

Poster Session A 9:00 – 10:00 AM

BOARD 01 THE EFFECTS OF TERRITORIAL PHEROMONES ON THE BEHAVIOR OF RED-BACKED SALAMANDERS (*PLETHODON CINEREUS*). MATTHEW WALDRON, MWALDRON@MUSKINGUM.EDU, (DANNY INGOLD, INGOLD@MUSKINGUM.EDU), BIOLOGY DEPT., MUSKINGUM COLLEGE, 163 STORMONT ST., NEW CONCORD OH 43762.

Although many studies have been performed to address territoriality in red-backed salamanders, few have addressed the behavior of individuals introduced into a previously established vacant conspecific territory. The goal of this research was to examine the effects of territoriality in red-backed salamanders in a controlled lab setting. I observed how the intruding conspecifics reacted to a previously established red-back salamander territory in the absence of the territorial resident. I predicted that an introduced red-backed salamander will avoid the territory of a resident conspecific, and will exhibit more "alarm" behaviors when on the previously established territory versus other parts of the enclosure. This study was conducted from October 2004 through December 2004 in a controlled environmental chamber and included two treatments: one in which fecal pellets of red-backed salamanders will be left in the established territory, and a second in which they will be removed. Both treatments were replicated 12 times using randomly selected pairs of salamanders (sexes unknown) of a similar size. Each experiment involved placing a red-backed salamander in one side of a partitioned 35 cm x 18 cm x 11 cm chamber for 7 days, thus allowing it time to establish a territory. After 7 days, the salamander was removed, the partition removed, and a second red-backed salamander was placed in the chamber. The salamander was observed for one hour in the light early each evening, and the following behaviors were quantified: chin taps, nose taps, all trunk raised, front of trunk raised, and trunk flattened. A control chamber with a randomly selected salamander introduced to a previously unoccupied chamber was observed simultaneously.

BOARD 02 A PREDATOR MODEL AND DISTANCE FROM A FOREST EDGE COVER EFFECT ON THE FORAGING PREFERENCES OF WINTER BIRDS IN SOUTHEAST OHIO. BRYN N. WILLIAMS, BRYNW@MUSKINGUM.EDU, DANNY INGOLD (INGOLD@MUSKINGUM.EDU) 22 DEPOT STREET, APT. 201, NEW CONCORD OH 43762.

The objective of this research was to test if distance from cover to the nearest forest edge and the concomitant presence of a predator model will influence foraging by winter birds at artificial feeders in southeast Ohio. The proposed hypothesis is that birds will concentrate their foraging efforts at the feeder nearest the forest edge, except in instances when the predator model is placed nearest this feeder. This study will be conducted from early January 2005 through February 2005 along a 1 kilometer field/forest gradient in Muskingum Co., Ohio. This study will include two treatments and a control, each consisting of two replications; thus there will be a total of six observation sites spaced approximately 80 meters apart along the forest/field edge. Both treatments and control (no predator) will include three-multiple perch commercial bird feeders attached to two-meter high poles at a distance of 5, 15, and 30 meters from the forest edge respectively (all three feeders will contain the same amount of black-oil sunflower seeds). Treatments II and III will test for distance from the forest edge, but Treatment II also will include a predator model (owl model placed on the ground) positioned 5 meters from the middle feeder while Treatment III will include a predator model positioned 15 meters from the feeder nearest the forest edge. Each of the replications will be observed for 2 hours per week (two 1 hour visits) and the feeders will be weighed and filled at the beginning of each observation period to determine how many seeds are consumed. In addition, a tally of all bird visits to each feeder will be kept, in order to document the number of bird species as well as the number of individual visits that occur.

BOARD 03 HISTOLOGICAL STUDIES ON SELECTED HUMAN LYMPHOMAS AND HODGKIN DISEASE BY MEANS OF HIGH RESOLUTION LIGHT MICROSCOPY, IMMUNOMICROSCOPY AND TRANSMISSION ELECTRON MICROSCOPY (TEM). ELISABETH A. SCHULLER, AND DAVID L. MASON, S05.ESCHULLER@WITTENBERG.EDU. DEPT. OF BIOLOGY, WITTENBERG UNIVERSITY, SPRINGFIELD, OH 45501.

The main focus of this study was to determine characteristics of numerous lymphomas and Hodgkin's disease in order to gain additional ultra-structure information about these cancers. Approximately 60 cases of lymphomas and Hodgkin's disease from patients at Community Hospital in Springfield, OH were studied by

means of high resolution light microscopy, immunomicroscopy, and TEM. Cellular and sub-cellular features along with surface features were detected by immunology to help with their identification as specific cancers. With follicular lymphoma (B-cell lymphoma), enlarged germinal centers revealed proliferating cells that were immunostained for IgG kappa in their cytoplasm. By TEM, segments of rough endoplasmic reticulum were observed in the cells. With T-cell lymphoma, TEM revealed malignant cells with clefted nuclei, a characteristic feature of T-cells. Immunomicroscopy elucidated T-4 receptor (T-helper cells). Mycosis fungoides, a lymphoma of the skin, also revealed clefted nuclei of the malignant cells. Immunomicroscopy identified the malignant cells expressing T-4 receptor (T-helper cells). With multiple myeloma (plasma cell myeloma), malignant cells viewed by TEM contained eccentric nuclei and rough endoplasmic reticulum, a characteristic of plasma cells. Immunomicroscopy revealed IgA Kappa in the cytoplasm of the cells. With Burkitt lymphoma, both light and TEM revealed clear cytoplasmic vacuoles within the cells, a feature characteristically observed in the neoplastic cells of this malignancy. With Hodgkin disease, Reed-Sternberg cells having mirror-form nuclei with large nucleoli were observed by light and TEM. Detection of these cells can help to distinguish Hodgkin disease from lymphoma.

BOARD 04 HISTOLOGICAL STUDIES ON SELECTED HUMAN LEUKEMIAS BY HIGH RESOLUTION LIGHT MICROSCOPY, IMMUNOMICROSCOPY, AND TRANSMISSION ELECTRON MICROSCOPY (TEM). HEATHER A. GRIFFITH AND DAVID L. MASON, S05.HGRIFFITH@WITTENBERG.EDU DEPT. OF BIOLOGY, WITTENBERG UNIVERSITY, SPRINGFIELD, OH 45501.

Approximately 20 cases of leukemia were analyzed by high resolution light microscopy, immunomicroscopy, and TEM. The results showing cellular features and selected cellular markers are helpful for identification of different leukemias. Acute myelogenous leukemia revealed immature blast cells in the bone marrow and peripheral blood. By both light and TEM, developing lysosome granules were observed in the cytoplasm of the cells. With chronic myelogenous leukemia (CML) the myeloid cells, presenting in a blast cell crisis and viewed in a buffy coat preparation both by light and TEM, revealed immature myelocytes that contain developing lysosome granules. With myelomonocytic leukemia (MML) the promonocytes and neutrophilic myelocytes were both detected by light and TEM microscopy. Immunomicroscopy revealed a surface marker for CD13 that expresses on both monocytes and neutrophils. Cells of plasma cell leukemia revealed, by immunolight microscopy, IgG kappa segments in the cells and, by electron microscopy, rough endoplasmic reticulum in the cytoplasm. With hairy cell leukemia the malignant lymphocytes revealed "hair-like" extensions from the cytoplasmic membrane. By electron microscopy, these cells were seen "trapped" in a resected spleen. With chronic lymphocytic leukemia (CLL), both light and TEM, revealed small, actively dividing lymphocytes cloning-out in the bone marrow. With eosinophilic leukemia light microscopy revealed red-staining eosinophilic granules, and by TEM, crystalloid granules were seen in the cytoplasm of the pleomorphic cells.

BOARD 05 HISTOLOGICAL STUDIES OF HUMAN THYROID AND PARATHYROID CANCERS AND HASHIMOTO THYROIDITIS USING HIGH-RESOLUTION LIGHT MICROSCOPY, IMMUNOMICROSCOPY, AND TRANSMISSION ELECTRON MICROSCOPY. ERIN M. MILLS, S06.EMILLS@WITTENBERG.EDU, DAVID L. MASON, DMASON@WITTENBERG.EDU, WITTENBERG UNIVERSITY, Box 2008, SPRINGFIELD OH, 45501.

Endocrine malignancies are among the most difficult cancers to diagnose and treat. As the most common endocrine malignancy, thyroid cancer was diagnosed in 23,600 patients and was responsible for 1,460 deaths in 2004. In order to establish the distinguishing cellular and sub-cellular features in each type of thyroid and parathyroid cancer, one diagnosed case from four types of malignancies were studied by means of high-resolution light microscopy, immunomicroscopy, and transmission electron microscopy (TEM). Community Hospital in Springfield, OH, and Grady Memorial Hospital in Delaware, OH, provided five cases of human thyroid diseases including thyroid and parathyroid cancer. Hashimoto thyroiditis, a fairly common autoimmune disease of the thyroid, was also provided and studied in order to establish the differences between it and common malignancies. For papillary carcinoma, high-resolution light microscopy revealed branching papillae encased in cuboidal epithelial cells. Specific to this malignancy was the presence of nuclei with fairly dispersed chromatin. Cells of a diagnosed follicular carcinoma were uniform in shape and the tumor still contained follicles. Thyroglobulin was detected by immunomicroscopy in both papillary and follicular carcinoma

revealing the follicular cell origin of each. Observation of medullary carcinoma by light microscopy revealed spindle shaped cells. Immunomicroscopy of this case yielded a strong reaction for calcitonin, which sets this malignancy apart due to its c-cell origin. The parathyroid adenoma was identified by the presence of uniform chief cells with centrally located nuclei, small neurosecretory hormone granules under TEM, and a strong reaction for parathyroid hormone by immunomicroscopy. Hashimoto thyroiditis was easily distinguishable from malignancies by the abundance of lymphocytes, which is common in autoimmune diseases. These cellular and sub-cellular identifications are important when determining which type of disease is present, as many thyroid and parathyroid diseases appear similar macroscopically. It is crucial for one to be able to correctly diagnose these diseases, as treatment routes are slightly different for each type.

BOARD 07 ASSESSMENT OF THE GENETIC DIVERSITY OF CAPTIVE WESTERN LOWLAND GORILLAS VIA MHC ANALYSIS GENEVIEVE E. MULROY¹, GNVEMRLY@OTTERBEIN.EDU, LESLIE A. KNAPP², AND SIMON K. LAWRENCE¹, SLAWRENCE@OTTERBEIN.EDU, ¹DEPT. OF LIFE & EARTH SCIENCES, OTTERBEIN COLLEGE, WESTERVILLE, OH 43081, ²UNIVERSITY OF CAMBRIDGE.

Conservation of biodiversity occurs on many levels. Genetic diversity plays a key role at the intraspecies level. Captive species, such as *Gorilla gorilla gorilla*, experience population bottlenecks causing a decrease in their genetic diversity. More specifically, a loss of Major Histocompatibility Complex (MHC) diversity is likely. Because the MHC is linked with disease haplotypes, determining these linkages will be useful in understanding diseases of captive gorillas. Using gel electrophoresis and sequencing techniques, the MHC diversity of a multi-generational family of captive *Gorilla gorilla gorillas* has been assessed. This analysis also allows for haplotype linkage analysis. A pedigree was compiled for a family of captive western lowland gorillas. Polymerase Chain Reaction (PCR) amplification, denaturing gradient gel electrophoresis (DGGE), separation and DNA sequencing of the MHC region has been performed. The results from the DNA sequencing have been identified by using BLAST searches. To date, four DRB1 alleles, nine DRB3 alleles, and three DRB5 alleles have been identified. Once the DNA sequencing is completed and the alleles have been identified, the pedigree chart will be used to determine haplotype linkages within the family. This information can be used in captive breeding programs of gorillas to ensure a greater genetic diversity.

BOARD 08 A HIGH RESOLUTION CYTOLOGICAL EXAMINATION OF NORTH AMERICAN DANDELION (*TARAXACUM OFFICINALE*) ORGAN MORPHOLOGY. KRISTEN D. RINEHART, S05.KRINEHART@WITTENBERG.EDU, KEVIN M. GRIBBINS, KGRIIBINS@WITTENBERG.EDU, AND MATTHEW H. COLLIER, MCOLLIER@WITTENBERG.EDU, DEPT OF BIOLOGY, WITTENBERG UNIVERSITY, SPRINGFIELD, OH 45501-0720.

Common dandelions (*Taraxacum officinale* Weber; Asteraceae) are clonal, perennial, short-day eudicots that have recently been shown to take up metals (e.g., Cd, Cu, Pb, Zn) in their tissues. Although these plants are known to sequester metals, the mechanism responsible for their apparent metal tolerance is not understood. The first step in defining the mechanism behind metal tolerance in dandelions is to determine the location of sequestered metals in the plant's body tissues or cells. Thus, the present study was undertaken to provide micrographs depicting the microscopic anatomy of major plant organs, which furnish a histological model to investigate metal uptake in dandelions. To our knowledge, this is the first complete cytological study of organ morphology in North American dandelions using tissue samples embedded in plastic. Tissues embedded in plastic allow for the examination of cellular structures at much higher resolutions than those tissues traditionally embedded in paraffin. Leaf, taproot, scape (leafless, hollow stem), inflorescence bud, and inflorescence tissues from dandelion plants (N=5) were dehydrated, infiltrated, embedded in Spurr's plastic, and sectioned using an ultramicrotome. The tissues examined exhibited cellular anatomies typical of eudicotyledonous plants. However, taproot sections were unique in that they revealed a series of articulated laticifers (cells or vessels containing latex). We intend to compare organ cellular morphologies of dandelions used in this study to those grown in metal polluted media. These future comparisons may help elucidate potential cytological effects (e.g., chlorosis and/or necrosis) of metal pollution on dandelion growth.

