bowling Green OH 43402. (Bowling Green High School)**

In recent studies it was found that women do not recover as well as men after a heart attack and undergoing bypass surgery. A reason to explain this is that women have smaller coronary arteries than men, and therefore do not get blood pumped through the body as efficiently. In this project 50 cadaver hearts collected prior to the 1980s (supplied by Dr. Baptista M.D., Ph.D. from MUO of Toledo) were measured with a digital caliber to find the diameter of each of the arteries. The arteries measured were the right coronary artery, left coronary artery, left anterior descending, circumflex, and posterior descending artery and distance bifurcation. The hearts were both from males and females. At the end of the study the measurements of each artery were compared to that of the other gender. In accordance with the previous studies found, the results agreed with the hypotheses that women would have smaller diameters than men. In some arteries the difference was significant according to the one-tailed t-test applied to the average measurements. For the right coronary artery and the posterior descending artery their t values were significant. The t-value for the RCA is 1.746 and the t-value for the PD is 2.104. This information can lead to new research by providing some key evidence in gender differences of the heart. This information can also aid surgeons before conducting a bypass operation.

BOARD 80 **CRYSTAL FALLOUT, GROWTH, AND SIZE AFFECTED BY IMPURITIES AND CHEMICALS. Zechariah A. Ciccone, zaeciccone@aol.com, 5208 W. Viola, Austintown OH 44515. (Ohio Distance Electronic Learning Academy)**

Crystals form when molecules of a solution sink (fallout) and collect on the bottom of a container or when chemicals evaporate from a solution. The molecules contact other like molecules until the combined molecules become large enough, forming a crystal. The experiment's purpose was to demonstrate how impurities and chemicals affect crystal fallout, growth, and size. It is hypothesized that larger crystals form in potassium alum than in ammonium alum and that larger crystals form in a solution without impurities than one with impurities. Three containers had potassium alum solution and chromium nitrate (for a purplish color); three containers had ammonium alum solution and green food coloring. The impurities were vegetable oil and vinegar added to both groups. Potassium alum and ammonium alum were tested with and without the impurities vegetable oil and vinegar, for two weeks at four-day intervals, measuring the crystal sizes, using the metric scale. The potassium alum vinegar solution formed the largest, clearest crystals (6.875 mm-average), and the ammonium alum oil solution formed medium-sized, fairly clear crystals (3.125 mm-average). The first hypothesis was correct. The smallest crystals were formed by both pure potassium and ammonium alum solutions, (5 mm-average and 1.5 mm-average, respectively). The second hypothesis was incorrect. The vinegar potassium alum solution produced the largest, brightest crystals (observed with a 100x-900x zoom microscope). Though not found in any research used, vinegar proved to enhance crystal growth. Further research will test vinegar's effects on different crystal-forming chemical solutions like Rochelle salt, chromium nitrate, or copper sulfate.

BOARD 81 **FACE-ISM: A CASE STUDY OF STEREOTYPING IN NEWSWEEK MAGAZINE. Kapil R. Melkote, Kmelkote@gmail.com, 1505 Devonshire St., Bowling Green OH, 43402. (Bowling Green High School)**

Face-ism, the amount of facial prominence in a photograph, may convey certain messages about the depicted person. Researchers have found that higher facial prominence conveys perceptions of higher intelligence, ambition and dominance. The purpose of this study was to investigate the face-ism phenomenon in the depiction of the genders in *Newsweek* magazine. The study investigated the following hypotheses: (a) Depictions of people in U.S. media images will give greater prominence to the face in male than in female depictions in the years 1985 and 2005, and (b) The differences in the facial depictions between male and female subjects will increase between 1985 and 2005. The face-ism coding process was used to choose eligible pictures. Mean facial prominence was calculated for pictures of males and females from 1985 and 2005 respectively. These data were analyzed to see if one group had significantly higher facial prominence than the other. The results of this study found that males received significantly higher facial prominence in both 1985 (n=164, t = 3.386, p < .001) and 2005 (n=98, t= 3.04, p < .003). This supported the first hypothesis, and shows that modern mass media are still stereotyping between the genders. However, the difference between male and female scores between 1985 (Male=.5602, Female=.4249, *diff*= .14) and 2005 (Male=.5535, Female=.4139, *diff*= .14), was found to be the same. This did not support the second hypothesis; however, it also showed that despite no increase in face-ism, there was also no decrease.

BOARD 82 **THE EFFECTS OF ORGANIC AND INORGANIC FERTILIZERS ON CORN (Zea saccharata) GROWTH. Christina Morrell, 4604 Turney Rd., Apt. 2, Garfield Heights OH 44125. (Cuyahoga Valley Career Center, Dept of Horticulture)**

The experiment was conducted to test the effects of organic and inorganic fertilizers on plant growth. Organic fertilizers improve soil texture and increase moisture retention. Inorganic fertilizers are easier to apply and generally less expensive than organics. Plants treated with organic fertilizers will have better growth. The experiment was conducted in a controlled greenhouse environment. Plant growth rates were monitored in three separate trials: organic fertilizer, inorganic fertilizer, and no fertilizer (control). Fifteen black four-inch pots were used in each trial. In each pot a seed of corn was hand sewn. The organic fertilizer was produced by Plant Tone™, and was applied at a concentration of 2.0g ferilizer/200ml water in each four inch pot. For the inorganic trial, each corn plant received a 200ml solution of inorganic fertilizer (20/10/10). Two treatments were applied for each of the trials. The corn plants treated with organic fertilizer appeared to demonstrate the best growth. The final vertical measurements were taken in centimeters on 25 April 2006. The means for each group were as follows: organic- 60.4 cm, control- 54.9 cm, inorganic- 49.3cm. A t-test was used to analyze the difference between mean plant heights for the three trials. The P-value for inorganic versus organic was highly significant (P< 0.0008). The data supported the hypothesis that organic fertilizers have the necessary components to produce greater vertical growth. To conclude, organic fertilizer promoted the best overall plant growth.

BOARD 83 **A SENSORY EVALUATION OF BEEF: A STUDY COMPARING THE PREFERENCE AND DIFFERENCE BETWEEN HIGHLAND BEEF AND A NATIONAL MEAT RETAILER'S PRODUCT. Abigail B Snyder, snyder@horizonview.net, 241 Whisler Rd, Kingston OH 45644. (Zane Trace High School)**

Highland cattle are a potentially important source of specialty beef. A study was conducted with the cooperation of American Highland Cattle Association's beef producers. Fifty panelists were asked to a) identify the difference between sirloin samples of Highland cattle and samples from a national retailer in a triangle difference test and b) identify their preference between them in a paired preference test. The hypotheses were that a) there was no significant difference in the ability of panelists to identify difference and b) there is no significant difference between panelist preferences. Sample steaks were frozen to -20 degrees Celsius. Thirty hours prior to testing samples were thawed at 4 degrees Celsius. Steaks were cooked on a belted oven at 350 degrees Fahrenheit. to an internal temperature of 145 degrees Fahrenheit. (medium rare). Samples were cut into 5 pieces approximately 1x1 inch in size. Each panelist was given a set of two samples (one Highland, one national retailer) and asked to identify which they preferred and a set of three samples (a random combination of two from one group and one from another), and asked to identify which was different. 27 of the panelists indicated they preferred meat from the national meat retailer. 23 panelists preferred Highland. 39 out of the 50 panelists identified a difference between the two. Results were analyzed using binomial statistical analysis with a previously established 0.05 alpha level. A significant difference was found in the ability of panelists to identify difference, and the first hypothesis was rejected; no significant difference was found

in preference, and the second hypothesis was accepted. The researcher concluded a substantial number of panelists preferred Highland beef, opening a viable market for Highland producers.

BOARD 84 **EFFECT OF PRODUCE CLEANERS ON SURFACE HERBICIDE. Andrew J. Frankart, sfrankart@juno.com, 5044 Brookhill Ln., Lima OH 45807. (Lima Central Catholic High School)**

The purpose of the experiment was to determine if commercial produce cleaners are effective in removing surface herbicides on soybeans. Produce cleaners were tested for residual traces of glyphosate, the herbicide agent in a popular herbicide called Roundup®. Research was prompted by curiosity of the effectiveness of produce cleaners and by prior knowledge of harmful effects of consuming herbicides. The hypothesis was that an average of seventy percent of surface herbicide would be removed by the application of commercial produce cleaners. Project experimentation involved spraying four sets of untreated soybeans with a commercial herbicide, Roundup®, in order to simulate the spraying of the produce as it would occur in commercial agriculture. The herbicide was allowed to dry on all four sets of soybeans. The control set received no further treatment. The other three sets were treated with either commercial produce cleaners or water. The beans that had been sprayed with herbicide and then treated with varying cleaners were tested by the process called Cation-Exchange Chromatography with Postcolumn Derivatization with the instrument called a Dionex 500 High Performance Liquid Chromatography system containing several reagents including potassium phosphate, o-Phthalaldehyde (OPA), sodium hypochlorite (bleach), and 2-mercaptoethanol that were used to determine the amount of glyphosate remaining. The testing revealed that the group rinsed with water alone removed more of the glyphosate than any of the other groups. The results indicated that the produce cleaners rinsed an average of 69% of glyphosate off the produce item. This agrees with my hypothesis that 70% of glyphosate would be removed by commercial produce cleaners. Interestingly, water alone rinsed 87% of glyphosate off of the produce while Fit Produce Cleaner rinsed 67% of the herbicide off and Environne Fruit and Vegetable Wash rinsed off 51% of the herbicide. The conclusion from this testing is that the surfactants in the commercial cleaners actually facilitated the spread of the glyphosate across the surface of the bean rather than helping breakdown the herbicide for rinsing.

BOARD 85 **ARE NON-SMOKING SECTIONS OF RESTAURANTS REALLY SMOKEFREE? Lawrence I. Boothe, lboothe@1st.net, 798 Township Rd. 15, Rayland OH 43943. (St. John Central High School)**

Suspended particulates in the air were measured in ten public facilities throughout Ohio in cities such as Cleveland, St. Clairsville, Dillonvale, Yorkville, and several others. This was done by using the Sidepak AM510 Monitor, which measures total suspended particulate (TSP) in the air in micrograms per cubic meter ($\mu g/m^3$). The purpose of this study was to prove that non-smoking sections in public facilities were not really smoke free. The Sidepak draws in air through a sensor that measures these particles based on the scattering of light. The data showed that the air quality was poorer in the ten public facilities than it was in the control (the facility with no smoking present whatsoever). The readings on the Sidepak monitor ranged from .012($\mu g/m^3$) to 19.204($\mu g/m^3$). These results were then compared with the Air Quality Index for particulate matter pollution. According to the Air Quality Index, the air quality was code green (good) in all ten facilities; however, there was a measurable amount of particulates in the air which means that non-smoking sections were not completely smoke-free. Therefore, it can be inferred that the only way to limit this air pollution would be to stop the source of the pollution, the smokers themselves. By enacting a statewide ban on tobacco in all public facilities, the air that we breathe would be healthier for us and for generations to come.