BOARD 09 DEVELOPMENTAL STAGES OF THE MOTH FLY (*PSYCHODIDA: PSYCHODA CINEREA*) IN VITRO AND IN VIVO BY MEANS OF LIGHT AND SCANNING ELECTRON MICROSCOPY (SEM). DAVID L. MASON, DMASON@WITTENBERG.EDU, KRISTEN D. RINEHART, AND CARMEN E. TRISLER. DEPARTMENT OF BIOLOGY, WITTENBERG UNIVERSITY, SPRINGFIELD, OH 45501.

Over the years a limited amount of research has been carried out on stages in the life history of the moth fly by means of light microscopy, and no scanning electron microscopy (SEM) has been presented on the very interesting morphological features of the adult or larval stages. Most image information has been presented as drawings. Therefore, the goals for this research project were to capture adult moth flies, place them in various growth media, induce them to lay eggs, follow their developmental stages, and digitally capture views of their external morphology by means of light and scanning electron microscopy (SEM). Adult flies were trapped in plastic vessels from outdoor toilets at John Bryan State Park in Yellow Springs Ohio for two summer periods in 2003 and 2004. Between five and eight flies were placed in 8 X 4 inch glass vessels half filled with urine, sewage waste, putrefying meat juice, or fermenting peach juice. In human urine, eggs were seen deposited by females. Eggs hatched into larvae that had 3 larval instars before pupating. The verriform larvae measured 5-10mm and were constructed of a head capsule with eyespots, 25 segments with dorsal setae of a variable number extending from each sclerotized plate, several shorter setae extending from the ventral region on a number of the segments, and a terminal segment having anal hooks. By stereomicroscopy the mouth parts were observed grazing on food sources, and SEM revealed -teeth-like-maxillary projections around the opening. From the dorsal side of the terminal segment an attachment structure was observed. The setae were viewed flexing in an oar-like motion as the larvae moved in their aquatic environment. Flies were observed in an obtect pupa stage with extending labial horns and emerging into their adult winged stage. This research provides for a better understanding of the developmental stages from adult flies to eggs and larvae, and it presents outstanding visual information both by light and SEM on the larval stages.

BOARD 10 SOCIAL BEHAVIOR DEVELOPMENT OF YOUNG RATS WHOSE MOTHERS CONSUMED SMALL AMOUNTS OF POLYCHLORINATED BIPHENYL (PCB). ASIA D. JOHNSON¹ (JOHNSAD@BGSU.EDU), SHANNON M. BURT² (SMBURT@BGSU.EDU), MAEGAN E. HORINEK¹ (HMAEGAN@BGSU.EDU), LOGAN E. MCKNIGHT¹ (LOGANEM@BGSU.EDU), CHRISTINA ASBROCK¹ (CASBROC@BGSU.EDU), H. CASEY CROMWELL² (HCC@BGSU.EDU), AND (LEE A. MESERVE¹) (LMESERV@BGSU.EDU). DEPT OF BIOLOGICAL SCIENCES¹ AND PSYCHOLOGY², BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

Polychlorinated biphenyl eaten by pregnant rats alters thyroid status, neurochemistry, and neuroanatomy, and learning/memory of offspring. Less is known about development of social behavior after PCB exposure. This study will compare developmental behavior of control and PCB exposed young rats using established social behavioral measurements. Mothers of control rats will be fed regular chow, and the diet of PCB-exposed rats will contain 12.5 or 25.0 ppm of PCB (PCB 47/77 mixture). Conditioned place preference test will measure ability of 12-14-day-old rats to discern between a characteristic odor (lemon extract) associated with the mother and that odor associated with a cotton ball. Social interaction will be estimated by observing play behavior in 30-50-day-old rats. Comparative social investigation of 50-60-day-old rats of an adjacent cage that is either empty or contains a littermate will be determined using the social port test. Finally, over the range of 22-60-days-of-age, general motor abilities of the rats will be compared. It has been confirmed that control rats show a preference for an odor when it has been associated with the mother. It is anticipated that PCB exposed rats will display a lesser ability to discriminate in this test. It is further anticipated that PCB exposed animals will display less play behavior and be less socially investigative than controls. Given previous studies, hyperactivity of PCB animals is likely. Results from this study can be generalized to other endocrine disruptors like PCB. Extrapolation to dietary PCB humans in humans may be possible.

BOARD 11 TRAFFICKING OF MENKES PROTEIN IN ADRENOCORTICOTROPH TUMOR CELLS EXPRESSING THE CUPROENZYME PAM. ANNE M COLLACO COLLAA@BGNET.BGSU.EDU, ANA MARIA OYARCE AOYARCE@MCO.EDU, TAMI C STEVENSON TCSTEVE@BGNET.BGSU.EDU, DEPARTMENT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43402.

To ensure appropriate copper homeostasis, organisms express proteins such as copper chaperones and the P-type ATPase known as the Menkes copper transporter (MNK). These proteins are important for copper efflux and delivery of copper to cuproenzymes including cytochrome c oxidase, dopamine b-monooxygenase and peptidylglycine a-amidating monooxygenase (PAM). Mutations within MNK result in a disorder known as Menkes disease, which is characterized by neurodegeneration, connective tissue abnormalities, and hypopigmentation. Symptoms seen in Menkes patients are attributed primarily to the loss of copper delivery to copper-requiring enzymes. Previous studies show that the activity

of PAM, which is responsible for the \pm -amidation of over 50% of all neuropeptides, is severely reduced in MoBr mice, an animal model of Menkes disease. The intracellular localization of MNK is copper dependent as observed from studies in fibroblasts and Chinese hamster ovary cells transfected with MNK. At steady-state, MNK is localized to the *trans*-Golgi network (TGN). As extracellular copper levels rise, MNK moves from the TGN to the plasma membrane to pump excess copper from the cell and when cellular copper levels are low, MNK is trafficked back from the plasma membrane towards the TGN. The localization of MNK in cells with high levels of the cuproenzyme, PAM has not been fully examined. For that reason, we chose to examine the localization of MNK in AtT-20 PAM-1 cells where both MNK and PAM are being expressed. For these experiments, subcellular fractionation, Western blot analyses and immunofluorescence microscopy were performed to determine the localization of MNK in AtT-20 PAM-1 cells at control state, or with copper, or with a copper chelator (BCS) or in the presence of BCS and copper. Western blot analyses from the sucrose density gradients showed that MNK in these cells at steady state is localized in the lighter fractions corresponding to the TGN and in the denser fractions corresponding to the secretory granules. The localization of MNK does not appear to be altered in the presence of copper or with both copper and the chelator. However, in the presence of BCS, MNK appears to be more enriched in the fractions that correspond to the TGN. Moreover, immunofluorescence microscopy showed that MNK is localized in the TGN and in secretory granules at steady-state, or with copper or with BCS and copper; however, in the presence of BCS, MNK is more tightly compacted in the TGN with little localization in the granules. Both the immunostaining and the sucrose density gradients suggest in the presence of copper, MNK is not being trafficked to the plasma membrane. To further confirm these results, cell surface biotinylation will help to answer whether or not copper influences the trafficking of MNK to the plasma membrane.

BOARD 12 THE CO-LOCALIZATION OF MENKES PROTEIN AND THE AMIDATING ENZYME IN ANTERIOR PITUITARY CELLS. EMILY M. SHOAF (EMSHOAF@BGSU.EDU), (TAMI C. STEVESON, (TCSTEVE@BGSU.EDU)). DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

Copper is required for the normal function of several important enzymes, while excess copper is highly toxic and can produce detrimental effects. Therefore, copper homeostasis is carefully regulated. Disturbed copper homeostasis is observed in Menkes disease, a lethal disorder characterized by neurodegeneration and connective tissue abnormalities. Mutations in the Menkes protein (MNK), a P-type copper transporter ATPase, can cause copper requiring enzymes, such as peptidylglycine α -amidating monooxygenase (PAM), to malfunction. PAM is essential for the carboxyl-terminal amidation of over 50% of all neuropeptides. Since copper transport and use is essential for PAM amidation, we are examining the behavior of endogenous MNK in the anterior pituitary of rats. Both PAM and MNK are highly expressed in the anterior pituitary, where MNK has been observed to localize to distinct punctate vesicles as well as the *trans*-Golgi network. However, it remains unclear whether MNK and PAM are expressed together in all five-cell types present in the anterior pituitary. Currently, we are using sequential immunostaining with two rabbit polyclonal antibodies, one directed towards the carboxyl-terminal of the MNK protein and the other at PAM, in addition to anterior pituitary cell-type specific markers, to gain a better understanding of the cell-specific relationship between MNK and PAM. Our hypothesis is that MNK will be expressed in all the anterior pituitary cell types, as PAM is expressed all. In general, this study is important, as it will provide us with a better understanding of the subcellular involvement of MNK in its delivery of copper to PAM.

BOARD 13 REGULATION OF MENKES PROTEIN IN ADRENOCORTICOTROPE TUMOR CELLS. PRASHANT SINGH¹ (PRASHS@BGNET.BGSU.EDU), ANA MARIA OYARCE² (AOYARCE@MCO.EDU), TAMI C. STEVESON¹ (TCSTEVE@BGNET.BGSU.EDU). ¹DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH, 43403. ²DEPT OF PHARMACOLOGY AND THERAPEUTICS, MEDICAL COLLEGE OF OHIO, TOLEDO, OH.

Copper is an essential trace element required as an integral component of several important enzymes including cytochrome C oxidase, superoxide dismutase, lysyl oxidase, tyrosinase, ascorbic acid oxidase, peptidylglycine \pm -amidating monooxygenase (PAM) and dopamine ²-monooxygenase (DBM). The Menkes protein (MNK) is a copper- translocating P- type ATPase that plays a crucial role in copper homeostasis as well as the movement of copper into and out of cells. MNK is localized to the *trans*-Golgi network in fibroblasts and is thought to supply copper to the cuproenzymes listed above. Mutations in MNK are known to cause Menkes disease, a lethal X-

linked recessive disorder characterized by neurodegeneration, connective and bone abnormalities and early childhood death. Previous studies have reported that trafficking of MNK in response to changes in copper levels and is mainly regulated by post-translational modifications including phosphorylation, and does not involve de novo protein synthesis in fibroblasts. Using western blot analyses and RT-PCR, we have determined that MNK protein, lysyl as its mRNA, are altered in adrenocorticotrope cells (AtT20) when these cells are cultured in varying levels of copper, suggesting that MNK may undergo both transcriptional and translational Regulation. Thus, MNK transcript and protein levels may be more responsive to changes in copper levels in neuroendocrine cells.

BOARD 14 THE EFFECT OF PCB ON DEVELOPMENT IN NEUROENDOCRINE AND BRAIN TISSUES. ¹EMILY C. HART (EHART@BGSU.EDU), ¹LEE A. MESERVE (LMESERV@BGSU.EDU), ²ANA MARIA OYARCE (AOYARCE@MCO.EDU), ¹TAMI C. STEVESON (TCSTEVE@BGSU.EDU). ¹DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH, 43403. ²DEPT OF PHARMACOLOGY AND THERAPEUTICS, MEDICAL COLLEGE OF OHIO, TOLEDO, OH.

Polychlorinated biphenyls (PCBs) are a class of highly lipophilic industrial compounds that persist as environmental contaminants. PCBs can make their way into food webs, thus detrimentally affecting organisms. Exposure to PCBs causes behavioral alterations, endocrine disruptions, suppression of the immune system, alterations in brain development, reproductive difficulties and birth defects. Previous studies have shown that exposure of Sprague-Dawley rats to PCB 47/77 from conception to 30 days of age causes an increase in the processing of peptidylglycine at the effect of PCB on the relationship between MNK and PAM expression and processing. Pregnant Sprague-Dawley rats (N = 5) were fed control chow or chow containing a mixture of PCBs (47/77) and offspring were euthanized at 3 and 30 days of age. Following treatment, the anterior pituitary, adrenal gland, cortex, hypothalamus, hippocampus, cerebellum, medulla and liver tissues were collected, homogenized and analyzed by Western blot using PAM and MNK antibodies. Preliminary studies (N = 5 rats) have determined that MNK levels increase over time from day 3 to adult in the adrenal, pituitary and medulla of the brain, while MNK levels decrease through development in the PCB treated animals. RT-PCR studies are being conducted to determine mRNA levels of both PAM and MNK in order to assess whether transcriptional and/or translation regulation of MNK and PAM is occurring.