BOARD 86 **CHEMOLUMINESCENCE: THE TIMELESS PROCESS. Lizzie D. Martin, lizziedae91@yahoo.com, 15899 St. Rt. 739, Richwood OH 43344. (North Union High School)**

The research conducted involved detecting blood on multiple surfaces after sanitizing, sealing, and after an extended period of time. The hypothesis was made that bovine blood could be detected by a chemical called luminol [3-aminophthalhydrazide]. Luminol reacts through a process called chemoluminescence, in which a chemical reaction produces light. When the luminol reacts with the blood, it glows blue. In phase I of this study, blood was applied to rock, stainless steel, a block of teflon, cotton, plastic, steel, and wood. The materials were then cleaned with a bleach and water mixture, Spray 9™, and Oxygen Action™. The materials were then sprayed with luminol and the chemoluminescent reaction occurred. In phase II, Super Iron Out™ was used. Then the luminol was sprayed and the reaction occurred after an entire year. In phase III, the materials were again sanitized and some of them were sealed. A new kind of luminol was sprayed and the reaction occurred after 2 years. In the fourth and final phase of this study, two new objects were added, a wall and a stage. The reaction occurred on these surfaces after 20 years since the blood was applied. A new chemical was also used, called phenolphthalein [3,3-bis (p-hydroxyphenyl) phthalide], to verify that the reaction was blood. Phenolphthalein is also a chemoluminescent compound, however it glows pink. The new luminol used was much more efficient. It was safer and easier to use and the reactions were more intense in luminosity and lasted several minutes longer. The research shows that luminol could detect blood after sanitizing, sealing, and an extended period of time.

BOARD 87 **JUICED UP ORANGES: CAN YOU TELL HOW JUICY AN ORANGE IS BY RUNNING AN ELETRIC CURRENT THROUGH IT? Jakob N Hoellerbauer, choellerbauer@usa.net, Simon M Hoellerbauer, choellerbauer@usa.net, Renee A Morris, rrmorris@sprynet.com, 3491 Mariners Way, Lewis Center OH 43035. (Olentangy Shanahan Middle School)**

By conducting these experiments, it was attempted to establish a clear relationship between the juiciness of an orange and the resistance it would present to an electric current, which could then be used for commercial purposes. The hypothesis was as follows: the resistance of an orange is inversely proportional to the amount of juice it contains. To test this hypothesis, the following experiment was conducted. Two thin gold electrodes were entered into the peels of ten navel oranges from the same batch to measure the electrical current and calculate the resistance. These oranges were then dehydrated in a dehydrator for five consecutive days, and their resistance and mass were measured daily. On average, the oranges lost 25 % of their mass during the initial 24 hours of dehydration and their resistance decreased from 60 to 12 kiloohms. Then a second experiment was conducted to verify the results from the dehydrated oranges. The juice content, or amount of water in an orange, and the electrical resistance of five oranges were determined to establish a pattern. The hypothesis was proven incorrect; the experiment showed that the exact opposite happens. The more juice an orange has the more resistance it presents to electricity. However, the experiments could not be used to rank the oranges from juiciest to least juicy. More research would have to be performed to find a way to commercialize this method.

BOARD 88 **DOES INCREASING STRUCUTRAL MEMBER WIDTH INCREASE TENSILE STRENGTH? Sarah K. Mayo, panthers10@zoominternet.net, 309 Township Road 1135, Proctorville OH 45669. (Chesapeake Middle School)**

A Pratt Through Truss bridge was constructed out of cardboard file folders following detailed specifications. Built out of solid bars and hollow tubes, the bridge was load-tested to determine how successfully the structure worked. It was observed that external load applied to the bridge structure resulted in internal forces – tension or compression – developing within each structural member. Focusing on tension forces in the solid bars, the hypothesis was that there would be a direct linear relationship between member width and tensile strength. Test specimens were nine cardboard bars - three bars each of three different widths (4mm, 6mm, and 8mm) and all of the same length (20cm). Experimental testing was conducted using a simple, home-built, wooden lever machine. Specimens were individually clamped to the lever machine and load (sand) was added to a bucket until the specimen failed. The weight of the sand was then charted. The mass of the bucket/sand that caused each specimen to fail was converted to a force using the equation W (weight of the object) = m (mass in kg) x g (acceleration of gravity, 9.81 meters/sec^2). The mass was expressed in kilograms, therefore the weight W was in newtons. The principle of the lever was applied using the equation T (unknown internal force / tensile strength) = W (weight of the bucket and sand) L_2 / L_1 (L_2 and L_1 being measured directly from testing machine) to determine the force in each test specimen at failure. Data entered on a spreadsheet program revealed the tensile strength of the 4mm bars to be 18.74 N (newtons), 19.60N and 20.20N. The tensile strength of the 6mm bars was 29.59N, 29.75N, and 30.25N. The tensile strength of the 8mm bars was 40.93N, 41.82N, and 42.85N. An x-y scatter plot graph showing tensile strength vs. member width was then created. Experimental results proved that there is a linear relationship between member width and tensile strength. This experiment is important because an engineer must be able to determine the strengths of the structural members that comprise it in order to evaluate a structure's load-carrying ability.

BOARD 89 **THE EFFECTS OF POLLUTION IN POND WATER. Richard L. Baxter, jjorch@fuse.net, Samuel J. Wenke, mwenke@fuse.net, 7836 Zion Hill Rd., Cleves OH 45002. (St. Catharine of Siena)**

This study was to determine how pollution effects microorganisms in pond water. The hypothesis was that pollutants would effect the microorganisms with some pollutants having a greater effect. Pond water was collected, hay infusion made, 600 ml of hay infusion and 200 ml of pond water put into seven glass jars. Five days later, each jar tested for living organisms. 15 ml of five pollutants added to five jars and 1/3 of a rusty soup can added to the sixth jar. Each jar, including control jars, tested daily for amounts of microorganisms and findings were charted. Control jars showed less than 1% decrease of microorganisms, rock salt caused 50%-75% decrease, but the organism *Anabaena* multiplied. Roundup™ eliminated algae and decreased more than 50% of the microorganisms. Lack of food and oxygen may have caused a decrease in microorganisms. Tire mulch and rust decreased 25-50% of the microorganisms. 20-20-30 fertilizer caused increase in algae, effects similar to rock salt. Motor oil floated to top, cutting off oxygen and eliminating more than 75% of the microorganisms. The experiment supported the hypothesis with all pollutants tested having some effect, ranging from 25% to greater than 75%. Motor oil had greatest effect. Rust and tire mulch had the least. The data shows how bad some pollutants can be to microscopic life, which can have an impact on all life. It's important that humans be very careful with things that can pollute water. Understanding the effects of water pollution helps protect life.

BOARD 90 **PROJECTILE VELOCTIY. Michael J Anthony, fraznic@gmail.com, Joey P Alexander, Ja1exander@yahoo.com, 5079 TR 339, Millersburg OH 44654. (West Holmes High School)**

Three methods of determining the velocity of .22 caliber bullets and air rifle pellets were compared. First, the time from the sound of the gun shot until the sound of a projectile hitting a metal pipe, was measured with an Mp3 Recorder. Second, a Ballistic Pendulum was used to determine projectile velocity by the transfer of momentum from a projectile to log suspended from a branch. Third, a Homemade Electronic Velocity Chronograph clocked by a quartz oscillator measured the time interval of the projectiles passing through the two sensors (aluminum foil) spaced four feet apart. Finally as a control, a commercial velocity chronograph was also employed. There was about 5%-10% variability scattered evenly from shot to shot; perhaps the normal variability of the projectiles. The average velocities of the pellets were: the Mp3 Recorder 1193 **F**eet **P**er **S**econd (**S**tandard **D**eviation 7.07), the Ballistic pendulum 509 Fps (SD 1.15), the Foil Chronograph 502 Fps (SD 33.190and the Commercial Chronograph 543 Fps (SD 15.98). The averages of the results for the .22 were: the Mp3 Recorder 1193 Fps (SD 10.61), the Ballistic Pendulum 1111 Fps (SD 40.06), the Foil Chronograph 110 Fps (SD 34), and the Commercial Chronograph 1215 Fps (SD 23.26). The Foil Chronograph, method which could be formed into a large target or an array of targets was the method with the most potential to have commercial application. The Ballistic Pendulum method was unique, because time did not have to be measured to determine the velocity of a projectile. The sound method (Mp3 Recorder) was the least useful, because it was difficult to distinguish the "bang" from the "ping" unless the gun was separated from the pipe at just the right distance.

BOARD 91 **A COMPARISON OF CORTICAL PATHOLOGY IN PROGRESSIVE MULTIFOCAL LEUKOENCEPHALOPATHY (PML) AND MULTIPLE SCLEROSIS (MS). Amy J. Ransohoff[1,2], aransohoff08@hb.edu, Natalia Rebenko-Moll[2], molln@ccf.org, Barbara Tucky[2], tuckyb@ccf.org, Anna Rietsch[2], rietsca@ccf.org, Richard M. Ransohoff[2], ransohr@ccf.org, [1]19850 Marchmont Road, Shaker Heights OH 44122, [2]Neuroinflammation Research Center, Cleveland Clinic. (Hathaway Brown School)**

MS and PML cause demyelination of the central nervous system. Myelin is a fatty membrane that wraps around and insulates nerve fibers. Demyelination is the loss of myelin. In MS, demyelination is associated with inflammation. In PML, demyelination is caused by JC virus infection. Myelin loss produces similar symptoms in MS and PML (motor weakness, sensory loss, cognitive impairment). MS causes demyelination in both the cerebral cortex and white matter, two different layers of brain tissue. MS cortical demyelination takes three forms: subpial, intracortcial, and leukocortical. The purpose of this study was to determine if cortical demyelination occurred in PML. Tissues from PML cases (n=13) were obtained from the Cleveland Clinic's Pathology Department. Through immunohistochemistry, different antibodies were applied to display cell types and tissue changes. The antibodies used included myelin basic protein (MBP), which showed areas of demyelination; CD3, which showed T cells; and CD68 showed macrophages. Digitized merged images were analyzed using Adobe Photoshop®, and cell counts were performed. NIH Image J was used to calculate tissue area and results were expressed as percent demyelination or cell number per unit area. Surprisingly, subpial demyelination was absent from PML, but intracortical (1.8% of the cortical area) and leukocortical lesions (5.2%) were both easily visible. CD68+ macrophages were the majority inflammatory cells in PML intracortical (88.5%) and leukocortical (94.4%) lesions. In conclusion, many features of cortical pathology are shared between MS and PML, two demyelinating diseases with different causes. However, subpial demyelination is relatively specific to MS. (Supported by a grant from the National Institutes of Health PO1NS39667 to Richard M. Ransohoff)

BOARD 92 **STATISTICAL ANALYSIS OF VARYING Jβ DISTRIBUTIONS OF THE COMPLEMENTARITY DETERMINING REGION 3 (CDR3) OF T CELL RECEPTORS. Ashley E. Dreier, aedreier@alltel.net, Christine L. O'Keefe, 16770 Staffordshire Court, Chagrin Falls OH 44023. (Hathaway Brown School)**

The complementarity determining region 3 (CDR3) is a very specific and highly variable region found on T cell receptors (TCRs). The CDR3, which consists of a variable (V), diversity (D), and joining (J) region, binds directly with the antigen during an immune response. Its clonotype, or sequence, is responsible for determining antigen-specificity. A better understanding of CDR3 clonotypes would have an impact on the treatment of an unlimited number of diseases. In this study, a database was compiled of 8,000 CDR3 clonotypes of the variable β (Vβ) chain of TCRs. The database was then divided into different groupings by Vβ family and diagnosis. One-sample X^2 tests of equality of proportions along with two-sample X^2 tests of homogeneity were performed. The tests revealed that the Jβ family distributions for the three Vβ families specifically analyzed (Vβ 6-1, Vβ 20-1, Vβ 28) were not uniformly distributed ($p<1\bullet10^{-16}$ for all three families). Also, the Jβ distribution of Vβ 6-1 ($p=3.057\bullet10^{-74}$) and Vβ 28 ($p=8.745\bullet10^{-7}$) differed from the overall Jβ distribution for all Vβ families, while Vβ 20-1 ($p=0.144$) did not, suggesting that certain Vβ families preferentially utilize Jβ families in different ways. Also, the Jβ distributions of normal and abnormal cells differed ($p=2.589\bullet10^{-9}$) as did the Jβ distributions of interrelated diseases, specifically LGL leukemia and AA ($p=3.630\bullet10^{-3}$). Marked deviations were observed in Jâ distributions for LGL leukemia and AA, most seen in the frequency of Jβ 1-4 ($X^2=7.398$, 4.856). These preliminary results suggest that patients with LGL leukemia have very different T cell repertoires from patients with AA. This suggests that a T cell repertoire of a patient could be taken and analyzed to distinguish between the two diseases when indeterminate symptoms are shown in a clinical setting.