BOARD 15 ANALYSIS OF TICK SALIVA AND FEEDING SITES FOR EVIDENCE OF TRANSMISSION OF THE TICK-ASSOCIATED FUNGUS, SCOPULARIOPSIS BREVICAILIS. JOSHUA B. BENOIT¹, S05.JBENOIT@WITTENBERG.EDU, ERIC J. RELLINGER¹, S07.ERELLINGER@WITTENBERG.EDU, JAY A. YODER¹, JYODER@WITTENBERG.EDU, KEVIN M. GRIBBINS¹, KGRIIBINS@WITTENBERG.EDU, SAM R. TELFORD III², SAM.TELFORD@TUFTS.EDU, ¹DEPARTMENT OF BIOLOGY, WITTENBERG UNIVERSITY, SPRINGFIELD OH 45504, ²DEPARTMENT OF IMMUNOLOGY AND INFECTIOUS DISEASES, HARVARD SCHOOL OF PUBLIC HEALTH, BOSTON MA 02115.

Inability to promote mycoses and vector competence of ticks for fungi is reported. The focus was *Scopulariopsis brevicaulis*, a soil mold and mycosymbiont of the American dog tick *Dermacentor variabilis* and lone star tick *Amblyomma americanum*. Transmission is likely by conidia (asexual spores), anticipating prevalence in expressed saliva and deposition into skin. Saliva was collected by pilocarpine induction into glass capillaries inserted over the tick's mouthparts. Tissue was biopsied and blood drawn from ears of an immunologically-naïve New Zealand white rabbit, *Oryctolagus cuniculus*, from sites where ticks had fed. Methylene blue was used to stain conidia for microscopy and fungal culturing was conducted on potato dextrose agar with identification from subcultures of hyphal tips. Skin where no ticks fed and skin receiving an intradermal injection of pure *S. brevicaulis* were controls. Fungus culturing and slide preparations showed less than 5% saliva containing *S. brevicaulis*; no other fungi were present, and those testing positive, albeit few, were not specific to a particular life cycle (N=200 saliva samples each from larvae, nymphs and adults). Less than 4% recovery of *S. brevicaulis* was from tissue biopsies (N=35) and blood (N=200-100 μ l aliquots), corresponding to low fungus levels detected in saliva. Histological examination of an attachment site, with feeding tick intact, failed to reveal conidia beneath the skin surrounding the mouthparts. Similar low percentages were observed for skin not exposed to ticks (ANOVA; P>0.05), but pure *S. brevicaulis* injection resulted in 100% recovery (each N=35) which confirms our technique. Our conclusion is that ticks act infrequently as a fungal vector.

BOARD 16 RELATIONSHIP OF SELF-REPORTED PREPUBESCENT PHYSICAL ABUSE TO THE RIGHT PARRHIPPOCAMPAL GYRUS OF ADULT FEMALES. KEVIN P. McANINCH s06.KMCANINCH@WITTENBERG.EDU, NICOLE KINZELER s04.NKINZELER@WITTENBERG.EDU, CATHY L. PEDERSON CPEDERSON@WITTENBERG.EDU, DEPARTMENT OF BIOLOGY, WITTENBERG UNIVERSITY, SPRINGFIELD OH 45501.

This study investigated the relationship of physical abuse on the volume of the parahippocampal gyrus. It was hypothesized that women with prepubescent physical abuse would have a smaller parahippocampal gyrus due to the release of glucocorticoids in response to stress. Sixteen female participants aged 20-37 years filled out a demographic sheet, *Childhood Trauma Questionnaire*, *Wonderlic Personnel Test* and had an MRI of their brains. These participants were divided into two groups: 8 women with a score of 16 or higher for physical abuse on the *Childhood Trauma Questionnaire* were placed in the experimental group, and 8 subjects with a score of 5 on the same scale were placed in the control group. Demographic variables such as age, drinks last year, marijuana joints smoked, pack years smoking, and IQ were analyzed for significance (all exceeded $p > 0.09$). The right parahippocampal gyrus was traced by two experimenters blinded to group using 3D Brainstation, and then total volumes of each slice were averaged and summed to determine total volume. A univariate analysis of variance found no significant difference in right parahippocampal gyrus volumes between the physical abuse and control groups, $F(1,14) = 0.78$, $p = 0.392$. A Pearson r correlation demonstrated no correlation between abuse and parahippocampal gyrus volume, $p = 0.65$. Two demographic variables were significantly different between the groups, and anxiety ($p < 0.001$) and emotional abuse ($p < 0.001$) were therefore covariates in parahippocampal volume and correlations between abuse and parahippocampal volume.

BOARD 17 MOVEMENT OF *Oreaster reticulatus* ON SAN SALVADOR ISLAND, BAHAMAS. JOHN S. FLEMING, s07.JFLEMING@WITTENBERG.EDU, COURTNEY M. DANCER, s07.CDANCER@WITTENBERG.EDU, VINCENT G. PETERSON, s05.VPETERSON@WITTENBERG.EDU, BRYAN K. KUJAWA, s05.BKUJAWA@WITTENBERG.EDU, AND JAMES M. WELCH, JWELCH@WITTENBERG.EDU, WITTENBERG UNIVERSITY, DEPARTMENT OF BIOLOGY, P.O. Box 720, SPRINGFIELD OH 45501.

The habitat preference of *Oreaster reticulatus*, the cushion sea star, was studied on San Salvador, Bahamas, during June 2004. We observed cushion sea stars in Graham's Harbor both in sand and in turtle grass beds, but more frequently in turtle grass beds. We hypothesized that sea stars preferred turtle grass beds, so they would move farther if placed in sand than in turtle grass. Four similar sized cushion sea stars, with numbers etched into their aboral surface, were placed in turtle grass beds or on sandy bottoms, in pairs or individually, and the distance and direction that each star moved were measured. Cushion sea stars placed in turtle grass beds moved at an average speed of 2.67 m hr⁻¹, which was slower than those placed on the sand (3.57 m hr⁻¹). Sea stars allowed to move for only an hour moved at a faster average speed (9.5 m hr⁻¹) than those allowed to move for multiple hours (2.9 m hr⁻¹). Sea stars placed in pairs generally moved together in the same cardinal direction. *O. reticulatus* always moved away from the shore, which was toward turtle grass beds or deeper into them. Our data confirm our hypothesis that sea stars would move farther in sand than in turtle grass. These tendencies indicate a preference for turtle grass habitats.

BOARD 18 IMPACT OF ABIOTIC CHARACTERISTICS ON SPECIES DIVERSITY IN TIDEPOLS ON SAN SALVADOR, THE BAHAMAS. MIRANDA R. HOOVER (s05.MHOOVER@WITTENBERG.EDU), FAYTH J. RICHARDSON (s06.FRICHARDSON@WITTENBERG.EDU), AND JAMES M. WELCH (JWELCH@WITTENBERG.EDU). WITTENBERG UNIVERSITY, DEPT OF BIOLOGY, P.O. Box 720, SPRINGFIELD, OH 45501.

In San Salvador, The Bahamas, tidepools are created in the karst formations along the shore by water erosion and boring organisms. The hot tropical sun can rapidly change the salinity and temperature of tidepools, potentially stressing organisms in them. The specific characteristics of individual tidepools may determine which species can survive there. Our null hypothesis was that species diversity would not be affected by tidepool characteristics. Tidepools at four locations on San Salvador, The Bahamas were included in this study: Cut Cay, Singer's Point, Blackwood Bay, and Bonefish Bay. We measured temperature, salinity, length, width, and depth of 45 tidepools. For each tidepool, we counted and identified all the animals to species and calculated the Shannon-Weiner diversity index. There was no significant correlation between the species diversity and any abiotic characteristics. However, there were differences in species composition for tidepools of different temperature, salinity, and size. Warmer tidepools (32-34°C) contained species of nerites, *Nerita* spp., while the cooler pools

(28-29°C) were dominated by red rock urchins, *Echinometra lucunter*. Brittle stars, feather dusters, and mussels were found in lower salinity pools (35-36 ppt), but not in higher salinities (39-41 ppt). Many of the organisms in these high salinity pools were snails. Baby-tooth nerites, *Nerita versicolor*, were found only in shallow pools (≤ 0.10 m), while yellow fan worms, *Notaulax occidentalis*, were found only in the deep pools (≥ 0.15 m). Abiotic factors do not necessarily alter the species diversity index, but these factors do affect which particular species can inhabit a tidepool.

BOARD 19 CHARACTERIZATION AND USE OF A SYNECHOCYSTIS SP. STRAIN PCC 6803 NITRATE-DEPENDENT BIOREPORTER. NATALIA VALERYEVNA IVANIKOVA, NATALI.IV@BGNET.BGSU.EDU, R. MICHAEL L. MCKAY, RMMCKAY@BGNET.BGSU.EDU AND GEORGE S. BULLERJAHN, BULLERJ@BGNET.BGSU.EDU. NATALIA IVANIKOVA, DEPARTMENT OF BIOLOGICAL SCIENCES, 217 LIFE SCIENCES BUILDING, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43402.

The use of cyanobacterial whole-cell luminescent bioreporters has enhanced our ability to monitor nutrient availability in aquatic ecosystems. We have constructed a *Synechocystis* sp. strain PCC 6803 bioluminescent reporter for the assessment of nitrate bioavailability. Specifically, a 380 base pair DNA fragment containing the NtcA/B-dependent nitrate/nitrite-activated *nirA* promoter (regulating expression of genes encoding nitrite reductase) was fused to the bacterial luciferase genes, *luxAB*, and introduced into *Synechocystis* by genetic transformation. Characterization of this strain, designated AND100, yielded dose-dependent increased bioluminescence coincident with increased nitrate added to the growth medium from 1-100 μ M. Bioluminescence in response to nitrate addition was light-dependent up to 50 μ mol quanta m⁻² s⁻¹. Deficiency of nutrients other than nitrate resulted in a lower luminescent response, causing the bioreporter to underestimate the true nitrate concentration. Thus, in addition to its utility as an analytical tool to measure nitrate, strain AND100 can be used to elucidate factors that constrain drawdown of nitrate in freshwater systems. This is pertinent to a system such as Lake Superior where the concentration of nitrate has increased six-fold in the last century.

BOARD 20 NEUROPROTECTION BY OCULOTROPHIN PROTOMORPHOGEN EXTRACT IN THE GLAUCOMATOUS EYE. ANDREW J. KLISE, AKLISE@WOOSTER.EDU, (SHARON LYNN, SLYNN@WOOSTER.EDU), COLLEGE OF WOOSTER, 931 COLLEGE MALL, WOOSTER OH 44691.

Oculotrophin PMG® (OPMG) contains Protomorphogen™ extract and is a proprietary supplement sold since 1956 by Standard Process Inc.® to promote eye health. Some ophthalmologists have suggested the use of this supplement to glaucoma patients. Due to the extract's long sales record, the assumption is that use of this extract causes some sort of clinical effect. However there are no published data suggesting that OPMG extract is effective in treating the glaucomatous eye. The purpose of this study was to determine if OPMG extract acts as a retinal neuroprotectant in Sprague-Dawley rats with retinal cell damage from pressure-induced ischemic-reperfusion (PIIR) injury. This type of retinal cell damage is similar to that seen in glaucomatous human patients. Two doses of OPMG extract were investigated (0.011 mg/kg, n=5 rats and 0.022 mg/kg, n=6 rats). The hypotheses of this study are that (1) rats which sustain the PIIR injury and receive OPMG extract will have significantly less retinal ganglion cell damage than rats that receive a placebo (n=6), and (2) the amount of retinal cell damage will be negatively correlated with the amount of OPMG extract administered. The number of retinal ganglion cells per unit area that survived PIIR injury will be assessed histologically.

BOARD 21 THE EFFECT OF ANXIETY ON THE VOLUME OF THE FIMBRIA. JUSTIN S. JOHNSON (s06.JJOHNSON@WITTENBERG.EDU) AND JENNY M. MEYER (s05.JMEYER@WITTENBERG.EDU) WITTENBERG UNIVERSITY, PO Box 720, SPRINGFIELD, OH 45501.

Anxiety disorder affects millions of people in the United States. Chronic anxiety works on the hypothalamus-pituitary-adrenal axis to cause the release of glucocorticoids into many areas of the body, including the brain. The fimbria has been shown to have an exceptionally high density of glucocorticoid receptors. The purpose of this study is to determine if clinical anxiety resultant from child abuse causes volume loss of the fimbria. Two groups of female subjects recruited from the community, ages 20-40 matched for handedness, IQ, average abuse, number of alcoholic drinks per year, age, and average depression were given MRIs and the fimbria was traced bilaterally. It was determined that there was no significant difference in the volume of the fimbria between groups of women with anxiety disorder and the control group. For the left fimbria, $F(1,14) = .155$, $p = .7$. For the right fimbria, $F(1,14) = .863$,

$p=.369$. The results of this study seem to imply that excitotoxicity of the fimbria does not occur as a result from elevated glucocorticoid levels.

BOARD 22 AMYGDALA VOLUME RESULTANT FROM ANXIETY SECONDARY TO CHILDHOOD ABUSE. JUSTIN S. JOHNSON (S06.JJOHNSON@WITTENBERG.EDU), CATHY L. PEDERSON (CPEDERSON@WITTENBERG.EDU) WITTENBERG UNIVERSITY, P.O. Box 720, SPRINGFIELD, OH 45501.

Prepubescent abuse is a far too common occurrence in the United States. The results of abuse, such as clinical anxiety can have serious implications on the victim of the abuse, affecting personal relationships and everyday functioning. As the amygdala has been shown to be involved in emotional regulation of the stress response, the purpose of this study was to determine the volumetric effects of clinical anxiety on the amygdala. Thirty six female participants age 20-40 were recruited from the community and were screened using a demographic sheet, the *Childhood Trauma Questionnaire*, *Wonderlic Personnel Test*, and *Millon Clinical Multiaxial Inventory*. Participants were divided into three groups ($n=12$): severe abuse, moderate abuse, and a control. Groups were matched on age, IQ, drinks per year, years of education, body mass index, and cigarette pack years ($p>.107$ for all demographics). Participants were given MRIs and the amygdala was traced bilaterally in horizontal sections by a researcher blind to group participation. It was determined that no significant relation exists between prepubescent abuse and reduction of amygdala volume $F(2,32)=.105$, $p=.05$. The results of this study seem to imply that prepubescent abuse does not cause a volumetric reduction of the amygdala.

BOARD 23 A COMPARISON OF BIODIVERSITY BETWEEN TWO SITES IN AN ANTHROPOGENICALLY ALTERED HABITAT IN THE WILDS AMY M. ILLER AILER@MUSKINGUM.EDU, (JAMES L. DOOLEY JDOOLEY@MUSKINGUM.EDU), DEPT OF BIOLOGY, MUSKINGUM COLLEGE, 163 STORMONT ST, NEW CONCORD, OH 43762.

Two important measures of biodiversity are species richness and abundance. Insects, especially butterflies (*Lepidoptera*), are well-suited species for biodiversity studies. Among many favorable characteristics, butterflies are sensitive indicators of ecosystem health. A portion of the Wilds has been strip mined and reclaimed, and this was the area of study. One site has undergone reclamation while the other site has undergone reclamation and further restoration with the intent of creating butterfly habitat. The goal of this study is to assess biodiversity in terms of species richness and abundance in the two study sites. A transect route consisting of existing pathways was designated for each site. Each transect was surveyed, and presence of butterfly species and individual butterflies were recorded at least once a week in September and October, 2004. These data were analyzed to determine biodiversity between each site, between the two overall habitat types, and between habitat types within sites. It is expected that the restored butterfly habitat and grassland habitat type will exhibit higher levels of biodiversity as reflected by conventional diversity indices. This information provides insight into the success of the butterfly habitat with respect to butterfly biodiversity. Also, since butterflies are indicators of ecosystem health, this study provides a means of comparison between the general health of the two sites and types of habitat within the sites.

BOARD 24 TESTING AQUATIC AND TERRESTRIAL HABITAT VARIABLES IN THE DECLINE OF BLANCHARD'S CRICKET FROGS IN OHIO. ALLEN A. SKINNER, ASKINNER@WOOSTER.EDU, RICHARD M. LEHTINEN, RLEHTINEN@WOOSTER.EDU, THE COLLEGE OF WOOSTER, Box 2727, WOOSTER OH 44691.

Although amphibians have naturally dynamic population fluctuations, many species are experiencing decline or extinction. Blanchard's cricket frogs (*Acris crepitans blanchardi*) have declined or been extirpated in many areas of their historic range in the Midwestern United States. Recent studies in Ohio have shown that *Acris* populations have been declining from east to west and possibly from north to south, but little is known of the cause(s) of these declines. A possible mechanism may be that acid rain and/or other habitat factors may negatively affect Blanchard's cricket frog populations. In the summer of 2004, these hypotheses were examined by conducting a large-scale chorusing survey of cricket frogs at randomly selected aquatic habitats. These habitats were found along three transects running east from the Indiana border for a distance of 165 km (102 sites in each transect; 306 sites total). At each site, we listened for calling cricket frogs for five minutes and measured several habitat variables that may influence Blanchard's cricket frog presence (water pH, water alkalinity, aquatic vegetation coverage, and terrestrial vegetation coverage). Using

a multiple regression model to predict the presence of cricket frogs, the only significant variable in this analysis was increasing terrestrial vegetation cover, which was negatively correlated with cricket frog occurrence. Alkalinity, pH, and aquatic vegetation cover had no significant influence on the occurrence of cricket frogs. These results suggest that Blanchard's cricket frogs avoid heavily forested areas, but do not suggest any strong correlation between water chemistry variables and cricket frog occurrence.

BOARD 25 A COMPARISON OF BUTTERFLY ABUNDANCE AND RICHNESS BETWEEN UNALTERED AND RESTORED AREAS OF THE BEAVER CREEK WETLANDS, GREENE COUNTY, OHIO. LAURA B. SKALESKI LAURAS@MUSKINGUM.EDU, (JAMES L. DOOLEY, JDOOLEY@MUSKINGUM.EDU), MUSKINGUM COLLEGE, 163 STORMONT ST, NEW CONCORD OH 43762.

Using butterflies as bioindicators, differences in population numbers between reconstructed and natural wetland areas might indicate a difference in habitat quality. The purpose of this research is to examine the effects of wetland restoration, which can result in habitat that is structurally and functionally different, on butterfly populations. The objectives of this study are to (1) estimate butterfly abundance, richness, and diversity in both a restored and natural area of the Beaver Creek Wetlands, (2) use these estimates to compare the two areas and identify any correlations between estimates and wetland attributes, (3) determine if some species of butterflies are not colonizing the restored area, (4) provide a limited initial assessment of the success of the Beaver Creek Wildlife Area restoration, and (5) provide initial numbers for the possible development of a long term monitoring program in the Beaver Creek Wetlands. Butterfly population counts were carried out from May through August 2004 following the Pollard-Transect method. One transect was laid out in each wetland area and divided into sections based on changes in habitat type. Weather conditions, date, time of day, length of time spent recording, type and number of species observed, and number of individuals observed were all recorded. Differences in population composition between the two sites will be examined. It is anticipated that the restored wetland area will have lower abundance, diversity, and richness and that some particularly sensitive species may be found only in the natural wetland area.

BOARD 26 A SURVEY AND STATISTICAL ANALYSIS OF ANURANS OF GUERNSEY COUNTY, OHIO. NATALIE A. FATH, NFATH@MUSKINGUM.EDU, (JAMES L. DOOLEY, JDOOLEY@MUSKINGUM.EDU), DEPT. OF BIOLOGY, MUSKINGUM COLLEGE, 163 STORMONT ST., NEW CONCORD OH 43762.

Anurans are closely linked to the health of their habitats and often are cited as key bio-indicator species. Anurans serve as a good bio-indicator species in many ecosystems because their lifecycle takes them through phases in both terrestrial and aquatic environments. Fluctuations within populations can be correlated with changes in the ecosystem. Ohio's record's of anurans in Guernsey County has been incomplete with some species never recorded or not recorded since 1970. Anurans were collected in Adams, Cambridge, Center, Jefferson, Knox, Madison, Washington, Wheeling, and Wills Township of Guernsey County from late winter 2004 to the fall of 2004 using road cruising as the primary method of collection. The majority of the specimens were preserved and have been given to the Cincinnati Museum of Natural History to be kept as records of the species occurrence. In addition, each specimen was identified, measured, and recorded with locality information and collection date. To date the following species have been recorded in Guernsey County: *Bufo americanus americanus*, *Hyla versicolor*, *Pseudacris crucifer crucifer*, *Rana catesbeiana*, *Rana clamitans melanota*, *Rana palustris*, and *Rana pipiens*.

BOARD 27 IMPACT ON WOODY PLANTS BY THE NORTH AMERICAN BEAVER (*CASTOR CANADENSIS*) AT THE WILDS, MUSKINGUM COUNTY, OHIO. BRYAN W. VOELKER BVOELKER@MUSKINGUM.EDU, (JAMES L. DOOLEY JR. JDOOLEY@MUSKINGUM.EDU), DEPT. OF BIOLOGY, MUSKINGUM COLLEGE, 163 STORMONT ST., NEW CONCORD OH 43762.

The Wilds, a 4,050 hectare center for wildlife conservation, of southeastern Ohio has a history of intense surface-mining and provides an important opportunity for advancing restoration ecology. There is concern that the herbivory pressure of beaver (*Castor canadensis*) may negatively affect the restoration processes in the northern section of the property restored in 1973-1975. The canopy-opening foraging and selective feeding of beavers could influence the structure and diversity of woody plant communities. This study will assess the impact of beaver on an ecosystem recovering from surface-mining where the short-term and, more importantly, the long term effects of such beaver foraging on woody plants and therefore ecosystem recovery need to be quantitatively assessed. To study the influence of beaver on shoreline woody

plants, one active and two recently abandoned beaver dam sites were chosen. Transects were established at all three sites and the following data recorded: woody plant diameter, species identity and cutting history by beaver. Analysis of these data will allow determination if browse selection affects the woody plant community at these sites and to assess the degree to which forest succession and recovery may be altered by beaver herbivory in terms of species richness, diversity and evenness.

BOARD 28 A SURVEY AND STATISTICAL ANALYSIS OF ANURANS OF MUSKINGUM COUNTY OHIO. DANIELLE KAYE THOMPSON DTHOMPSON@MUSKINGUM.EDU, (JAMES L. DOOLEY JDOOLEY@MUSKINGUM.EDU), DEPT OF BIOLOGY, MUSKINGUM COLLEGE, 163 STORMONT ST., NEW CONCORD, OH 43762.

Anurans are closely linked to the health of their habitats and are often sited as key bio-indicator species. Anurans serve as a good bio-indicator species in many ecosystems because their lifecycle takes them through phases in both terrestrial and aquatic environments. Fluctuations within populations can be correlated with changes in the ecosystem. Ohio's state record of anurans in Muskingum County has been incomplete with some species never recorded or not recorded since 1970. Anurans were collected in the townships of Union, Washington, Highland, Springfield, Perry, Adams, Monroe, and Madison in Muskingum County from late winter 2004 to the fall of 2004 using road cruising as the primary method of collection. Many of the specimens collected were preserved and have been given to the Cincinnati Museum of Natural History to be kept as voucher specimens to record the species occurrence in the county. In addition each specimen was identified, measured, and recorded with locality information and collection date. To date the following species have been recorded in Muskingum County: *Bufo americanus americanus*, *Hyla versicolor*, *Pseudacris crucifer crucifer*, *Rana catesbeiana*, *Rana clamitans melanota*, *Rana palustris*, *Rana pipiens*, and *Rana sylvatica*.

BOARD 29 DETECTION OF INFLUENZA A VIRUSES IN MIGRATING BIRDS IN NORTHEAST SIBERIAN LAKES GANG ZHANG, GANGZ@BGNET.BGSU.EDU, SCOTT ROGERS, SROGERS@BGNET.BGSU.EDU, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

The influenza A viruses are responsible for continual outbreaks of disease in human populations. Ecological and phylogenetic studies suggest that wild waterfowl are the principal reservoirs for influenza A viruses, which occasionally are transmitted to other hosts, leading to influenza outbreaks among those species. In the Northeast Siberia, hundreds of lakes lie along the Kolyma river (69N, 162E), which attract large flocks of migrating birds each year. Building nests and feeding there, aquatic birds distribute the influenza A viruses they carry, pick up viruses dropped by other birds and deposit the viruses elsewhere. The lakes are frozen much of the year (Oct. – April). The viruses can remain preserved in the ice for long periods of time. We hypothesized that these lakes are major abiotic reservoirs for the influenza A viruses and preserve high titers of infectious viruses through the months when the lakes are frozen. The main objective of this research was to detect the influenza A viruses in those lakes and study the phylogenetic relationships among the isolates. Also, the viability of the influenza A viruses in the lakes at several times during the year was assessed to determine the extent of virus carry over from one season to the next. Till now, 21 positive results have been got from the 2 of the 6 lake ice/water samples we assayed, by using RT-PCR (Reverse-transcription polymerase reaction) targeting at H1 gene. While previously influenza A viruses has been recovered from lake water, this is the first report of the recovery of influenza A viruses (including any viruses) from lake ice. Phylogenetic analysis showed considerable variation in those achieved sequences.

BOARD 30 NEBULIZATION TREATMENTS OF CYSTIC FIBROSIS AND NON-CF MICE WITH DIFFERENT SALINE VEHICLES: IMPACT OF ZINC AND ATP ON INFLAMMATORY ENDPOINTS. HOLLEH M. MOHEIMANI, HM_MOHEI@HOTMAIL.COM, CAPITAL UNIVERSITY, 1 COLLEGE & MAIN, COLUMBUS OH 43209.

Inherent defects exist in the immune response of the Cystic Fibrosis (CF) lung. Collectively, the literature suggests that defects in Cystic Fibrosis Transmembrane Conductance Regulator (CFTR) expression and function facilitate a heightened airway inflammatory response, comprised of an increased leukocyte infiltration and IL-8 production and altered NF- κ B activation. Previous studies have shown that application of zinc and ATP to the CF airways rescues defective chloride secretion. This study examined whether application of zinc and ATP would also attenuate leukocyte infiltration, chemokine production, and NF- κ B activation within the CF lung. For this study, both CF and non-

CF mice were nebulized using various saline solutions containing or lacking the zinc and ATP co-agonists for 5 consecutive days for 30 minutes each day. Immediately following the last nebulization, bronchial-alveolar lavage fluid (BALF) was collected and analyzed for differences in leukocyte cell count and chemokine (KC/IL-8, RANTES) content. Leukocyte cell counts and RANTES amounts were negligible, low or undetectable in the BALF of all experimental groups. In the BALF of CF mice, KC/IL-8 was measurable in selected experimental groups that received saline vehicle alone. Zinc and ATP attenuated KC secretion markedly into these airways. Parallel in vivo studies revealed that zinc and ATP also attenuated NF- κ B activation in airway epithelial cells. Future studies will examine the upper limits of zinc and ATP tolerability after nebulization and will define the cellular and therapeutic mechanisms of zinc and ATP's anti-inflammatory effects that may be beneficial in CF.