BOARD 93 **THE EFFECTIVENESS OF VARIOUS ANTIOXIDANTS IN INHIBITING PEROXYNITRATE RADICAL ACTION ON BSA PROTEIN. Marie Hu, marie80hu@yahoo.com, 2343 Poplar Ct., Sylvania OH 43560. (Sylvania Southview High School)**

Oxidative damaging is the cause of many diseases. Antioxidants can prevent oxidative damaging and are therefore crucial to the well being of the human body. The purpose of this experiment was to determine which antioxidant (Vitamin C, glutathione, or beta-carotene) was most effective in inhibiting oxidative damage from peroxynitrite radicals. The hypothesis was that concentration of each antioxidant and type of antioxidant would influence its effectiveness. Nitration of the protein Bovine Serum Albumin (BSA) by the peroxynitrite radical was chosen as the model system for oxidative damage of proteins. The antioxidants reacted with the peroxynitrite radicals to prevent BSA from oxidation damage. For each antioxidant, absorbance levels of BSA at 430 nm were measured by the SpectraMax 300 spectrometer, at antioxidant concentrations ranging from 0 to 25 mg/mL, to determine percent inhibition. Vitamin C achieved 100% inhibition at 1.625 mg/mL, glutathione achieved 100% at 6.25 mg/mL, and beta-carotene never achieved more than 56% inhibition. In conclusion, results suggested that Vitamin C was an effective inhibitor at all concentrations, glutathione was an effective inhibitor at high concentrations, and beta-carotene was a poor inhibitor at all concentrations, supporting both parts of the hypothesis.

BOARD 94 **AN OVEREXPRESSION SCREEN FOR GENES INVOVLED IN MOTORNEURON CELL FATE. Uma R. Mohan[1], umohan09@hb.edu, Qilei Hang[2], qilei.hang@case.edu, Heather T. Broihier[2], heather.broihier@case.edu, [1]9554 Brayes Manor**

Dr., Mentor OH 44060, [2]Dept of Neurosciences, Case Western Reserve University. (Hathaway Brown School)

A gain of function screen is used to isolate and identify genes that cause different cell fates in motorneuron cells of *Drosophila melanogaster*. A gain of function screen is designed to test genes that are selected using P-element insertions into the DNA in one line, which can be crossed with another line containing the GAL4 driver gene. The purpose of this screen was to identify *Drosophila* lines with mutant phenotypes for the expressions of even-skipped (eve), hb-9, and 1D4 proteins in motorneuron cells. It was hypothesized that the mutant phenotypes would have different expressions of eve protein. 128 lines of *Drosophila* containing specific genes selected using P-element insertions were crossed with elavGAL4 females. Embryos from each line were fixed and stained using α-eve, α-hb9, and α-1D4 stains. The patterns of motorneuron cell groups in each line were compared to the wild type phenotype. 13 mutant eve phenotypes were identified because the pattern in which eve was expressed in these lines had different patterns from the wild type. Inverse PCR analysis was performed on each of the mutant lines in order to find the corresponding EP flanked gene. Two mutant phenotypes were shown to be caused by a foxO gene or a gene upstream of foxO. Another sequence from a gene found in the C37 mutant line was blasted against the Flybase genomic and EST databases. A potential target gene was found to be retained (retn) or dri (dead ringer). In conclusion, this target gene may link to a gene identified in mice causing motoraxon degeneration. This is used as a model for human neuronal disorders and will be explored more in future work.

BOARD 95 **MODALITIES OF TRACKING HEART RHYTHMS. Shabdha U. Chigurupati, schigurupati08@hb.edu, 1863 Cottesworth Lane, Gates Mills OH 44040. (Hathaway Brown High School)**

Atrial fibrillation (AF) is an irregular heart rhythm, with which multiple impulses begin and travel through the atria, the top chambers of the heart. AF can be treated both medicinally and surgically, with the common goal of treatment to restore normal sinus rhythm and regulate the heart rate. After treatment, patient heart rhythm may be monitored transtelephonically. With this technology, samples of a heart rhythm are transmitted via telephone to a physician, using a monitor that includes two bracelets with electrodes. In patients with AF who underwent the Maze Procedure, this study 1) used transtelephonic monitoring (TTM) to assess heart rhythm, and 2) assessed patient compliance. After surgery, all patients were asked to utilize TTM. Over a 15 month period, 57 patients continued sending in such recordings. A patient was considered in compliance with TTM if he sent in a strip of his rhythm monthly. The results show TTM is an effective means of determining heart rhythm, as it allows physicians to accurately assess a patient's rhythm. Its accuracy is evident because the percentage of patients who experienced AF decreased as more time elapsed, showing that surgery was successful. Patient compliance was satisfactory, with an average of 75%. TTM, which is beneficial to both physicians and patients has many advantages, including patient convenience, because patients can avoid frequent visits to the physician. Also, when patients have episodes of unusual heart rhythms, they can quickly transmit the samples, and physicians will be able to detect any abnormalities earlier.

BOARD 96 **BIODIESEL FROM OILSEEDS: AN EXPERIMENTAL AND ENERGY BALANCE EXAMINATION. Elizabeth J. Bailey, JWBailey97@aol.com, 23447 Emmons Rd., Columbia Station OH 44028. (Columbia High School)**

Oil was collected by solvent extraction from five oilseeds suitable for biodiesel production: soybean, sunflower, rape, flax, and peanut. The production and energy balance of biodiesel was compared to corn ethanol. Energy balance is the ratio of the energy content of the bio-fuel to the energy content of the fossil fuel used in bio-fuel production. It was hypothesized that biodiesel production from oilseeds would be simpler and have a larger net energy balance than corn ethanol. For each oilseed, six 10 g samples were finely ground, sealed in filter paper bags, and soaked in 20 ml Coleman stove fuel ($\sim$ 40 wt% hexane) for 5 hours. Filter bags were removed and the fuel was evaporated from the bag and oil solution to determine the amount of oil extracted. Experimental results, wt% oil (sunflower 40.6%, soybean 14.4%, rape 39.8%, peanut 45.8%, flax 37.7%), were consistent with literature values. Goering and Daugherty's energy balance was updated for improved equipment, crop yields, and labor use. Energy balances were calculated: (1) crediting the energy content of both the bio-fuel and byproducts, (2) crediting only the bio-fuel. Crediting the bio-fuel and byproducts, biodiesels ranged from 5.58 (rape) to 3.34 (peanuts), compared to 1.67 for ethanol. Crediting only the bio-fuels, biodiesels ranged from 3.51 (rape) to 2.06 (soybeans), compared to 1.06 for ethanol. Energy balances of all biodiesels under both assumptions are substantially larger than ethanol's most optimistic energy balance. Biodiesel's simpler processing and larger energy balance make it a better fossil fuel replacement than ethanol.

BOARD 97 **CIRCADIAN RHYTHM REGULATION IN THE PINEAL ORGAN OF ZEBRAFISH. Lauren T. Goldstein-Kral1, Lgold248@aol.com, 19600 North Park Blvd, Shaker Heights OH 44122 (Hathaway Brown). Ramil R. Noche, ramil.noche@case.edu, Dept of Biology, Case Western Reserve University, Jennifer O. Liang, jol@case.edu, Dept of Biology, Dept of Genetics, Case Western Reserve University.**

Daily changes in levels of melatonin hormone cause diurnal organisms to sleep at regular intervals. The vertebrate pineal gland generates cyclic melatonin biosynthesis, increasing production in the evening and decreasing production in the morning. This cycle in melatonin synthesis is an example of a circadian rhythm, or a biological cycle that occurs approximately every twenty-four hours and can persist without environmental cues. The suprachiasmatic nucleus (SCN), located in the ventral brain, controls melatonin production in the mammalian pineal. It was hypothesized that the SCN also modifies pineal rhythms in zebrafish (*Danio rerio*). To test this hypothesis, pineal rhythms were examined in zebrafish *cyclops* mutants, which lack ventral brain, including the region giving rise to the SCN. Circadian expression of the *serotonin-N-acetyltransferase* (*aanat2*) gene was compared in wildtype ($n>10$) and *cyclops* ($n=6$) embryos. *cyclops* embryos had cyclic expression of *aanat2* mRNA, but levels were lower than in wildtype embryos as shown by comparing digital images of wildtype and *cyclops* pineals. While these results are consistent with the hypothesis, it is unclear how the *cyclops* mutation affects pineal cells. To determine whether *cyclops* and wildtype pineals are the same size, *orthodenticle homeobox 5* (*otx5*) mRNA, expressed in all pineal cells, was labeled. There was no significant difference in the area of the *otx5* expression domain at 29 hours post-fertilization ($p=0.088$) and 4 days post-fertilization ($p=0.30$) for wildtype embryos ($n\geq10$) compared to *cyclops* embryos ($n=10$). This suggests that there is a similar number of pineal cells in wildtype and *cyclops* embryos. Thus, it was concluded that lower levels of *aanat2* mRNA in *cyclops* mutants relates to absence of ventral brain, not to a decrease in the number of pineal cells.

BOARD 98 **THE DEVELOPMENT OF ONE-DIMENSIONAL, MULTILAYERED PVK/PVA PHOTONIC CRYSTALS. Dora C. Huang, dhuang09@hb.edu, Yeheng Wu, yeheng.wu@case.edu, 28118 Edgepark Blvd, Westlake OH 44145 (Hathaway Brown School).**

Photonic crystals are known for their unusual properties regarding the propagation of light and their bandgaps. A photonic bandgap, which contains many of the same features of an electronic bandgap in a semiconductor, is a forbidden region for photons (light). These bandgaps can be created with materials that have a large difference in their refractive indices and can be viewed on a transmission graph as a dip, with the dip representing low light transmittance. The purpose of this project was to create a one-dimensional, multilayered, polymer photonic crystal, where its bandgap could be viewed through a graph of its transmission, taken from a spectrophotometer. It was hypothesized that the experiment would produce such a crystal and that a dip in the transmission of light would occur at visible to near infrared range on the graph, indicating a bandgap with an expected width of 140 nm. The crystal ($n=4$) was created by spin coating alternating layers of poly vinylcarbazole (PVK) and poly vinylalcohol (PVA). The transmittance curve of the thirteen layer sample showed a 39 percent dip in the transmission at 900 nm (near the center of the bandgap that stretched from approximately 825 nm-990 nm), which provided evidence that the sample created was the periodic structure desired. These one-dimensional photonic crystals can be used to create very small lasers, when the crystal is doped with laser dye, or added to a substance to create extremely white pigment.