BOARD 31 THE EFFECTS OF BEE POLLEN ON STREPTOZOTICIN-INDUCED DIABETIC MALE RATS. MICHELLE S. GRISEK, GRASEKMS@STU.LEMOYNE.EDU, (BETH B. PRITTS, PRITTSBB@LEMOYNE.EDU), LE MOYNE COLLEGE, 1419 SALT SPRINGS ROAD, SYRACUSE NY 13214.

Bee pollen, advertised as a "miracle health supplement," is said to be helpful for diabetics because manufacturers report that it regulates blood glucose levels. Bee pollen is nearly 50% carbohydrate and therefore may be potential harmful to diabetics. Because there is no governmental regulation of dietary supplements, manufacturers' claims don't require proof. In addition, diabetics typically have high serum lipid levels. The scientific literature reports that bee pollen lowers blood serum lipid levels. The purpose of this research is to examine the physiological effects of bee pollen consumption in IG-CDS male rats (Charles Rivers Labs) made diabetic by intraperitoneal injection of Streptozotocin, which kills pancreatic beta cells that synthesize insulin. Rats (n=16) with Streptozotocin-induced diabetes (similar to Type 1 diabetics) and controls (n=8) will consume bee pollen in amounts proportional to the recommended human dosage mixed into their chow. After a 2-week exposure period, the rats will be anesthetized and decapitated. The effects of bee pollen consumption on organ weight, hormone, lipid and blood sugar levels, and protein concentration will be determined. Colorimetric assays will be performed to test serum glucose and lipid levels. Lowry assays will determine protein content of the liver, skeletal muscle, and kidney. Radioimmunoassay will be used to determine the amount of serum insulin.

BOARD 32 SOIL-CONTAMINANT ASSOCIATIONS AT AN ECOLOGICALLY DISTURBED SITE UNDERGOING NATIVE GRASS PHYTOREMEDIATION. EBONEY SMITH (DEVYNE212003@YAHOO.COM), W. MEADE (JOAB@SBCGLOBAL.NET), S. OKUNADE (SOKUNADE@CENTRALSTATE.EDU), K.V. NEDUNURI (KNEDUNURI@CENTRALSTATE.EDU), C. LOWELL (CLOWELL@CENTRALSTATE.EDU), AND J. R. SHANN (JODIE.SHANN@UC.EDU). WATER RESOURCES MANAGEMENT, CENTRAL STATE UNIVERSITY, WILBERFORCE, OH 45384.

This study identified how characteristics of a typical silty loam soil could be altered due to its association with creosote from an industrial dumpsite in Southwest Ohio. Analysis of the waste conducted in the Department of Biology at University of Cincinnati revealed excessive concentrations of polycyclic aromatic hydrocarbons (PAH) and heavy metals. Two regions within the site were selected: one region which contained the mixed waste of soil and sludge having a mean PAH concentration of 5000 ppm, and a region towards the center of the site mildly contaminated with a mean PAH concentration of 80 ppm. These regions initially had same soil however sludge was added over the time. Site clean up efforts involved uniformly spreading contaminant, tillage, and application of vegetative treatments until the concentrations of PAH were lowered. Phytoremediation trials were underway using native grasses in a greenhouse study at Central State University using layers of soil collected from this site. Remediation depends on bioavailability of these contaminants, and thus the water retention capacity of the contaminated soils. Soil characterization was performed on soil collected from the center (mild), and a 1:1 mixture collected from the two regions (mixed). Soil gradation tests, bulk density, water holding capacity, plasticity index, and field capacity experiments were performed to determine differences in particle size, and water retention at various size fractions. Soil gradation tests showed greater association of PAH to coarse soil particles passing through mesh no. 10. Soil particle sizes finer than mesh no. 140 were removed in the sample from the mixed due to their association with the PAH. The water holding capacity of the mixed sample associated with excessive waste was 30% lower than the corresponding value for the mildly contaminated soil from the center.

BOARD 33 SOIL QUALITY COMPARISON OF ORGANIC AND CONVENTIONAL FARMING SYSTEMS IN NORTHWEST OHIO. ALAN P. SUNDERMEIER, SUNDERMEIER_5@OSU.EDU, OHIO STATE UNIVERSITY EXTENSION, 440 EAST POE ROAD, BOWLING GREEN OH 43402.

A farming experiment was established in northern Wood County, Ohio to gain a better understanding of what occurs with crop production and soil changes when farmers transition from one management system to another. The treatments chosen for this experiment represent the pests and soil fertility problems experienced by farmers transitioning either to organic or other more diversified crop management systems. Overall, the experiment is addressing ways to maintain production and economic viability while building soil quality. At this site, five replicate blocks that are ½ acre each were established for each of the following five farming systems: #1 – No-till conventional corn, soybean, wheat rotation; #2 – Integrated reduced input tilled corn, soybean, wheat rotation; #3 – Certified Organic (pesticide free) corn, soybean, wheat rotation; #4 – Certified Organic forage and grain rotation; #5 – Certified Organic multi-crop rotation. In 2001, 2002, 2003, & 2004, multiple site soil sampling 0-15cm deep were analyzed for the following soil quality properties: total soil organic matter, particulate organic matter, total nitrogen, microbial biomass nitrogen, nitrate nitrogen, and bulk density. After four years, total soil organic matter was 2.9% in farming system #1, compared to 3.7% organic matter in farming system #2 & #4, and 3.4% organic matter in farming system #3 & #5. Higher organic matter levels are an indication of improved soil quality in the certified organic farming systems.

BOARD 34 UTILIZATION OF GIS BY PUBLIC SAFETY PERSONNEL IN NORTHWEST OHIO. KAREN D. JOHNSON-WEBB¹, KDJOHNB@BGNETBSU.EDU, BRUCE W. SMITH¹, GEOGRAPHY BSMITH4@BGNET.BSU.EDU, MELISSA M. SPIREK², MSPIREK@BGNET.BGSU.EDU, 109 SOUTH HALL, BOWLING GREEN STATE UNIVERSITY, ¹GEOGRAPHY AND CENTER FOR REGIONAL DEVELOPMENT, AND ²SCHOOL OF COMMUNICATION STUDIES, BOWLING GREEN OH 43403.

Geographic information systems (GIS) can serve an important role in assisting rural communities responding to traumatic events such as a terrorist attack. With it, emergency preparedness challenges in rural areas can be addressed, such as identifying for emergency routes, the most proximate hospitals, emergency treatment centers and shelters. Northwest Ohio is a region that regularly experiences floods, tornadoes and blizzards. It is also a potential target for terrorist attacks because it has a nuclear power plant, active Lake Erie ports, is a nexus for several interstate highways and has a substantial agricultural community. The purpose of this study is to ascertain the level and quality of usage of GIS among public safety personnel in rural counties of northwest Ohio. Public safety personnel in eleven rural counties were contacted via a telephone survey in May 2004. Eleven respondents, supervising 125 other staff, were asked to identify their use of GIS in terms of level of expertise, desire to learn and current use. All respondents were familiar with GIS and its potential. Five of 11 counties reported that they used GIS. Respondents reported that 67 percent of the total number of personnel had little or no GIS expertise. All respondents reported a need for GIS training among their staff. Respondents also identified barriers to adopting GIS. Lack of practical and affordable training was the most frequent response. Suggestions to address these needs include development of GIS training oriented toward rural personnel, and tools for use after training to build GIS capacity in rural jurisdictions are outlined.

BOARD 35 SYNTHESIS OF 2-KETOLACTONE MEDIUM-SIZED RINGS FOR TRANSANNULAR REACTION STUDIES. JENNIFER A. LEISING LEISINGJA@HIRAM.EDU; (COLLEEN FRIED FRIEDCA@HIRAM.EDU) HIRAM COLLEGE. PO Box 676 HIRAM, OH 44234.

In nature there are many biologically active compounds containing medium-sized rings (7-9-membered rings). One example of this is Taxol®, currently being used in the treatment of cancer, which was discovered in the 1960s in extract from the Pacific Yew. Previous work has shown that the Taxol® core can be made in low yield through a transannular reaction. The goal of the current research project is to develop more efficient and widely applicable synthetic methods for this compound. The first step of this process is to optimize the synthesis of an 11-membered ring precursor. 6-Bromohexanal can be converted through a three-step process involving the protection of the aldehyde group, addition of diethyl malonate, and reduction to yield 7-methanol-7-octenal. Fischer esterification of this product with bromoacetic acid yields 8-oxo-2-methylenooctyl 2-bromoacetate. Previously work indicates that this compound should cyclize in the presence

of samarium iodide to form an eleven-membered ring. Current results show that the desired starting aldehyde can be synthesized in a 70% yield. Protection of the aldehyde proceeds in a much lower yield at 14%, and current studies are aimed at improving this yield. Alkylation of diethyl malonate proceeds at 24% yield, and modifications aimed at improving this yield are being explored. If the desired 11-membered ring can be synthesized a series of electrophiles will be used to explore the induction of a transannular reaction. The proposed method has the potential to provide a versatile method for the synthesis of all medium-sized rings once each of the reactions has been optimized.

BOARD 36 ROLE OF ANGIOTENSIN II IN THE REGULATION OF NHE₆, A PROTEIN IMPLICATED IN HYPERTENSION. MARY M. HETRICK, MCMARY_99@YAHOO.COM, NARA GAVINI, NGAVINI@BGNET.BGSU.EDU, LAKSHMI PULAKAT, PULAKAT@BGNET.BGSU.EDU, 217 LIFE SCIENCES BLDG., BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

The Renin-Angiotensin System (RAS) plays a vital role in the regulation of blood pressure and fluid homeostasis. RAS is regulated, in part, through the hormone Angiotensin II (Ang II), a powerful vasoconstrictor that serves as a regulator of hypertension and other cardiovascular diseases. Involvement of Ang II in the regulation of sodium levels by activation of the Na⁺/H⁺ Exchangers (NHE) has been demonstrated in many tissues. This has led to extensive research into the structure, function, and regulation of the proteins belonging to the NHE family. Of the seven known NHE isoforms, only two, NHE₁ and NHE₆, exist in heart tissue. The NHE₁ protein has been comprehensively studied and its activities inside the cell are well elucidated. The activities of the NHE₆ protein remain unclear. To analyze the conditions leading to activation of the NHE₆ protein in mammalian cells, the human breast cancer cell line MCF-7 was used. The hemeagglutinin-tagged NHE₆ plasmid was introduced to the MCF-7 cells via transient transfection. The transfected MCF-7 cells were exposed to Ang II and results implicated that the presence of Ang II was essential for strong interaction between the Ang II receptor AT₁ and NHE₆. It was ascertained that MCF-7, co-transfected with the Ang II receptor AT₂ and hemeagglutinin-tagged NHE₆, also required the presence of Ang II for activation. Further investigation revealed that tyrosine and threonine phosphorylation of NHE₆ occurred when AT₁ is activated by ligand binding. In summary, our results indicate that Ang II activates NHE₆ through its AT₁ receptor and therefore may play a crucial role in the development of pathophysiological conditions in the heart.

BOARD 37 THE DEVELOPMENT OF RNA INTERFERENCE IN PHYTOPHTHORA INFESTANS. ELISE S. DEMITRACK, EDEMITRACK@WOOSTER.EDU., (WILLIAM MORGAN) Box C-1461/COLLEGE OF WOOSTER 1189 BEALL AVE, WOOSTER, OH 44691.

Phytophthora infestans, responsible for the Great Irish Famine of 1845, causes "late blight" in which the stems and fruits of potato and tomato plants are infected. While DNA sequencing of the *P. infestans* genome is nearing completion, the function of most genes remains to be determined. Gene silencing by RNA interference (RNAi) is now becoming a common tool for functional genomics in many organisms. The purpose of this research project is to test for RNA interference as a method of gene silencing in the plant pathogen *P. infestans*. The targeted gene in these experiments is the Green Fluorescent Protein (GFP) gene. The effectiveness of introducing dsRNA through pinocytosis will be examined. This method involves the uptake of dsRNA by *P. infestans* zoospores mixed with a high concentration of dsRNA in a hypertonic medium, allowing the dsRNA to be carried into zoospores via pinocytotic vesicles. The cells are then transferred to a hypotonic medium where the dsRNA is released into the cytosol, upon vesicle lysing. Gene silencing experiments were carried out every 8 days, as zoospores are best when collected after 8 days of culture growth. Observations have been made by observing the brightness of zoospores under a fluorescent microscope, to see if GFP was effectively silenced. So far, the results of first experiments indicate that GFP has not been effectively silenced; however, it has been discovered that an increased concentration of dsRNA must be used for subsequent experiments. These results will be compared to positive control results, in which zoospores were not subjected to dsRNA. Graphs and data tables will then be generated to compare the fluorescence levels in dsRNA-treated zoospores and the positive controls.

BOARD 38 REGULATION OF THE GROWTH OF BREAST CANCER CELL LINE BY ANGIOTENSIN II RECEPTOR AT2. LAKSHMI R PILLAI, LPILLAI@BGNET.BGSU.EDU, NARA GAVINI, NGAVINI@BGNET.BGSU.EDU, LAKSHMI PULAKAT, PULAKAT@BGNET.BGSU.EDU, 217 LIFE SCIENCES BUILDING, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

In 2003, the American Cancer Society estimated 1,334,100 new cases of cancer and 556,500 deaths due to cancer. Metastasis is the most difficult aspect of cancer that contributes to such high mortality. Overexpression of receptor tyrosine kinases (RTKs) such as ErbB2 and ErbB3 will enhance metastatic properties of cancer cells. ErbB2 overexpression occurs in 20-30% of breast cancer and correlates with shorter time to relapse and lower overall survival. The human breast cancer cell line MDA-MB-453 is an example of such aggressive breast cancer. Previous studies in our lab have identified a novel interaction between the third intracellular loop (ICL) and C-terminal cytoplasmic domain of the Angiotensin II receptor subtype AT2, and the ATP binding domain of the ErbB2 and ErbB3 receptors, in yeast two-hybrid assay. The third ICL of AT2 is shown to be essential for AT2-mediated inhibition of cell growth and induction of apoptosis. ATP-binding is crucial for the growth-stimulatory signaling by RTKs. This prompted us to propose that AT2 may regulate the growth promoting signaling by ErbB2/ErbB3 receptors by sterically hindering ATP binding and preventing phosphorylation of ErbB2/ErbB3. Our preliminary results indicate that expression of AT2 in breast cancer cell line MDA-MB-453 by transient transfection leads to inhibition of cell growth and formation of multi-protein complex containing AT2 and ErbB2. We also demonstrate that not only AT2, but also AT1 is capable of forming multi-protein complex in human breast cancer cell line.

BOARD 39 CONTRIBUTIONS OF NON-ESSENTIAL TRANSMEMBRANE DOMAIN RESIDUES TO EFFICIENT ENERGIZATION OF TONB PROTEIN. KIMBERLY L. KELLER, KKELLER@BGNET.BGSU.EDU, RAY A. LARSEN, LARSER@BGNET.BGSU.EDU, DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

The gram-negative bacterium *Escherichia coli* has two systems that transduce energy from the cytoplasmic membrane to the outer membrane, the TonB system (TonB, ExbB, ExbD) and the TolA system (TolA, TolQ, TolR). These two systems contain proteins that share the same basic topology, with the transducers of energy in the systems being TonB and TolA, respectively. While the other proteins in the two systems share a 90% homology in their transmembrane domains (ExbB/TolQ and ExbD/TolR), TonB and TolA share only a conserved SHLS motif in their transmembrane domain. The SH residues of this motif are highly conserved between gram-negative species. Cross-talk occurs between these systems, albeit inefficiently. This low efficiency most likely reflects a system specificity dictated by the side groups of transmembrane domain residues not shared between TonB and TolA. In the present study, we began to examine the relative contributions of these groups by systematically removing differences to create a generic transmembrane domain which retains only the essential Ser and His residues, arrayed on an alanine scaffolding with their spatial relationships retained. TonB derivatives containing up to 14 alanine substitutions still properly partitioned to the cytoplasmic membrane and retained their ability to interact with ExbB, with half-lives comparable to that of wild type TonB. The differential ability of Exb and Tol complexes to energize such TonB derivatives provides insight into energization by the two systems.

BOARD 40 INVESTIGATION INTO PROTEIN ARGININE METHYLTRANSFERASE 7 (PRMT7) AS A POTENTIAL PROGESTERONE RECEPTOR COACTIVATOR. JENNIFER L. HOEHN, JHOEHN@MUSKINGUM.EDU, MUSKINGUM COLLEGE, 163 STORMONT ST., NEW CONCORD OH 43762; DENNIS H. DOWHAN, BERT W. O'MALLEY, DEPT OF MOLECULAR AND CELLULAR BIOLOGY, BAYLOR COLLEGE OF MEDICINE, HOUSTON TX 77030.

The nuclear receptor superfamily contains the largest group of human transcription factors, including over 50 known steroid hormone and nuclear receptors. Several previously identified protein arginine methyltransferases (PRMTs) have been found to function as steroid hormone receptor coactivators. This study aimed to determine whether a recently identified PRMT encoded on human chromosome 16q22.1, termed PRMT7, is capable of functionally coactivating steroid hormone receptors. Transfections were carried out in CV-1 cells (a monkey kidney cell line) to look at the levels of transcription of a reporter luciferase gene in the presence and absence of a vector expressing PRMT7. Levels of hormone mediated progesterone receptor coactivation increased approximately 2 to 4 fold over the levels seen of just progesterone alone when PRMT7 was

expressed. Increased levels of coactivation of approximately 3 fold were seen for the vector expressing the positive control SRC-1, a well known coactivator of the progesterone receptor. A mammalian 2-hybrid assay was also carried out in both HeLa and CV-1 cells lines to test for potential direct protein-protein interaction between PRMT7 and the progesterone receptor. For use in the assays, vectors expressing chimeric proteins were created. The mammalian 2-hybrid assay results in HeLa, but not CV-1, cells showed a 13 fold increase in the level of the luciferase reporter gene for the chimeric protein containing PRMT7 as compared to levels in the absence of ligand. This increase indicates a potential interaction or association between PRMT7 and the progesterone receptor in HeLa cells. Together these data tentatively suggest that PRMT7 may exhibit a moderate level of coactivation of the progesterone receptor.

BOARD 41 THE EFFECTS OF A COMBINATION OF TWO TETRACHLOROBIPHENYL CONGENERS (PCB 47 AND PCB 77) ON THE ENZYME; PEPTIDYLGLYCINE A-AMIDATING MONOOXYGENASE IN ANTERIOR PITUITARY CELLS. DOUGLAS A. DONAHUE¹ (DDONAHUE@WILRESEARCH.COM), ANA M. OYARCE² (AOYARCE@MCO.EDU) LEE A. MESERVE³ (LMESERV@BGNET.BGSU.EDU) AND TAMI C. STEVESON³ (TCSTEVE@BGNET.BGSU.EDU)
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Polychlorinated biphenyls (PCB) are widespread, persistent, lipophilic environmental contaminants that bioaccumulate through food webs and are concentrated in adipose tissue. Placental and lactational PCB exposure in rat offspring causes metabolic and endocrine disruptions including hypothyroxinemia, spatial learning and memory deficits, neurochemical and neurobehavioral alterations, and reproductive difficulties. Molecular causes of endocrine disruption by PCB are not well understood. The present study examined PCB effects on pituitary hormone processing enzymes. Rats, from conception to postnatal day 30, were fed control chow, or chow containing a mixture of PCB 47 and PCB 77. Offspring (n=32) were euthanized at 30 days, and blood and pituitaries collected. Primary cell cultures were grown from anterior pituitary lobes. All PCB treated animals experienced a depression in circulating levels of T₄ and T₃. Stimulation studies revealed no influence of PCB 47/77 on the ability of cultured anterior pituitary to secrete soluble forms of the hormone-processing enzyme, peptidylglycine a-amidating monooxygenase (PAM). PCB 47/77 exposure did not alter the synthesis of PAM, but PAM was more completely processed to its soluble components, PAM-2s and PAL as exposure levels of PCB 47/77 was elevated. Soluble PAM proteins first appeared at the lowest dose of PCB 47/77, 1.25 ppm. Immunostaining of the anterior pituitary cells resulted in little variation in PAM localization in PCB 47/77 treated cells compared to controls. Thus, the present study suggests that ingestion of small amounts of a mixture of two PCB congeners can have physiological consequences that may lead to alterations in the amidating enzyme.

BOARD 42 COMPARING THE DNA DAMAGE CAUSED BY FORMALDEHYDE AND GLUTARALDEHYDE IN CANCER TISSUE FIXATIONS CHIA-JUI TSAI, C TSAI@BGNET.BGSU.EDU, SCOTT ROGERS, SROGERS@BGNET.BGSU.EDU, DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

Many molecular biotechniques are useful in detecting macromolecular changes. Disease stages may be analyzed accurately based on these molecular changes. Therefore, many molecular methods have potential to be applied as routine and highly informative clinical diagnosis tools. Preservation methods become an essential consideration while preserving tissues. The most common fixative in hospitals is 10% neutral buffered formalin (NBF). However, 1% glutaraldehyde preserves cellular structure better than formalin, and recent studies indicate that it preserves DNA better than formalin. These two aldehyde-base fixatives cross-link proteins and nucleic acids to stabilize the cellular structure. Studies have shown that formalin fixation damages DNA integrity, and sequence. In this study, four kinds of human tissues (normal, sarcomas, leukemias, and carcinomas) were fixed by the standard tissue fixing procedures, separately in 10% NBF or 1% glutaraldehyde. DNA from the fixed tissues was extracted and segments of the nuclear small subunit ribosomal DNA (SSU rDNA) were amplified by polymerase chain reaction (PCR) and sequenced. The DNA sequences were analyzed by comparing the DNA changes between NBF fixed and 1% glutaraldehyde fixed. Extraction of the DNA was more difficult in glutaraldehyde-fixed tissue than in formalin fixed tissue.

However, glutaraldehyde caused less DNA sequence changes and maintained the DNA integrity better than formaldehyde. Therefore, glutaraldehyde is a better fixative than formalin for preserving DNA for clinical molecular studies of cancer tissues.

BOARD 43 THE RELATIONSHIP BETWEEN THE PINE BARK BEETLE (*IPS PINI*) AND THE TIP BLIGHT PATHOGEN (*SPHAEROPSIS SAPINEA*) ON AUSTRIAN PINE. JUSTIN WHITEHILL¹ (JUSTINGAWHITEH@HOTMAIL.COM), JEFFREY S. LEHMAN¹ (JLEHMAN@OTTERBEIN.EDU), AND PIERLUIGI BONELLO² (BONELLO.2@OSU.EDU), ¹155 MAIN ST., DEPT OF LIFE SCIENCE, OTTERBEIN COLLEGE, WESTERVILLE, OH 43081, ²DEPT OF PLANT PATHOLOGY, OHIO STATE UNIVERSITY, COLUMBUS, OH.

The ascomycete *Sphaeropsis sapinea* causes tip blight and canker formation of Austrian pines (*Pinus nigra*) resulting in extensive losses in the northeast/central US. While rain splash and wind are likely vectors for short-range dispersal of *S. sapinea*, we hypothesize that the common pine bark beetle, *Ips pini*, may vector the pathogen across long distances. Our objectives are to determine whether populations of *I. pini* carry *S. sapinea*, and whether *I. pini* carrying *S. sapinea* can transmit the disease. *I. pini* was collected from Sharon Woods Metro Park, Westerville, OH and plated on semi-selective tannic acid agar to determine the presence of *S. sapinea*. Phoresy rates (i.e., the frequency of *S. sapinea* within *I. pini* populations) were determined. Spore suspensions (100,000 spores/ml) of *S. sapinea* were used to inoculate adult beetles (10 ul per beetle), and then beetles (n=15 male and 15 female) were allowed to feed on Austrian pine logs in the greenhouse. Feeding sites were examined for discoloration, and tissue from sites was plated on semi-selective medium to confirm the presence of *S. sapinea*. *S. sapinea* was detected on 2 of 36 and 1 of 28 beetles collected in two different sampling times. After 1 week, *S. sapinea* was detected in the tissue at the feeding sites, but tissue showed little discoloration. After 3 weeks, feeding sites were highly discolored, and *S. sapinea* was re-isolated in the tissue. These results suggest that naturally occurring populations of *I. pini* carry the fungus *S. sapinea* and that beetles harboring *S. sapinea* are able to transmit the pathogen, at least under artificial conditions.

BOARD 44 MASS TRANSPORT THROUGH AN ION-EXCHANGE POLYMER FILM. ERIN I. KLENK, EKLENK@MUSKINGUM.EDU, AND (LOIS A. ZOOK-GERDAU, LZOOK@MUSKINGUM.EDU.) MUSKINGUM COLLEGE, 163 STORMONT STREET, NEW CONCORD, OH 43762.

The polymer Nafion® is commonly used in a wide variety of electrochemical applications. Sensors coated with Nafion® are used for detecting glucose, hydrogen ions, water and oxygen. Nafion® is also used as a divider in electrochemical cells such as batteries. Data from previous literature shows discrepancies in mass transport through the polymer when different counter ion sizes and concentrations were used. This project will examine the effects of ion size and concentration on mass transport of redox probes through Nafion® coated electrodes. Rotating disk and cyclic voltammetry will be used to measure mass transport within the films. Counter ions include Li⁺, Na⁺ and K⁺ in the form of the nitrates. Different concentrations of a counter ion will also be examined. If consistent data for the ion size and concentration are derived, then the project will examine the effects of charge using divalent counter ions such as Mg²⁺ or Ca²⁺. Also if ion size, concentration and charge are found to be altering mass transport through the polymer film for the initial redox probe, a series of other redox probes of differing hydrophobicity will be examined.