BOARD 99 **CATALYTIC COMBUSTION HYDROGEN AND OXYGEN IN A MICROTUBE FOR ROCKET APPLICATION. Sarah E. Counihan (eeyoresarah1024@hotmail.com); 2161 Demington Dr, Cleveland Hts OH 44106.**

A large amount of research is underway regarding the use and effectiveness of micro-propulsion devices, typically for micro-

satellites. One avenue of micro-chemical thruster research is the use of catalyzed ignition in a microtube. Previous experimental results on microtubes have demonstrated that a desired thruster level and specific impulse can be achieved. The present study aims to explore the feasibility of using micro-chemical thrusters as ignition sources for large rockets. When catalyzed ignition is established in a microtube, the reacting gases propagating into the combustion chamber can be utilized to ignite larger thrust class rockets. This type of micro-igniter would benefit rocket propulsion systems through the elimination of high voltage discharges used in spark ignition. This study was designed to determine the possibility of igniting a platinum microtube with a 0.8 millimeter diameter without any resistive heating at low equivalence ratios. Testing was conducted in a vacuum chamber and data obtained through a Data Acquisitioning System. Flow rates were set at 300 standard cubic centimeters per minute (SCCM), 400 SCCM, and 500 SCCM, and equivalence ratios varied from 0.1 to 0.3 at all flow rates. Testing revealed that self-ignition H_2 and air was possible. All flow rates and equivalence ratios experienced this phenomena with maximum temperatures ranging from 450 K to 1187 K. Future work includes testing the feasibility of the ignition exhibited in counterflow with air and hydrogen/oxygen mixtures to determine whether or not a microtube can be used to efficiently ignite a larger class rocket.

BOARD 100 **STUDY ON LOW LINOLENIC ACID SOYBEANS Hannah Ruth Cox coxpj6@adelphia.net 2614 Lick Run Road Chillicothe OH 45601**
(Zane Trace High School).

A genetically modified soybean, Nutrium®, has been developed to have 5% less linolenic acid than normal soybeans. The purpose of this project was to determine if the loss of linolenic acid was compensated by an increase in another unsaturated fatty acid, and if the genetic modification would persist in the next generation. The hypotheses were that (1) the Nutrium® would have 5% less linolenic acid than Roundup Ready®, that (2) the loss of linolenic acid was compensated by an increase in linoleic acid, and that (3) the genetic modification would persist in the next generation. Ten samples each of the first-generation and second-generation Nutrium® and Roundup Ready® soybeans. The soybeans were crushed, and then fatty acid methyl esters were extracted with hexane. Sodium methoxide was used to form the methyl esters of the fatty acids. The methyl esters were analyzed using a gas chromatograph. The average percentage and standard deviation for each principal fatty acid was calculated. The percent of linolenic acid of first-generation Nutrium® was 2.4% which is 4.3% less than Roundup Ready®, within 1.5 standard deviations of the 5% in the hypothesis. The percentages of linoleic and oleic acids show no significant change (less than one percent). The compensation hypothesis was incorrect. Only two saturated fatty acids (palmitic and stearic) show a slight increase of 1%. The first-generation and second-generation Nutrium® has the same linolenic acid concentration but the linoleic acid concentration is significantly greater and the oleic acid concentration is less than those in the first-generation Nutrium®. The genetic modification may not pass completely into the next generation. The differences in fatty acid content are likely due to the different weather patterns from year to year and from location to location.

BOARD 101 **CATHODE RAYS. Sarat Tallamraju, (saratgr8@sbcglobal.net), 33202 Brackenbury Dr, Solon OH 44139.**

The purpose of this study was to determine the possibility to create a Cathode Ray Tube at home using inexpensive and readily available materials and study the properties of cathode ray and plasma globe. The greatest challenges were to achieve high voltage and enough vacuum necessary for creation of cathode rays. In the experiment, an auto ignition coil was used for high voltage generation and an acrylic tube with rubber seals and common nails were inserted through the seals, acting as electrodes. The vacuum was created through forcing the two rubber seals into one end of the tube and pulling the inner seal towards the other side of the tube. A household incandescent bulb was used to create the plasma globe. Lantern batteries were used for a safe power supply and a relay switch was used for continuous ray generation through cyclic operation of switches. Then, the characteristics of cathode rays and plasma in plasma globe were studied. In conclusion, the research and the hypothesis agreed with the results of my study- Cathode rays need vacuum of about 1% of the pressure of the atmosphere and very high voltage of electricity. Also, cathode rays are negatively charged and attract to positive charges and repel to negative charges. As evident by the glow of a phosphorous coated sheet, cathode rays emit X-Rays and also emit radio waves. Cathode rays also made a florescent lamp glow. The plasma did need high voltage and glowed better in smaller globes. These results show that cathode rays and plasma globe have many unique properties and more properties are yet to be discovered.

BOARD 102 **LIGHT BULB EFFICANCY. Meredith M. Evans (evansfam@clover.net) 54676 TR 152 West Lafayette OH 43845.**

The purpose of this experiment was to determine which type of light is the most efficient in a footcandles to amp ratio. The types of lights tested were mercury vapor, high pressure sodium, halogen, fluorescent and incandescent. An amperage meter was placed around the hot wire leading to the electrical receptacle to which each light was separately connected. The light meter was placed 152.5 cm away from the testing area and 91.5 cm above the ground. Each sample was tested five times for the amps passed through the meter. The footcandles produced were read each time from the lumen meter and recorded. The hypothesis of this experiment was that the 100 watt incandescent bulb would rate the most efficient because research showed that incandescent light bulbs use the least energy to burn. The lights ranked, most to least efficient were: 65 watt incandescent floodlight, two fluorescent bulbs, one fluorescent bulb, tungsten – halogen, 25 watt incandescent, high pressure sodium, 75 watt incandescent, 100watt incandescent, and mercury vapor. The result of 65 watt incandescent floodlight being the most efficient is because it had a wide back inside the bulb which was coated in a reflective substance. Homeowners could draw from this experiment that, to reduce energy expenses but still have a brightly illuminated space they could use a 65 watt incandescent floodlight. Thus, if more homeowners purchased 65 watt incandescent floodlamps this could cause rise in demand for these lights resulting in a change in the lighting industry.

AQUATIC BIOLOGY & ECOLOGY PODIUM SESSION
9:00 AM, SATURDAY APRIL 21, 2007
Dr. Susan Carty - Presiding
ELA ROOM 109

9:00 **NEW RECORDS FOR FRESHWATER DINOFLAGELLATES IN ALASKA. Susan Carty scarty@heidelberg.edu Dept of Biology, Heidelberg College, Tiffin, OH 44883.**

Nine freshwater dinoflagellates have been previously reported from Alaska based on four reports from the literature. It was the goal of this research to visit the vicinity of Juneau, Alaska in July 2006 and sample standing water locations for freshwater dinoflagellates. Thirty eight locations, including lakes, ditches, small ponds and muskeg bogs were sampled using a 10 ìm plankton net, squeezings of vegetation, or collection of whole water. Five new species were recorded for Alaska including *Peridiniopsis polonicum, Peridinium umbonatum, Gloeodinium montanum, Gymnodinium fuscum,* and *Hemidinium nastum*. It is anticipated that other, interior habitats will yield additional species.

9:15 **THE AVAILABILITY OF LABILE DISSOLVED ORGANIC CARBON TO LAKE ERIE BACTERIOPLANKTON. Tracey T. Meilander, ttrzebuc@kent.edu and Robert T. Heath, rheath@kent.edu. Dept of Biological Sciences, 256 Cunningham Hall, Kent State University, Kent OH 44242.**

The labile dissolved organic carbon (LDOC) pool consists of low molecular weight carbon compounds, such as sugars and amino acids, which are easily utilized by aquatic heterotrophic bacteria for metabolism, growth, and reproduction. Currently, the exact chemical composition and availability of the LDOC pool remains unknown. The purpose of this investigation was to determine if LDOC utilization was constant or variable in different bacterioplankton assemblages. LDOC was estimated using a bacterial bioassay method at eighteen stations in Lake Erie during summer of 2004. To determine if bacterial assemblage influenced LDOC utilization, bacteria from one station or depth were inoculated into the water from another station or depth and incubated at ambient temperature. The amount of carbon respired by the bacterioplankton was converted into moles of carbon utilized, or LDOC. In one-third of these swap experiments (n=18), changing the bacterial assemblage resulted in either a significant increase or decrease (ANOVA post hoc Tukey, $p < 0.05$) in LDOC utilization. Our results show that utilization of LDOC appears to be a function of the bacterial assemblage used as well as the water chemistry of each station. Our findings suggest that the bacterial assemblage at each station may influence the LDOC availability. Ohio Sea Grant (R/ER-60) funded this research.

9:30 **THE VOLUMETRIC INDEX OF THE PLANKTON (VIP): A RAPID METHOD TO MONITOR PLANKTON.** **Douglas D. Kane, dkane@ashland.edu, Jessica A. Sizemore, sizemore.50@osu.edu, Hong T. Nguyen, nguyen.642@osu.edu, Kelsey E. Reider, reider.12@osu.edu, David A. Culver, culver.3@osu.edu F.T. Stone Laboratory, Put-In-Bay, OH 43456.**

Plankton is responsive to environmental changes and easy to collect; however, it is both time consuming and expensive to enumerate. Thus techniques to expedite the analysis of plankton samples are beneficial to researchers and resource managers. We developed the Volumetric Index of the Plankton (VIP) using zooplankton samples (n = 192 and n = 57) collected during 1998 and 2006 and phytoplankton samples (n = 50) collected (1998 only) from Lake Erie's three basins. Samples were enumerated using traditional microscopic techniques (e.g., Utermöhl technique) from which abundances and zooplankton (dry-weight) and phytoplankton (wet-weight) (specifically cyanophyte) biomasses were calculated. Samples were then settled in graduated cylinders and the volumes of zooplankton and phytoplankton were measured and standardized by the volume of water sampled. Linear regression analyses were used to determine if settled volumes could estimate the microscopically-determined abundances and biomasses. Log_{10} standardized zooplankton volume was significantly correlated with both log_{10} total zooplankton (crustaceans, rotifers, and dreissenid veligers) abundance ($p = 0.002$) and log_{10} crustacean zooplankton abundance ($p < 0.001$), with the latter relationship explaining more of the variability in the data ($r^2 = 0.223$ vs. $r^2 = 0.162$). Log_{10} standardized zooplankton volume was significantly ($p < 0.001$, $r^2 = 0.312$) correlated with log_{10} crustacean biomass. Further, log_{10} standardized cyanophyte volume was significantly correlated with cyanophyte biomass ($p = 0.001$, $r^2 = 0.206$). The VIP may be an appropriate technique for rapidly and qualitatively assessing plankton abundances and biomasses, but the low variability explained by this index prevents it from being useful as a quantitative estimator of plankton density or biomass.

9:45 **BURROWING MAYFLY (*HEXAGENIA* SPP.) BIOTURBATION AND BIOIRRIGATION: A NEGLECTED SOURCE OF INTERNAL PHOSPHORUS LOADING IN LAKE ERIE.** **Justin D. Chaffin jdchaff@bgsu.edu, Douglas D. Kane dkane@ashland.edu F.T. Stone Laboratory, Put-In-Bay, OH, 43456.**

Traditional lake eutrophication models predict lower phosphorus concentrations with decreased external loads. However, in lakes where decreased external phosphorus loads are accompanied by increasing phosphorus concentrations, a seeming "trophic paradox" exists. Internal phosphorus loads may better explain this paradox. Burrowing mayfly nymphs, *Hexagenia* spp., as bioturbators and bioirrigators are able to re-suspend sediment particles and solutes into the water column. It was hypothesized through these activities, *Hexagenia* nymphs would increase the water-column concentration of phosphate-phosphorus. Phosphorus concentrations of experimental microcosms (n = 6) containing lake sediments, filtered lake water, and nymphs (417 m^{-2}) collected from western Lake Erie, control microcosms containing lake water with sediments (n = 6), and control microcosms containing only lake water (n = 6) measured and compared from July 30, 2006, through August 5, 2006. Concentrations of total reactive phosphorus of the experimental microcosms were significantly (ANOVA, $p < 0.001$) greater than controls for ten of eleven sampling periods after time zero. Soluble reactive phosphorus concentrations of experimental microcosms was significantly (ANOVA, $p < 0.001$) greater than controls for all but one sampling time after time zero. Thus, *Hexagenia* are a source of internal phosphorus loading. High densities of *Hexagenia* nymphs in western Lake Erie may help explain the "trophic paradox." Further, *Hexagenia* may be a neglected source of internal phosphorus loading in any lake in which they are abundant. Future studies of phosphorus dynamics in lakes with *Hexagenia* must account for the ability of these organisms to increase lake internal phosphorus loading.

10:00 **MICROGEOGRAPHIC SONG VARIATION AND THE FORMATION OF DIALECTS IN THE DICKCISSEL.** **Derek M. Schook, dschook@wooster.edu, (Michael Collins, mcollins@wooster.edu, Timothy H. Parker, parkerth@whitman.edu), Box C-2655, The College of Wooster, Wooster OH 44691.**

Many songbird species have been shown to demonstrate song sharing and song dialects in different areas within populations. Most studies have identified dialects by sampling separate sites within populations. In contrast, this study investigates dialects by examining a continuous scale to explore microgeographic song sharing and the transitions between dialects. In the summer of 2006, recordings from 685 dickcissels (*Spiza americana*) were collected on or near Kansas's Konza Prairie. Additionally, songs from 32 banded birds were collected throughout the breeding season revealing temporal constancy in an individual's song. We categorized song syllables and quantified song sharing with Jaccard's Index of similarity. All four qualitative analyses revealed decreasing song similarity with increasing distance between birds. No significant difference was observed when comparing degree of song sharing at the native tallgrass prairie site (Konza) with the surrounding rural landscape sites (road transects). Further analysis through comparison of the frequency and duration of selected syllable components revealed that cultural mutation, or the gradual decline of syllable similarity, is variable among specific syllable types. Some syllable types show increasing dissimilarity as distance increases, while other types show no trend. These current analyses indicate that dickcissel song sharing trends should be capable of generating song dialects.

10:15 **USING MUSEUM SPECIMENS TO DETERMINE IF THE ANTENNULE MORPHOLOGY OF THE CRAYFISH *ORCONECTES VIRILIS* CORRELATES WITH THE FLOW ENVIRONMENT.** **Kristina S. Mead meadk@denison.edu, Biology Dept, Denison University, Granville OH, 43023.**

The local flow environment (mainstream current, turbulence, and substrate roughness) affects both the shape of the odor plume downstream of an odor source and specific features (concentration, width) of the odor filaments within the odor plume. The shape and arrangement of the sensors affect the thickness of the boundary layer coating the sensors, and thus their ability to extract chemical information. Since crayfish rely on chemical signals to gain information about predators, prey, and mates, crayfish aesthetascs might be physically tuned to how odors are present in the environment. Animals from different flow environments are hypothesized to have chemical sensors that are shaped to capture odors efficiently in that particular habitat, given hydrodynamic theory. Antennule and aesthetasc length, diameter, and spacing were compared among 43 distinct populations of the crayfish *Orconectes virilis* listed as being collected in river (n=21), creek (n=10) or lake (n=12) habitats. Structural parameters were measured from SEM micrographs using ImageJ (NIH) and analyzed using ANOVAs (JMP, SAS Institute). Although variation was high, the mean aesthetasc length was longer in Lake *O. virilis* (113±10 um) than in creek (108±8 um) or river (105±10 um) crayfish. Lake animals had aesthetascs that were attached to the antennule at a larger angle relative to the supporting antennule (43±4°) than animals from creeks (29±4°) or rivers (33±3°; p=0.038). The greater aesthetasc length and insertion angle extend the receptor-laden portion of the sensor beyond the boundary layer of slow-moving fluid created by the antennule, allowing water containing odorant molecules to be accessed by the sensors.

10:30 **DOES TRIBUTARY-DERIVED PHYTOPLANKTON BIOMASS INFLUENCE HYPOLIMNETIC HYPOXIA IN THE SANDUSKY SUBBASIN OF LAKE ERIE?.** **Mary C. Marasco[1], marasco.6@osu.edu, Joseph D. Conroy[1], conroy.27@osu.edu, Douglas D. Kane[1,2], dkane@ashland.edu, Lauren E. Hitchcock[1], hitchcock.204@osu.edu, David A. Culver[1], culver.3@osu.edu, [1]F.–T. Stone Laboratory and Dept of Evolution, Ecology, and Organismal Biology, Columbus OH, 43210 and [2] Dept of Biology/Toxicology, Ashland University, Ashland OH 44805.**

In spite of nutrient control programs, the reoccurring problem of seasonal hypolimnetic hypoxia in the central basin of Lake Erie suggests the importance of other ecological processes in affecting hypolimnetic oxygen depletion rates (HOD). One possible ecological process that has received little attention is phytoplankton loading from tributaries. Whereas previous studies emphasized excessive nutrient loading from tributaries leading to increased within-lake primary production, phytoplankton loaded from tributaries may increase organic matter even more, leading to increased decomposition and greater HOD. To test this hypothesis we regularly (weekly in May – August, 2006) monitored dissolved oxygen concentrations and phytoplankton biomass (as chlorophyll a concentration) in Sandusky Bay (at four sites) and subbasin (at seven sites) to determine HOD and to construct regression models between phytoplankton biomass and HOD. We found that sites nearest Sandusky Bay and the western basin of Lake Erie had higher HOD (means of 4.8 and 3.8 mg O_2 L^{-1} $month^{-1}$ for the western and eastern subbasin sites, respectively) but HOD did not simply correlate with phytoplankton biomass and often included a

significant lag time component (approximately one to two weeks), representing transport of tributary-derived phytoplankton to the offshore before its subsequent decomposition. These results emphasize the importance of tributary-derived phytoplankton in affecting offshore hypolimnetic hypoxia and suggest that additional watershed nutrient load restrictions would lead to phytoplankton load reductions, in turn, ameliorating HOD.

10:45 **PHOSPHORUS LIMITATION OF PHYTOPLANKTON GROWTH ALONG A TRANSECT FROM THE SANDUSKY RIVER TO LAKE ERIE. Joseph D. Conroy[1], conroy.27@osu.edu, Curtis C. Clevinger[2], cclevin1@kent.edu, Robert T. Heath[2], rheath@kent.edu, and David A. Culver[1], culver.3@osu.edu, [1]Dept of Evolution, Ecology, and Organismal Biology, The Ohio State University, Columbus OH 43120 and [2]Dept of Biological Sciences, Kent State University, Kent OH 44242.**

Nearly 30 years have passed since implementation of the Great Lakes Water Quality Agreement which sought to limit excessive phytoplankton biomass by decreasing within-lake phosphorus (P) concentrations by decreasing P load. Limits to P input were mandated through watershed actions (i.e., no-P detergents, conservation tillage programs, tertiary wastewater treatment) and mediated by tributary P transport. However, tributaries were not considered as sources of phytoplankton load to offshore lake areas although recent satellite imagery and biological monitoring suggests tributaries serve as phytoplankton sources. To understand better the limitations to phytoplankton productivity along a loading gradient from tributary to offshore, we measured P-limitation metrics (total P concentrations, total organic carbon (C) to P molar ratios, P-debt, and P turnover times) during 2005 and 2006 at sites in the Sandusky River and Bay and offshore in Lake Erie. We hypothesized that P concentrations were high in tributaries leading to increased P limitation with distance from the river. We found that P concentrations at river, bay, and offshore sites (mean +/- standard error) decreased (5.5 +/- 1.1, 3.5 +/- 0.3, and 0.5 +/- 0.1 ìM; $F_{2,45} = 20$, $P < 0.001$), C:P increased (170 +/- 30, 250 +/- 20, and 1590 +/- 550; $F_{2,45} = 31$, $P < 0.001$), and P-debt increased (0.03 +/- 0.01, 0.05 +/- 0.01, and 0.43 +/- 0.091 ìmol P ìg chlorophyll a^{-1}; $F_{2,19} = 8$, $P = 0.004$), supporting our hypothesis, while P-uptake was similar between sites ($F_{2,19} = 0.9$, $P = 0.44$). These results, in conjunction with high tributary phytoplankton biomasses, demonstrate that tributary nutrients and phytoplankton can affect offshore community dynamics and provide further impetus to control phytoplankton growth before it enters the lake.

11:00 **PHENOLOGICAL DIFFERENCES IN *VERNONIA GIGANTEA* AFFECT SEED PREDATION Andrew C. McCall, mccalla@denison.edu, Joshua M. Drizin, drizin_j@denison.edu, Stephanie D. Fettig, fettig_s@denison.edu, Kathryn A. Sparks, sparks_k@denison.edu. Dept of Biology, Denison University, Granville OH 43023.**

Plants may flower and set seed over a wide period of time, with some individuals flowering earlier and finishing sooner than plants in the same population. One hypothesis for this variation is that plants have been selected to flower at extreme times, thus avoiding seed predation. Alternatively, plants that flower too early or too late may not receive efficient pollinator service. Flowering phenology and percent of inflorescences with gall damage and percent seed filled in 39 haphazardly-chosen ironweed (Asteraceae: *Vernonia gigantea*) plants were measured at the Denison University Biological Reserve, Licking County, OH in October of 2006. Using a repeated-measured MANOVA on these 39 plants, it was found that plants that ended flowering earlier in the season had a significantly higher percentage of inflorescences galled by an undescribed cecidomyiid (Diptera: Cecidomyiidae) larva than those ending flowering later ($F_{1, 37} = 11.25$, $P = 0.002$, between-subjects comparison). Additionally, samples taken from the 39 individual plants earlier in the season had a significantly higher proportion of galled inflorescences than samples taken from the same plants later in the season ($F_{1, 37} = 6.49$, $P = 0.015$, within-subjects comparison). Individual inflorescences were also sampled from each plant on a single census date to estimate percent seed set. There were no significant differences in percent seed set between early-flowering plants and later-flowering plants among the 39 samples($F_{1, 37} = 0.23$, $P = 0.627$). These results suggest that later-flowering plants may experience less seed predation but do not suffer a decrease in effective pollination.

BIOLOGY & MEDICAL PODIUM SESSION
9:00 AM, SATURDAY APRIL 21, 2007
Dr. Mark Headings - Presiding
ELA ROOM 110

9:00 **BENEFITS OF ATTENTION DISRUPTION WITH ANIMATED ICONIC OBJECTS. D. W. Repperger[1], daniel.repperger@wpafb.af.mil, C. A. Phillips[2], Gina Thomas-Meyers[1], Denise L. Aleva[1], Steve C. Fullenkamp[3], [1]Air Force Research Laboratory, AFRL/HEC, Wright-Patterson, AFB, OH 45433, [2] Wright State University, [3]General Dynamics Corporation, Dayton, OH.**

In the fields of human performance and visualization, the utility of animation of icons in visual displays has shown mixed results from the literature. One benefit of providing animation is the ability to draw attention to a key attribute (or dimension) of an iconic object, but may cause loss of attention of a different dimension of the same iconic object. This zero sum game effect may be detrimental and viewed as disruptive. At the Air Force Research Laboratory, an animation study was conducted involving complex military icons with up to ten attributes. Over 6,000 runs involving four subjects were compared for a balanced design consisting of static versus animated features of key dimensions (attributes) of an icon. Accuracy was determined by asking the subject the state of an iconic attribute after it had been displayed for one second. The underlying hypothesis investigated was that animation may direct attention away from an observer but at a price of reducing attention to another dimension of the same object. A two-way analysis of variance of complexity as well as animation state indicated ($p<.01$) that improvement of accuracy of the animated feature will increase over the static situation. The post-hoc analysis included the Tukey-Kramer Honestly Significant Difference test. Concurrently, when the accuracy increases for the animated dimension, a corresponding reduction occurred in a different dimension, thus demonstrating a zero-sum game effect on the manipulation of the attention of human subjects. In conclusion, attention may be productively directed via animation, but some loss is inevitable. This work supports a constant attention resource model for this particular application.