BOARD 45 NOVEL POLYIMIDES AS METAL ION SCAVENGERS. ALBERT T. MORELL, AMORELL@MUSKINGUM.EDU, (PAUL S. SZALAY PSZALAY@MUSKINGUM.EDU), MUSKINGUM COLLEGE, 163 STORMONT STREET, NEW CONCORD OH 43762.

The plan is to synthesize new polyimides from 18-crown-6 dianhydride and aromatic diamines. These polyimides will be investigated for ability to scavenge metal ions from organic and aqueous solutions. The first step in the preparation of polyimides is the formation of a polyamic acid. The polyamic acid is then converted into a polyimide via a condensation reaction. The polyamic acids will be transformed into the corresponding imide by either thermal cycle treatment of the polymer film on a glass plate or exposure in solution to a dehydrating agent such as acetic anhydride. Reaction conditions that have been investigated will be discussed along with variations under consideration. Characterization of the polyimide products using UV-visible and infrared spectrophotometries will be discussed. Solubility tests will also be conducted on the polyimides to assess the range of solvents they could conceivably remove metal ions from. A procedure for measuring the scavenging ability will be developed through exposure of the polyimides to potassium thiocyanate. The uptake of the potassium and the associated thiocyanate

anion will be evaluated by infrared and UV-visible spectrophotometries. Subsequent investigations including heavy metals will then be carried out.

BOARD 46 SITE FIDELITY AND POPULATION DYNAMICS IN WOOD TURTLES (*GLYPTEMYS INSCULPTA*) ALONG THE AU SABLE RIVER IN NORTHERN MICHIGAN. ELIZABETH J. CLAIBORNE, S05.ECLAIBORNE@WITTENBERG.EDU, TIMOTHY L. LEWIS, TLEWIS@WITTENBERG.EDU, PHILIP W. HUBER, PHUBER@FS.FED.US, WITTENBERG UNIVERSITY DEPT OF BIOLOGY, P.O. 720, SPRINGFIELD OH 45501.

Wood turtle (*Glyptemys insculpta*) populations are declining in many areas of North America, and research focused on this species and its habitat is crucial for their survival. We studied a wood turtle population that inhabited areas around the Au Sable River in Mio, Michigan from 1998 to 2003 to determine seasonal and annual site fidelity in wood turtles, and to examine the dynamics of the population. Captured wood turtles (n=110) were marked, and the sex, age, weight, and carapace size were recorded. Additionally, 29 were fitted with radio transmitters. There were more females (63) than males (29) captured originally. Of the turtles captured, 60 were recaptured. Previous studies showed the average home range diameter for this Michigan population was 500 m. Therefore, a recaptured wood turtle found within that radius of its original location showed site fidelity. Based on this definition, 9 out of 60 recaptured turtles exhibited annual site fidelity, and 47 of the recaptured turtles showed seasonal site fidelity. Although site fidelity makes wood turtles more vulnerable to habitat loss, it is beneficial for conservational efforts. It increases our ability to monitor populations, and it also allows us to identify and protect habitats occupied by wood turtles.

BOARD 47 BEHAVIORAL RESPONSES OF *BISPIRA BRUNNEA* AND *ANAMOBAEA ORSTEDII* TO SHADOW, TOUCH/APPROACH, AND VIBRATION STIMULI ON SAN SALVADOR, BAHAMAS. ELIZABETH J. CLAIBORNE, S05.ECLAIBORNE@WITTENBERG.EDU, DANIELLE M. CLIFFORD (S06.DCLIFFORD@WITTENBERG.EDU), MARK E. YEHL, S06.MYEHL@WITTENBERG.EDU, JAMES M. WELCH, JWELCH@WITTENBERG.EDU, WITTENBERG UNIVERSITY, DEPT OF BIOLOGY, PO Box 720 SPRINGFIELD OH 45501.

The feather duster worms *Bispira brunnea* (social feather duster) and *Anamobaea orstedii* (split-crown feather duster) are tube-building worms that extend their radioles when unthreatened and retract them into their tube when presented with alarming stimuli. In this experiment, these two species were exposed to shadows, touch/approach stimuli, and vibrations to elicit retraction and observe differences in behavior between the species. It was hypothesized that the worms would not respond differently to the three stimuli, and that the two species' responses would be similar. These tests were conducted in June 2004 on San Salvador, Bahamas in three locations: Sand Dollar Bay, Snapshot Bay, and North Point. Each test was conducted on 30 or more of each species. Shadows were cast with a dive slate at varying distances; the touch/approach test was administered by attempting to touch the crown of the feather dusters; the vibrations were made by tapping the substrate with a finger 5 cm from the tube of the worms. Significantly more split-crown feather dusters than social feather dusters responded to the shadow stimuli ($\chi^2_1=12.85$; $p<0.001$). There was no significant difference in the number of responses to touch/approach or vibration stimuli. Time to re-emergence for both species was longest in the touch/approach test. The split-crown feather dusters took longer to re-emerge after all stimuli than social feather dusters. Overall, split-crown feather dusters are more sensitive to alarming stimuli than social feather dusters.

BOARD 48 CORRELATIONS OF SPINE NUMBER WITH BODY SIZE IN RED ROCK SEA URCHIN, *ECHINOMETRA LUCUNTER*. KELLY M. MCKAY S05.KMCKAY@WITTENBERG.EDU, JENNY M. MEYER S05.JMEYER@WITTENBERG.EDU, CARL B. POOLE S05.CPOOLE@WITTENBERG.EDU, KELLY M. MCKAY 615 WOODLAWN AVENUE, SPRINGFIELD OH 45504.

The ecological function of sea urchin spines is not fully known. Research was conducted to determine if the number of spines changes with an increase in body size of the red rock sea urchin, *Echinometra lucunter*. The red rock sea urchin is found throughout the Caribbean and mainly inhabits rocky intertidal zones. It has three size classes of spines that aid in defense, locomotion and food capture. We tested to see if the number of spines varies with increasing urchin size. The two largest size classes of spines were counted from 30 individuals collected from 5 separate sites off San Salvador, The Bahamas. Spine number ranged from 6.98 spines per centimeter to 16.39 spines per centimeter. Data

indicates that spine number increases as the body size increases as all correlations were positive. The strongest correlation was between body volume and secondary spines at $R^2=0.87$ and the weakest positive correlation was between test diameter and primary spines at $R^2=0.21$. The increase in spine number is mainly thought to be defense related. It is hypothesized that the additional spines aid in additional locomotion and food capture necessary for the larger urchins.

BOARD 49 ALGAE AND GRAZING HABITS OF THE SAN SALVADOR RED ROCK SEA URCHIN, ECHINOMETRA LUCUNTER. MEREDITH A. BEAVER, S06.MBEAVER@WITTENBERG.EDU, MELISSA O. MEKESA, S06.MMEKESA@WITTENBERG.EDU, KELLY A. PRASSER, S06.KPRASSER@WITTENBERG.EDU. MEREDITH BEAVER, WITTENBERG UNIVERSITY Box 2484, SPRINGFIELD OH 45501.

Red rock sea urchins, *Echinometra lucunter*, are common around San Salvador, Bahamas. In areas containing large populations of these urchins, there also appears to be a corresponding decrease of algae. As noted this could be due to the herbivorous effects of the urchins. This was investigated by monitoring the algae-specific food preferences of urchins. One sample of algae was collected from 8 different species including 1 calcareous alga: Mermaids Tea Cup (*Udotea sp.*), Network (*Microdictyon*), *Chymodopia sp.*, Leafy Flat Blade (*Stypodium sp.*) *Dicyoptera sp.*, Encrusting Sea Fan (*Lobophora*), Blue Green (*Cyanophyta*), and White Scroll Algae (*Padina*). After collecting 20 red rock sea urchins, their feeding habits were observed to determine if certain species of algae were consumed or preferred. The red rock sea urchins were kept in a tank where the set up mimicked their real environment as much as possible. Water was flowing consistently throughout the tank and at night a board was placed over the top of the tank so no light would disturb them. When observing the red rock sea urchins alga species could be determined when they ingested any alga. Over a two week period, the edibility of 8 different algae species were confirmed. This reinforced the general herbivore niche urchins are assumed to fill.

BOARD 50 ROLE OF PILING IN TRICOLORED HERMIT CRABS, CLIBANARIUS TRICOLOR. ERIC J. RELLINGER, S07.ERELLINGER@WITTENBERG.EDU, JENNA M. AMATULLI, S05.JAMATULLI@WITTENBERG.EDU, ERIC K. UNDERWOOD, S05.EUNDERWOOD@WITTENBERG.EDU, KATHLEEN A. REINSEL, KREINSEL@WITTENBERG.EDU, DEPARTMENT OF BIOLOGY, WITTENBERG UNIVERSITY, SPRINGFIELD, OH 45504.

Tricolored hermit crabs, *Clibanarius tricolor*, display diel activity, in which they form dense piles of up to 1500 individuals during the day and disperse at night. Preliminary observations suggest that group formation may provide protection from predation. To test this hypothesis, crabs were tethered, either grouped into piles ($N=75$) or isolated as individuals, and placed in their natural environment, the subtidal habitat of North Point (San Salvador, Bahamas). Crabs were exposed to potential predation by fish, crabs, or other crustaceans for 10h during the day and recollected to determine the incidence of predation. Predation was signified by either: (1) absence of a crab within the shell and damage to the shell or (2) absence of both the crab and its shell from the end of the tether. The rates at which isolated individuals and group members were preyed upon were not significantly different by paired t test ($t_3 = 3.2$, $p = 0.34$), suggesting that piling does not serve as a means of preventing predation on *C. tricolor*. Piling by *C. tricolor* may be a response to (1) optimal foraging conditions, (2) increased access to mates, or (3) increased participation in shell vacancy chains.

BOARD 51 A NOVEL DESCRIPTION OF THE LIFE CYCLE AND INTERACTIONS OF A FILAMENTOUS SOIL FUNGUS (SCOPULARIOPSIS BREVICAILIS) WITHIN TICKS. ERIC J. RELLINGER¹, S07.ERELLINGER@WITTENBERG.EDU, JOSHUA B. BENOIT¹, S05.JBENOIT@WITTENBERG.EDU, JAY A. YODER¹, JYODER@WITTENBERG.EDU, SETH A. MURRAY¹, HS.SMURRAY@WITTENBERG.EDU, LAWRENCE W. ZETTLER², LWZETTLER@HILLTOP.IC.EDU, ¹DEPARTMENT OF BIOLOGY, WITTENBERG UNIVERSITY, SPRINGFIELD, OH 45504, ²DEPARTMENT OF BIOLOGY, THE ILLINOIS COLLEGE, JACKSONVILLE, IL 62650.

We report internal isolation of *Scopulariopsis brevicaulis*, a common mold, from the lone star tick, *Amblyomma americanum*, and American dog tick, *Dermacentor variabilis*. Eggs, larvae, nymphs and adults ($N=160$ /stage) were analyzed for internally present fungi, revealing >80% recovery of *S. brevicaulis* and no other fungi. As evidenced by these high fungal loads, *S. brevicaulis* is a transstadial symbiont of ticks that is transmitted to host before oviposition. To examine the extent of fungal infection, midgut, dorsal cuticle (containing numerous integumental glands), salivary glands, and hemolymph ($N=375$ /tissue) were obtained through aseptic dissection. Solid tick tissues were surface sterilized and plated onto potato dextrose

agar, while hemolymph was a direct inoculant. Resulting hyphal tips were subcultured for identification. In contrast to salivary glands and midgut (<4% recovery), there was >90% recovery of *S. brevicaulis* from hemolymph and cuticle, with hyphae originating from integumental glands (light microscopy, 1000x under oil), suggesting that conidia circulate within the hemocoel and progress outward through integumental glands. No antagonistic effects are imposed, as evidenced by ticks having *S. brevicaulis* removed by an antimycotic (Amphotericin, topically applied, glass capillary fed and injected) and water-treated controls (total $N=515$ ticks) showing comparable water content, transpiration rate, and water vapor usage, when body water levels (ANOVA; $p<0.05$) were tracked at varying relative humidities with an ultramicrobalance. Ticks supply water and nutrients benefiting *S. brevicaulis*, and this fungus may produce tick sex pheromone components (recent GC/MS data).

BOARD 52 INCREASED ALGAL GROWTH AS A RESULT OF COCOA DAMSELFISH TERRITORIALITY IN SAN SALVADOR, BAHAMAS. STACEY L. JOSIF, S05.SJOSIF@WITTENBERG.EDU, KELLI J. FAUST, S05.KFAUST@WITTENBERG.EDU, CARRIE S. HAPP, S05.CHAPP@WITTENBERG.EDU, KATHLEEN A. REINSEL, KREINSEL@WITTENBERG.EDU, WITTENBERG UNIVERSITY, DEPT OF BIOLOGY, P.O. Box 720, SPRINGFIELD OH 45501.