9:15 **THE EFFECTS OF HUMAN NEST BOX DISTURBANCES ON VISITATION RATES, VISITATION DURATIONS AND RETURN TIMES OF EASTERN BLUEBIRD (*SIALIA SIALIAS*) PARENTS IN ASHLAND AND WAYNE COUNTIES OHIO. Daniel D. Noble dnoble@wooster.edu (Sharon E. Lynn slynn@wooster.edu), C-2378 1189 Beall Ave., Wooster OH 44691.**

Eastern bluebirds (*Sialia sialias*) are secondary cavity nesters and will nest in man-made boxes despite the possibility for anthropogenic disturbances. Nest box visitation rates of both parents were investigated following a standardized disturbance protocol in which one parent was captured at the nest box and released immediately. The nest boxes were videotaped for 1.5 hours to determine baseline rates of nest box visitation during the chick rearing phase. After this interval, the first arriving parent was trapped with a box trap, removed by hand and the nest was filmed again for 1.5 hours. The trials were run between days six and ten days after the eggs hatched during May through July of 2006. The nest boxes were located in Ashland and Wayne counties in Ohio. The visitation rates, duration of visits, and return times for both the captured and non-captured sex were investigated. The visitation rates and visitation duration were expected to decrease and following capture. In addition, the captured sex was expected to return later than the non-captured sex. The before and after nest visitation rates and visitation durations will be examined with paired t-tests. The return times will be investigated with independent t-tests. A one-way ANOVA will also be used to investigate the rate at which the visitations return.

9:30 **THE EFFECT OF SHORT-TERM ACUTE FOOD DEPRIVATION ON CORTICOSTERONE, CORTICOSTERONE BINDING GLOBULIN, AND TESTOSTERONE IN ADULT MALE ZEBRA FINCHES. Teresa B. Stamplis, tstamplis@wooster.edu, (Sharon E. Lynn, slynn@wooster.edu), The College of Wooster, 1189 Beall Ave, C-2765, Wooster OH 44691.**

The avian physiological stress response is characterized by increased blood concentration of the steroid hormone corticosterone (CORT), while corticosterone binding globulin (CBG), which regulates free CORT levels, has also been shown to decrease in some species, including the zebra finch (*Taeniopygia guttata*). Binding proteins such as CBG control hormone action such that bound hormone is inactive, and only free hormone participates in biological pathways. As birds lack sex-steroid binding proteins, CBG also regulates testosterone, resulting in reproductive implications for stress. With food deprivation as the stressor, total CORT, CBG, free CORT and testosterone were analyzed in adult male zebra finches (N=10) to determine the affect of this ecologically relevant stressor. Blood samples were collected after four- and ten-hour fasts and control periods. CORT and testosterone were measured via enzymoimmunoassays, and radioligand binding was used for CBG. Food deprivation was hypothesized to elevate total CORT, displacing bound testosterone from CBG and causing testosterone clearance. It was also hypothesized to decrease CBG, impairing CORT and testosterone storage capacity. One-tailed paired *t*-test analysis of CBG, and Wilcoxon Signed Ranks Test for total CORT, free CORT, and testosterone were performed. The predicted changes were detected at four and ten hours for total CORT (p=0.005, p=0.003), free CORT (p=0.005, p=0.003), testosterone (p=0.043, p=0.003), and CBG at ten hours (p=0.000), but not for CBG at four hours. These results support the hypothesized stress response mechanism and provide evidence of an important relationship between stress and reproduction in the zebra finch.

9:45 **AN INVESTIGATION OF BACKGROUND COLOR-MATCHING IN THE OAK TOAD, *BUFO QUERCICUS*. Andrew J. Rosendale, rosendaa@marietta.edu, Dave G. McShaffrey, mcshaffd@marietta.edu, Dept of Biological and Environmental Sciences, Marietta College, 215 5th St, Marietta OH 45750.**

It has been well documented that various Anuran amphibians possess the ability to alter the overall color of their skin in response to various environmental variables. Such color change has been studied in bufonid toads such as *Bufo americanus*, with background color influencing this color change. In this study, the effect of background color on physiological color change in the toad *Bufo quercicus* was examined with the expectation that toads would lighten or darken to more closely match the background color. Color matched toads (N=29) were placed on either a white or black background over a three hour time period and photographs of the specimens were taken at the 0, 0.25, 0.5, 1, 2, and 3 hour time intervals. These digital images were used to quantify toad skin color through the use of the histogram function of the Adobe® Photoshop® CS program. A tonal percentage out of 255 total tonal values was assigned to each image using the histogram's mean tonal value function. The toads were tested with N=14 for light colored toads on a black background and N=15 for dark colored toads on a white background. All results were analyzed using a Mixed-Factor ANOVA. Both light and dark matched toads underwent a significant color change (p= 0.00, á= 0.05) over the three hour periods with light matched toads changing an average of 8.50% while the dark matched toads changed an average of 6.59%. The analysis of color change values suggests that the species *Bufo quercicus* undergoes color change that results in skin color more closely matched to the color of their background, possibly as a form of crypsis; also, the color change in *Bufo* species is more widespread than the current literature indicates.

10:00 **HOW DO ANTENNULE MOVEMENT PATTERNS CHANGE DURING REGENERATION IN THE CRAYFISH *ORCONECTES SANBORNII*? Meg Richardson, richar_m@denison.edu, (Kristina S. Mead, meadk@denison.edu), Denison University, Slayter Box 1341, Granville OH 43023.**

Crayfish rely on chemosensory appendages (antennules) to track odors to find food, mates, and habitats. They "flick" their antennules in order to sample chemicals in the water using chemosensors (aesthetascs) located on the underside of the antennule. The arrangement of the aesthetascs on the antennule, as well as the speed of the flick affect odor-sampling effectiveness. Crayfish antennules that have been lost in a fight or removed experimentally can regenerate within 3 molts; they re-grow following the juvenile growth paradigm. This study will focus on the regeneration pattern of one species, *Orconectes sanbornii*. It was hypothesized that 1) the speed of the animal's flick will decrease after the antennules are experimentally removed (a sign that the antennules have reverted back to the juvenile mode). Or that 2) the speed of the flick will increase following antennule removal because the animal must compensate for having such short antennules. The crayfish (n = 35) were filmed flicking, and then had their antennules removed surgically. Following antennule removal, crayfish were filmed after each subsequent molt. The crayfish's natural odor sampling movements will be compared with those made during the regeneration process. Videos will be analyzed using the digitizing software Image J (NIH), which will make it possible to track the movement of antennules during successive frames of an olfactory flick.

10:15 **EXTRAFLORAL NECTARIES ON FAVA BEANS (BROAD WINDSOR), *VICIA FABA L.*, AND THEIR ATTRACTION TO NECTAR SEEKING INSECTS. Mark E. Headings[1], headings.1@osu.edu, and Leslie Morris[2], morris.508@osu.edu, [1]The Ohio State University Agricultural Technical Institute, 1328 Dover Road, Wooster OH 44691 and [2]USDA-ARS at The OSU Ohio Agricultural Research and Development Center.**

Some plants produce extrafloral nectar in addition to floral nectar and both are attractive food sources for certain nectar - seeking insects. The objective of field investigations conducted was to determine the presence or absence of extrafloral nectaries on over 30 different types of beans. The authors previously reported finding extrafloral nectaries on mung beans, adzuki beans and cowpeas (California Blackeye No. 5).The focus of this report is on extrafloral nectaries which have also been found on fava beans (Broad Windsor), *Vicia faba* L.; however, they differ in structure and location compared to that of the other three. They are not located on plant stems as the previous three but rather on sessile bract-like structures attached to the stems and appear as black spots. At least four orifices were observed in a given nectary. Seven close-up photographs of the extrafloral nectary structures were produced using a Hitachi S-3500 variable pressure scanning electron microscope. The structures in these photographs were magnified x35 to x400. It was observed that the multicolored Asian lady beetle, *Harmonia axyridis* and the small honey ant, *Prenolepis impairis,* were primary feeders at the extrafloral nectaries. Insects benefit from this food source; however, the benefit to the plant has not been determined.

10:30 **FREQUENCY OF METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* IN THE OHIO NORTHERN UNIVERSITY WRESTLING UNIT. Stacey Price, s-price@onu.edu, (Linda Young, l-young@onu.edu) 402 W College Ave, Ada OH 45810.**

The purpose of this project is to monitor the athletes/staff of the Ohio Northern University wrestling unit for colonization and/or infection with Methicillin-resistant *Staphylococcus aureus* (MRSA) during the 2006-07 season. It is hypothesized that MRSA colonization/infection will increase within the unit due to physical contact with other athletes during competition. Prior to the first practice, baseline values were collected from volunteers (N=29) who completed a general health questionnaire and a nasal swab was obtained from each using a culturette. Microbes were extracted by vortexing the swab in 5 ml of sterile phosphate buffered saline (PBS). Plates of TSA with blood and Mannitol Salt Agar were streaked for isolation and incubated at 37° C for 24 hours. Mannitol-fermenting colonies were tested for coagulase activity using a latex agglutination assay. Colonies from the 7 coagulase-positive specimens were suspended in PBS at a 0.5 MacFarland standard. 10 ìl of suspension was applied to a TSA with blood plate (growth control) and to a 4.5% NaCl with Oxacillin plate and both incubated as before. One specimen grew on the Oxacillin plate suggesting a positive MRSA screen for nasal colonization. The affected participant was referred to an infectious disease specialist who diagnosed MODSA (Modified *Staphylococcus aureus*) colonization. This MRSA screening process will be repeated after 3 competitions, before and after invitationals, and at the conclusion of the wrestling season. Data will be analyzed to determine whether a statistically significant increase in MRSA colonization/infection occurs in the ONU wrestling unit with increasing exposure to other athletes.

10:45 **THE EFFECTS OF ALCOHOL ON CHONDROGENESIS IN AGAROSE CULTURE. Veronica R. Avery, v-avery@onu.edu, Ohio Northern University, Department of Biological & Allied Health Sciences, Ada OH, 45810. (Amy L. Aulthouse).**

In the United States, approximately 1 in 25 pregnant women have reported binge drinking during their pregnancy. A few binges in early pregnancy could be dangerous even if the woman consumes no alcohol after that. Any alcohol consumption during pregnancy can result in fetal alcohol syndrome (FAS) which is characterized by impaired growth, craniofacial malformations, stunted growth and mental deficiencies. Skeletal development is also compromised, and limb defects frequently involve short distal phalanges and other digital separation defects. To investigate the affect that alcohol

has on the cartilage during endochondral bone formation, experiments were conducted using human chondrocytes grown in vitro. The cells were grown first in monolayer and then suspended as single cells in an agarose gel and grown for four weeks. Five treatment groups were established (n=24 for each group); a control, 0.5%, 1.0%, 1.5% and 2.0% ethanol treatment groups. Nine cultures from each treatment group were stained with trypan blue to determine cell viability. All cultures were stained with alcian blue to detect cartilage specific proteoglycans synthesis and mitotic activity was determined by counting the number of cell clusters (2 or more cells). An ANOVA was used to test for significance. Once significance was determined a student t-test was used to test for significance between the treatment groups. When normal control cultures were compared with the alcohol treatment groups there was a significant increase in number of dead cells, ($p=2.33x10^{-13}$), significant decrease in matrix production, ($p=1.41x10^{-34}$), and mitotic activity, ($p=.02$), with increasing concentrations of alcohol.

11:00 **TRANSDIFFERENTIATION OF CHONDROCYTES IN AGAROSE CULTURE** **Mackenzie A. Crawford, m-crawford@onu.edu, 310 Ballard Ave, Ada OH 45810 (Amy L Aulthouse, a-aulthouse@onu.edu, Ohio Northern University, Dept of Biological and Allied Health Sciences, 525 S. Main St., Ada, OH, 45810.**

Chondrocytes play an essential role in the development of endochondral bones, especially within the epiphyseal growth plate, where growth in length occurs. It is generally accepted that chondrocytes divide, calcify their matrix and die. Bone matrix is then deposited on the calcified cartilage. However, there is now substantial research that supports the idea that some chondrocytes transdifferentiate into osteoblast-like cells. Human chondrocytes grown in agarose culture for up to 4 weeks maintain the chondrogenic phenotype. However, the fate of these chondrocytes in long term agarose culture is unknown. For this project, human chondrocytes were grown for 8 weeks in agarose culture. Two experiments were conducted, N=80 for both. Chondrocytes were suspended in agarose culture, 5×10^5 cells per milliliter and fed twice weekly with media. Cultures were analyzed using an Olympus inverted microscope at 4, 6 and 8 weeks. Cultures were stained with alcian blue, a stain for cartilage matrix or were stained with alizarin red s, a bone stain. The number of alcian blue positive single cells and clusters were most numerous prior to 4 weeks and decreased from then on. The number of single cells and cell clusters positive for alizarin red s increased as the experiment continued and were most numerous between weeks 6 and 8. Some cultures were prepared for immunohistochemistry, but results are inconclusive due to technical difficulties. Further tests will be conducted to determine the presence of other bone markers.

11:15 **MOVEMENT OF MADTOMS (NOTURUS FLAVUS) IN HONEY CREEK** **William A. Monroe wmonroe@heidelberg.edu, (Kenneth Baker kbaker@heidelberg.edu) Dept of Biology, Heidelberg College, Tiffin, OH 44883.**

Little is known about the movements of stonecats (*Noturus flavus*) within the stream habitats in northwestern Ohio, most research is focused on the venomous sting. While some fish species are confined to specific habitats and are isolated from other populations, other fish are more mobile and traverse several habitats. It is hypothesized that stonecats utilize longer stream reaches but spend more time in riffles. Four stonecat madtom will be collected by netting and trapping and outfitted with radiotelemetry tags in February 2007 as part of a larger study on the ecology of Noturus. The tracking will be for 90 days, five days a week, once a day, alternating from day and night sampling times. The research area will be Honey Creek, in Forrest Nature Preserve in Tiffin, Seneca County, Ohio.

EARTH,ENVIRONMENTAL SCIENCE & GEOLOGY
PODIUM SESSION
9:00 AM, SATURDAY APRIL 21, 2007
T.B.A - Presiding
ELA ROOM 111

9:00 **INNOVATIVE SYSTEM FOR HARNESING WIND ENERGY.** **Majid Rashidi, m.rashidi@csuohio.edu, 2121 Euclid Ave. SH 232, Cleveland OH 44115-2214.**

This work relates to the design and analysis of a system to harness wind energy and to convert it into useful electrical energy. The system comprises a 3 dimensional stationary spiral structure that accommodates a plurality of electric generators mounted in the concave cavity of the space defined by the spiral structure. Each generator is directly coupled with no gearbox to a horizontally mounted 5-bladed turbine. The purpose of the stationary spiral structure is to gather the streamlines of a column of moving air and direct them to the turbines that are mounted on the spiral structure. This configuration amplifies the wind speed according to the Bernoulli's principle. The kinetic energy of a column of wind is proportional to the cubic power of the wind speed. Therefore, a typical wind amplification factor of 2 will result in an 8 fold energy amplification factor on the turbine shaft. System design has been completed for this project. Design for manufacturing (DFM), design for fabrication, and design for assembly have been implemented to come up with the final configuration of the system. Comprehensive Computational Fluid Dynamics (CFD) has been performed. Based on the CFD analysis a maximum amplification factor of 1.8 has been attained for the wind speed. For a 100KW wind mill system the spiral structure has been designed to have an outer diameter of 40 feet, 4 spiral turns, a turbine diameter of 10 feet, and a total of 6 turbines. A 1000 KW (1 MW) tower has been designed having a spiral structure that has an outer diameter of 60 feet, 12 spiral turns, a turbine diameter of 15 feet, and a total of 22 turbines.

9:15 **USE OF SOIL TEXTURE LABORATORY ANALYSIS TO PREDICT FRACTURES IN OHIO'S GLACIAL TILLS.** **Eun Kyoung Kim, kim.916@osu.edu Ann D. Christy, christy.14@osu.edu and Julie Weatherington-Rice, weatheringtn-rice.1@osu.edu. The Ohio State University, Dept of Food, Agricultural, and Biological Engineering, Columbus, OH 43210.**

Laboratory experiments on fracture formation in glacial materials were performed to (a) verify predictive models that were based on field data reported in 2006 and (b) extend the Ohio field data set to a wider coverage of the range of possible soil textures. Controlled fracturing experiments, performed in triplicate, of various soil mixtures extended the known range of fracture-prone materials. Grain sizes of the materials were determined according to USDA size classification (sand, silt and clay). Clay mineralogy was also analyzed by X-ray diffraction analysis to investigate the impact of the clay chemical composition on fracturing mechanisms in glacial tills. Methods included grinding soil core samples taken from three locations in Ohio, adding water and varying amounts of silica sand, pouring the mixtures into 8.5-inch diameter pans, allowing them to dry for over a week, and photo-documenting the presence or absence of fractures. The data for fractured lab samples were added to the field data (143 points) previously analyzed to update the predictive models. When plotted on the USDA soil texture ternary diagram, the laboratory experiment data indicated that tills having greater than 5% clay or less than 75% sand were more likely to support fracturing. Based on the combined data set, a 95% hexagonal predictive region was plotted on an USDA ternary diagram. Results indicate that tills with less than 60% sand, 25-70% silt, and 3-52% clay would be more likely to form fractures. The texture classes of tills predicted to sustain fracturing were mainly clay, loam, clay loam, silty clay loam and silty clay.

9:30 **THE EFFECTS OF QUARRYING ON WELLS IN SOUTHERN FRANKLIN COUNTY, OHIO.** **Naomi M. Hake (nbland@capital.edu), 813 Cypress Ln, Eaton, OH 45320; Terry D. Lahm (tlahm@capital.edu), Capital University.**

The South Well Field located in Franklin County provides water for 30 percent of the southern Columbus population. A series of wells pump an average of 22.7 million gallons of groundwater per day. These wells derive groundwater from glacial deposits, stream infiltration and underflow from limestone bedrock. North of the well field is a coarse aggregate quarry. The possibility exists for this quarry to start limestone quarry operations that may change the quality and quantity of groundwater available at the well field. A MODFLOW model of the groundwater flow in this region was modified from an existing U.S. Geological Survey model. The model computed hydraulic head values based on known aquifer conditions. The impact of quarrying operations on groundwater flow was simulated using this model for five different simulations. Simulation 1a showed the natural flow of groundwater. Simulations 1b through 3 showed small changes in the quarry. In simulation 4, a limestone quarry was simulated. In simulations 1a through 3, the aggregate quarry did not significantly affect the flow of groundwater. In simulation 4, the quarry draws water away from the wells, affecting the quantity of water. The results indicated a limited impact on the South Well Field with the current course aggregate mining operations. However, proposed limestone quarrying may significantly impact the regional groundwater flow system as shown by simulation 4 of the model.

Based on model results, these impacts may result in changes in quality and quantity of water available to the surrounding population should limestone quarrying proceed.

9:45 **THE NEW BEDROCK GEOLOGIC MAP OF OHIO COMPLETED. E. Mac Swinford mac.swinford@dnr.state.oh.us, Ernie R. Slucher, Douglas L. Shrake, Gregory A. Schumacher, Glenn E. Larsen, and Donovan M. Powers, ODNR, Division of Geological Survey, 2045 Morse Rd. C-1, Columbus OH 43229-6693.**

The Ohio Department of Natural Resources, Division of Geological Survey has created an updated bedrock geologic map of Ohio for use in mineral exploration, environmental conservation, and land-use long planning. The old bedrock map of Ohio, produced in 1921, was the oldest state bedrock-geologic map still in print in the United States and was inadequate for modern geologic investigations. A total of 788 7.5-minute scale quadrangle bedrock-geology maps were hand drawn, brought into a GIS environment, and digitally compiled to create a seamless bedrock map of the state, which was then generalized for publication a 1:500,000-scale map. The resultant published map shows the distribution, characteristics, and correlation of 45 individual map units at the surface or buried beneath Pleistocene-age glacial deposits and represents a dramatic update to the 1921 map particularly in western Ohio. Economic commodities and geologic hazards related to specific stratigraphic intervals are discussed in the text. Funding sources for this multiyear project include a severance tax on Ohio mineral industries, the U.S. Geological Survey STATEMAP component of the National Cooperative Geologic Mapping Program, the U.S. Environmental Protection Agency Nonpoint-Source Pollution Program, and the Ohio Department of Transportation.

10:00 **COMPARING SOIL EROSION ON AGRICULTURAL PLOTS USING RADIONUCLIDE INVENTORIES. Lauren F. Vitko, lfv2@case.edu, Andrew P. Stubblefield, aps14@humboldt.edu, (Gerald Matisoff, gxm4@case.edu), Peter J. Whiting, pjw5@case.edu, Case Western Reserve University, 1641 East 115th Street (House 5) 120B, Cleveland OH 44106.**

Sustainable agriculture requires evaluation of the impact of crop residue, contour plowing, and gradient plowing on the loss of soil by erosion. Fallout radionuclides, Be-7, Pb-210, and Cs-137, have proven to be a useful tools in examining soil movement. The purpose of this study is to use radionuclides and radionuclide inventories to evaluate soil erosion and its dependency on crop residue cover, till direction, and position (ridges verses furrows). Eight soil cores were collected from four, 62.71 m^2 agricultural plots at Arlington, Wisconsin after approximately 1.70cm of rainfall on July 20, 2006. Soil samples have been analyzed by gamma spectroscopy for Be-7, Pb-210, and Cs-137. Comparison of radionuclide inventories will be performed by calculating the mean difference and confidence interval, using the *Students t* test. Results will provide a relative measure of the impact of the three variables on soil erosion.

10:15 **THE EFFECTS OF AXIAL OBLIQUITY VARIATION ON HESPERIAN MARTIAN TECTONICS. David M. Blair, david.blair@case.edu, (Steven A. Hauck, II, hauck@case.edu), Case Western Reserve University, Dept of Geological Sciences, 10900 Euclid Ave, Cleveland OH 44106-7216; 2282 Grandview Ave, Cleveland Heights OH 44106.**

Previous analysis of imagery of wrinkle ridges on the surface of Mars has suggested evidence for a period of widespread and potentially synchronous contractional tectonism, though the driving mechanism for the formation of these features remains a mystery. Surface temperature variations over time due to changes in the planet's obliquity can lead to thermal stresses in the lithosphere that, depending on magnitude, may be capable of initiating contractional tectonic activity. Such a novel explanation has not yet been explored. Mars' obliquity cycles from 15º to 35º over the course of roughly 120,000 years, and previous studies indicate that there is a high probability (about 89%) that the obliquity has surpassed 60º at some point in the past 3 billion years; this extreme a change in obliquity may lead to sufficient change in temperature to generate significant thermal stresses. To asses this possibility, a simplified numerical model is being developed that couples a well-known model for the latitudinal variation of obliquity on Mars to a model for calculating the thermoelastic contribution to global stresses. If successful, this project would not only provide a possible explanation for this period of global contractional tectonism on Mars, but would also demonstrate another potential driving force for the tectonics of planetary bodies in the inner Solar System.

10:30 **PERFORMANCE OF COMPLEX NETWORKS USING INFORMATION-THEORETIC MEANS. D. W. Repperger[1], daniel.repperger@wpafb.af.mil, C. A. Phillips[2], R. L. Ewing[1], J. B. Lyons[1], [1]Air Force Research Laboratory, AFRL, WPAFB OH 45433, [2] Wright State University, Dayton, OH**

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Network science provides an exciting new area in understanding complex systems. Intricacy in distributed network systems is now a pervasive way of life through the development of the Internet, and other paradigms. By combining resources in a network-centric framework, this may add value because multiple resources may be integrated in a productive manner. However, there is very little known about optimizing flow performance, vulnerability and capability of such systems. Recently at the Air Force Research Laboratory in Dayton, Ohio, measures of network complexity impedance (resistance to flow), and other performance measures have been developed using an information-theoretic basis. The purpose of this effort is to better understand how to improve overall flow in complex distributed networks. Using computer simulations involving Evolutionary Algorithms of a US Air Force network-centric system, the goal was to determine how the overall flow through the network could be influenced by changes in the interior flow parameters. A 5 node system was simulated with 15 unknown flows. Due to the architecture of the network, there were 4 constraint equations, yielding 11 possible optimal flows. The optimal flows were determined using an Evolutionary Algorithm approach. The results of two extensive computer simulations (minimum flow and maximum flow) of 168 hours each on a PC showed that the flow through a system could change 400% by simply adjusting interior flow values of the nodes. In conclusion, the performance of complex networks can be easily influenced by manipulating interior flow values. These studies will lead to a better means of improving throughput performance in complex distributed networks through an information-theoretic methodology.

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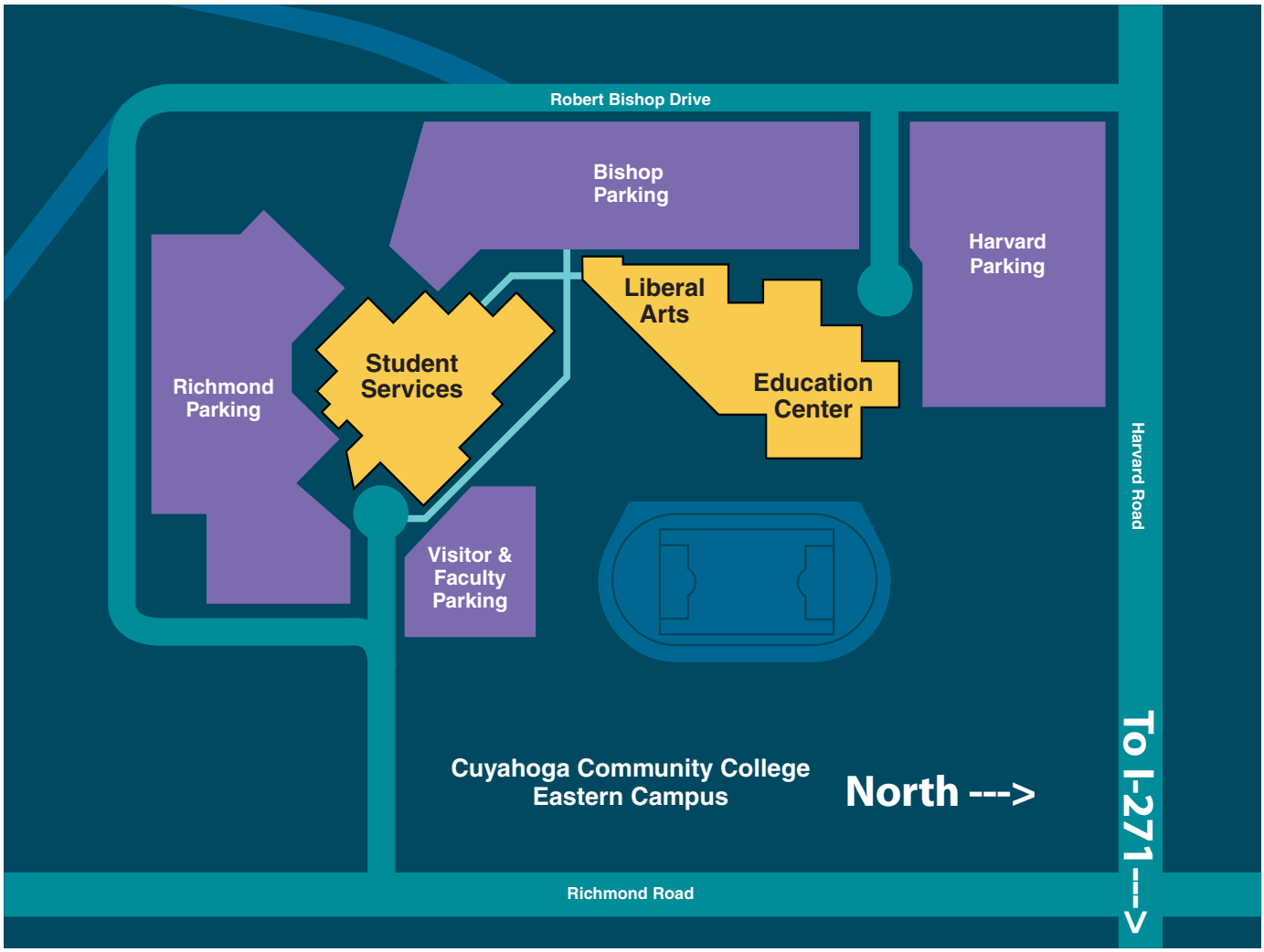
Planning Notes



Driving Directions to Eastern Campus
Cuyahoga Community College
Eastern Campus
4250 Richmond Road
Highland Hills Village, Ohio 44122-6195

How to Drive There by automobile:
The Eastern Campus is bound by Harvard Road to the north, Emery Road to the south, Richmond Road to the east and Green Road to the west.

Motorists traveling south on I-271 - Take the Harvard Road exit (Exit 28B). Turn right off the exit ramp and travel west on Harvard (about a quarter mile) to Richmond Road. Turn left on Richmond Road and travel south (about a quarter mile). The Eastern Campus entrance will appear on your right.

Motorists traveling north on I-271 - Take the Harvard Road exit (Exit 28B). Turn left off the exit ramp and proceed (about a quarter mile) west on Harvard to Richmond Road. Turn left on Richmond and travel south to the Eastern Campus entrance (on your right).

Motorists traveling I-480 east - Merge onto I-271 north (use local lanes) and then follow the directions above (north on I-271).

Please Note: A pay upon-exit parking fee of $.50 (two quarters) is charged in all campus lots. Handicapped parking permits are available from the Public Safety Office (Student Services Bldg., Room 1620, (216) 987-2325). To visit their web site, click here.

By bus: Routes #14 Kinsman and #94 East 260th – Richmond, destination sign Tri-C, provide direct service. Route #15F Warrensville Hts. flyer, provides service to and from Emery and Richmond.

By rail: Ride route #67X –Van Aken Blue Line to Van Aken and Warrensville and board the #14 Kinsman, destination sign Tri-C, from Warrensville and Chagrin. Or ride route #67AX Shaker Green Line to Shaker and Green and board the #94 East 260th – Richmond, destination sign Cuyahoga Community College. For additional information and assistance call the RTAnswerline at (216) 621-9500, TDD service (216) 781-4271 or visit www.riderta.com.

The Ohio Academy of Science

Registration Form

116th Annual Meeting
April 20-21, 2007
Cuyahoga Community College Eastern Campus

Advance registration must be received by April 9, 2007

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 printed 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.

		After Apr 9
Non-science spouse, parent or relative of first author	$10	$20

*Discount Rate for students who are not first author: (Does not include membership)

1-4 from same institution	$20	$30
5-10 from same institution	$15	$20
11 or more from same institution	$10	$20

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

PLEASE PRINT OR TYPE

Circle: Ms. Mrs. Mr. Dr.

Name _____
First Middle Last

Job Title _____

School, Organization, Agency, Institution, or Employer

_____

Is the following a home address? __ Yes __ No

Students MUST use home, dorm or apartment address.

Address _____

City _____

State _____ Zip _____ County _____

Work Phone (_____) _____

Home Phone (_____) _____

FAX (_____) _____

Email _____

MAIL FORM WITH PAYMENT TO:
The Ohio Academy of Science
PO Box 12519
Columbus OH 43212-0519
FAX 614/488-7629

Registration Fees

Please check appropriate categories. One fee covers the entire meeting. **Payment must be received by April 9, 2007 to avoid higher rates**. On-site registration will be accepted at the higher rate by credit card or check ONLY. **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.

		After Apr. 9
CURRENT MEMBER REGISTRATION RATE		
❑ Professional	$65	$70
❑ Retired	$40	$45
❑ Student	$25	$30
NON-MEMBER PROFESSIONAL AND RETIRED REGISTRATION		
Includes membership		
❑ Professional	$140	$145
❑ Retired with Journal	$ 80	$ 85
❑ Retired without Journal	$ 65	$ 70
NON-MEMBER PRE-COLLEGE AND COLLEGE STUDENT		
Includes Academy membership		
❑ College Student with Journal	$ 65	$70
❑ Student (17 & under) w/Jour.	$ 65	$70
❑ Student (17 & under) w/o Jour.	$ 50	$55
Does Not include Academy membership		
❑ Pre-college student	$20	$30
❑ College student	$20	$30
❑ 5-10 students each	$15	$20
❑ 11 or more students each	$10	$20
*See table at left for more information.		
NON-SCIENCE SPOUSE, PARENT OR A RELATIVE OF A FIRST AUTHOR		
❑ Spouse, parent or relative	$10	$20
Please use a separate form for each.		
MEMBERSHIP RENEWAL		
❑ Family	$85	
❑ Regular Member	$75	
❑ Retired Member w/OJS	$40	
❑ College Student	$40	
❑ Student (Age 17 & under) w/OJS	$40	
❑ Retired Member w/o OJS	$25	
❑ Student (Age 17 & under) w/o OJS	$25	

TOTAL ENCLOSED **$_____**

METHOD OF PAYMENT

NO REFUNDS AFTER April 19, 2007.
Return checks subject to a $30.00 return fee.
Only registrations paid by Purchase Order, VISA, or MasterCard will be accepted by FAX at 614/488-7629.

❑ This copy confirms a FAXed registration
❑ Check enclosed payable to The Ohio Academy of Science
❑ Purchase order enclosed No. _____
❑ **Online payment option** www.merchantamerica.com/ohiosci
❑ Please charge my credit card
___ VISA ____ MASTERCARD

CardNumber
__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|

Exp. Date __|__|/__|__|

3-digit Security Code (last 3 digits on back of card in signature panel) ___ ___ ___

Signature_____

REGISTRATION POLICIES

The Ohio Academy of Science
116th Annual Meeting
Hosted by **Cuyahoga Community College Eastern Campus**

April 20-21, 2007
Advance registration must be **received** by April 9, 2007 to qualify for lower rates.

ALL attendees must register.

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.

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.

		After April 9th
Spouse, parent or relative of first author	$10	$20
Discounted Rates for students who are not first author: (*Does not include membership*)		
1-4 from same institution	$20	$30
5-10 from same institution	$15	$20
11 or more from same institution	$10	$20

Please use a SEPARATE REGISTRATION FORM for each person.

Copy the form on the reverse side as needed.

MAIL FORM WITH PAYMENT TO:

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

FAX 614/488-7629 for credit card or purchase order.

Online payment option
www.merchantamerica.com/ohiosci

PREREGISTRATION DEADLINE: April 9, 2007