Stegastes variabilis, the cocoa damselfish, has been shown to defend territories against other herbivores, resulting in the growth of algal farms. These farms ensure the maintenance of algal diversity and population size, while providing food, shelter, and a nest site for the fish. The purpose of this study was to investigate the algal farms in San Salvador, Bahamas, resulting from *S. variabilis* territoriality and to compare them to surrounding areas. The null hypothesis was that there would be no increased algal growth within the territory in comparison to the surrounding area. Fish territories were chosen at random in six different locations surrounding San Salvador, Bahamas. A 1-m² quadrat was placed over the center of each territory, and the algal height was measured in each corner and the center of the quadrat. Percent algal cover was also estimated for each quadrat. The same measurements were then taken in a control region, chosen at random, two meters away from each individual territory. Average algal heights and percent algal cover in territory and control quadrats were compared using paired t -tests. Both the average algal height ($t_{39} = 7.25$, $p < 0.001$) and percent cover ($t_{39} = 3.12$, $p < 0.01$) were significantly higher within the *S. variabilis* territories compared to the surrounding area. Thus, the territoriality of the cocoa damselfish results in the increased growth of algae on coral reefs in San Salvador, Bahamas.

BOARD 53 INTERSPECIFIC & INTERSEXUAL DIFFERENCES IN CHEMORECEPTOR DENSITIES OF BLADDER GRASSHOPPERS (ORTHOPTERA, PNEUMORIDAE) ADAM R. SMITH ADAMI@BGNET.BGSU.EDU, (MOIRA VAN STAADEN MVS@CASPAR.BGSU.EDU) DEPT OF BIOLOGICAL SCIENCES, AND JP SCOTT CENTER FOR NEUROSCIENCE, MIND & BEHAVIOR LIFE SCIENCES BUILDING, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

Life history traits, from mating strategies to feeding patterns, are often reflected in an organism's sensory array. By profiling the receptor arrays of closely related species with known life history strategies, it is possible to determine how differing strategies are reflected in receptor patterns. The mouthparts of Acridid generalist feeders display a more diverse array of receptors than do those of specialist feeders. However, receptor distributions have not previously been investigated for more primitive grasshoppers, nor for antennae. The antennal arrays of two closely related species of bladder grasshoppers (Orthoptera, Pneumoridae) were profiled using Scanning Electron Microscopy (SEM) to determine differences in patterns of receptor structure and density. *Bullacris membracioides* is a specialist feeding on only two host species, whereas its congener *B. unicolor* is a generalist featuring at least eight plant species in its diet. If receptor patterns for the antennae follow those observed for the labrum, *B. unicolor* should have a much more diverse sensory array. Intersexual comparisons were also performed to determine the feasibility of pheromone detection in contributing to mate selection and location. Preliminary analysis indicates interspecific differences in the basic antennal structure as well as receptor profiles.

BOARD 54 EXTRA-PAIR PATERNITY AND THE PIED FLYCATCHER BENJAMIN S MCCARTY BMCCARTY@WOOSTER.EDU THE COLLEGE OF WOOSTER, KERN, M. AND FRAGA, D. 1189 BEALL AVENUE, WOOSTER, OHIO 44691

This research in progress focuses on the extra-pair copulations that exist outside of a pair bond in the *Ficedula hypoleuca* (Pied Flycatcher), a small migratory bird that exhibits polygynous and polyterritorial mating. Pied Flycatchers usually stays with the first

female they mate with and provide parental care for the young and any subsequent extra-pair copulations the male contributes very little parental care to help raise the chicks. The purpose of this study is to document the frequency of extra-pair copulations (EPCs) in two Welsh populations and a correlation test will be used to determine if there are any connections between the number of EPCs and factors such as male quality, breeding site quality, and distance. Blood samples have already been collected and the genomic DNA isolated. Preliminary data indicates that it is of sufficient quality for PCR analysis of microsatellite DNA to determine paternity. The paternity of the chicks in a given brood is to be assessed by DNA fingerprinting at four loci that have been previously described for this species. Using classical genetic techniques, paternity can be determined and this information correlated with data already collected concerning other factors that may influence the EPC frequencies.

BOARD 55 FOR HOW LONG DO NEIGHBORS REMAIN "DEAR ENEMIES" TO RESIDENT MALE CONVICT CICHLIDS (*CICHLASOMA NIGROFASCIATUM*). SARA M. PERRY, SPERRY@WOOSTER.EDU, (MICHELLE SOLENSKY, MSOLENSKY@WOOSTER.EDU), THE COLLEGE OF WOOSTER, 1189 BEALL AVE, BOX C-2480, WOOSTER OH 44691.

Convict cichlid fish, *Cichlasoma nigrofasciatum*, are a territorial species native to Costa Rica that exhibit the dear enemy phenomenon. In dear enemy recognition, residents react more aggressively to visual contact with unfamiliar conspecifics than a conspecific with which they are familiar. Because the familiar neighbor is less of a threat than a completely unfamiliar intruder, residents are expected to decrease energetically expensive (costly) and risky fighting behaviors toward the familiar conspecific. This study investigates whether resident convicts continue to exhibit dear enemy recognition toward a familiar conspecific after a 2 or 5 day absence of visual contact. The hypothesis is that there will be a decline in dear enemy recognition in resident convicts when there is a period of no visual contact between the resident and neighbor. This hypothesis predicts that while residents and neighbors are in visual contact with each other, dear enemy recognition will persist; however, as the length of no interaction increases, the resident's familiarity toward the neighbor will decrease, causing dear enemy recognition to decline. Forty convict cichlids were used for this experiment. After a 96 hour acclimation period, the resident's responses to a neighbor and an intruder were recorded. A cardboard divider was placed between adjacent tanks to eliminate visual contact between a resident and neighbor pair for 2 or 5 days, after which the resident's responses to its neighbor and an intruder were again measured.

BOARD 56 A COMPARISON OF THE IMPACT OF ZEBRA MUSSELS (*DREISSENA POLYMORPHA*) ON TWO CENTRAL OHIO STREAMS. ROBERT C. BAERS R_BAERS@HOTMAIL.COM, (MICHAEL A. HOGGARTH, MHOGGARTH@OTTERBEIN.EDU), DEPARTMENT OF LIFE AND EARTH SCIENCES, OTTERBEIN COLLEGE, WESTERVILLE OH 43081 AND DOUGLAS D. KANE, KANE.45@OSU.EDU, DEPARTMENT OF EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY, THE OHIO STATE UNIVERSITY, COLUMBUS, OH 43210.

Introduced species affect community structure wherever they occur. Zebra mussels (*Dreissena polymorpha*) have been shown to compete with zooplankton for food in lakes and macroinvertebrates for space in the benthos. This study examines the effects zebra mussels have on zooplankton and macroinvertebrate community structure in Alum Creek and Big Walnut Creek, Westerville, Ohio. The duration of this study was performed in 2004-2005 in Alum Creek Reservoir, Hoover Reservoir, and the two streams that flow out of these reservoirs, Alum Creek and Big Walnut Creek. Zebra mussels have been introduced into both impoundments however their population density is much greater in Alum Creek Lake than in Hoover Reservoir. This study relates sets of bi-monthly samples throughout a duration of six months, September 2004 - February 2005, of population densities for zebra mussels and zooplankton for the two reservoirs. In addition, translocation of zebra mussels downstream of these reservoirs have been studied by using modified Hester-Dendy multiplate samplers. We expect to find an inverse relationship between zebra mussel densities and zooplankton densities in the impoundments and between zebra mussel densities and macrobenthic organisms in the two creeks.

BOARD 57 VARIATIONS IN MACROINVERTEBRATE COMMUNITIES AS A RESPONSE TO VARIATIONS IN ALLOCHTHONOUS INPUTS. ADAM B LAMMERS, TRASHY983@HOTMAIL.COM. (MICHAEL HOGGARTH, MHOGGARTH@OTTERBEIN.EDU). DEPT OF LIFE AND EARTH SCIENCES, OTTERBEIN COLLEGE, WESTERVILLE, OH 43081.

Allochthonous inputs from the riparian corridor provide a great deal of benefits to stream communities. Macroinvertebrates use this leaf fall as both habitat and a major food source. However, there are many variations in streamside vegetation. Especially with environmental landscaping so popular in city planning, streamside tree species range from upland to wetland varieties as well as deciduous to coniferous varieties. It is important to understand the effects of these variations on the communities in the stream, including macroinvertebrates. Leaf litter was collected from sycamore, *Platanus occidentalis*, pin oak, *Quercus palustris*, sweet gum, *Liquidambar styraciflua*, and white pine trees, *Pinus strobus*, and placed in leaf litter traps composed of 1 cm metal screen attached to concrete blocks. These traps allow for access to the allochthonous material while not allowing other leaf fall to enter the trap. The leaf litter traps were placed in two riffles in Alum Creek downstream from an impoundment. These leaf litter traps were monitored monthly between late fall of 2004 and early spring of 2005, the period of time when annual leaf fall is naturally present in the stream. Macroinvertebrates were tallied from each sample of leaf litter. Species richness and Shannon-Weiner Index values were determined and compared with control data acquired from Hester-Dendy plates placed in the stream during the same time frame. Student T-tests were used to determine statistical significance.

BOARD 58 SUBSTRATE PREFERENCE IN FINGERNAIL CLAMS (*SPHAERIIDAE*). CHANTIL M. STULL, STULLY83@YAHOO.COM, (MICHAEL A. HOGGARTH, MHOGGARTH@OTTERBEIN.EDU), DEPT OF LIFE AND EARTH SCIENCES, OTTERBEIN COLLEGE, WESTERVILLE OH 43081.

Ohio lakes and streams support a broad diversity of freshwater mollusks. Among these are the bivalves known as fingernail clams in the family *Sphaeriidae*. Fingernail clams live in lentic and lotic habitats buried in the substrate. The goal of this study is to determine if there is a relationship between the size of the clam and the size of the substrate choice. This study examines substrate selection by the three genera in this family: *Sphaerium*, *Musculium*, and *Pisidium*. *Sphaerium* are generally larger with thick shells, *Musculium* are as large as *Sphaerium* and have thinner shells, and *Pisidium* are relatively small with thick shells. The hypothesis for this study is that the clams will select substrates as a function of their size (length). Clams were collected from Little Darby Creek, Madison County, Ohio and the Olentangy River, Franklin County, Ohio. A total of 30 clams were collected. Each clam was then measured and identified. Following this, clams were moved to an aquarium with four distinct sediment sizes forming the bottom of the tank. Clams were allowed to move for 48 hours, after which time all had buried. Once they buried themselves in the substrate they were determined to have made a choice. Preliminary results suggest that fingernail clams select smaller substrate, based on shell length, regardless of taxonomic differences. Additional analysis of shell thickness as it relates to substrate selection is ongoing. A correlation test will show the relationship of the clams to their substrate choice.

BOARD 59 A PRELIMINARY LIMNOLOGICAL INVESTIGATION OF ROSE LAKE, HOCKING COUNTY, OHIO. MICHAEL L. AUGHENBAUGH, S05.MAUGHENBAUGH@WITTENBERG.EDU, LENORE A. BAMBERGER, S06.LBAMBERGER@WITTENBERG.EDU, DANA M. WILKINSON, S05.DWILKINSON@WITTENBERG.EDU, (HORTON H. HOBBS III, HHOBBS@WITTENBERG.EDU), DEPT OF BIOLOGY, WITTENBERG UNIVERSITY, PO Box 720, SPRINGFIELD, OH 45501-0720.

During a study of the Salt Creek watershed in south central Ohio, Rose Lake was sampled at meter intervals on 24 September 2004 before fall turnover, no statistical analysis were conducted. This mesotrophic lake has a surface area of 6.9 ha, a maximum depth of 14m, is narrow and elongated along a NNE-SSW axis, and the dam for this small reservoir is anchored to the Black Hand Sandstone. Due to the lack of ions in sandstone, there is little buffering capacity. Water samples were obtained using a Kemmerer Bottle, dissolved oxygen, pH, conductivity, temperature and depth were measured with a YSI 6600 Multi-parameter Water Quality Monitor, and plankton were collected with a 30 liter Schindler-Patalas Plankton Trap and a Wisconsin plankton net. The epilimnion of the stratified lake extended to approximately 5m within the 14m water column. Saturated dissolved oxygen levels dropped precipitously within the metalimnion, creating anoxic conditions in the hypolimnion (clinograde oxygen curve) overlying a sapropel substrate. Sulfate-sulfur (surface = 13mg/l, bottom = 0mg/l) and pH values (surface = 7.2, bottom = 6.5) showed a similar pattern whereas specific conductance and iron increased significantly below 5 and 8m, respectively. Nitrate-nitrogen, orthophosphate, and silica dioxide showed no distinct depth-distribution patterns. Overall, plankton densities were quite low, ranging from 255 - 2869/liter, with *Dinobryon* being the most abundant plankton. Densities were greatest at 4m and lowest near the water-sediment interphase. Low plankton counts and low turbidity (6 NTU) in the epilimnion were correlated with a Secchi disk reading of

4.1m. A unusual feature of the lake is the occurrence of the olindiid freshwater cnidarian, *Craspedacusta sowerbyi* Lankester, medusae of which were observed in low densities in the epilimnion. The occurrence of which has never been completely documented in Ohio.

BOARD 60 ARE SEX RATIOS IN BLUEBIRDS (*SIALIA SIALIS*) INFLUENCED BY ENHANCED FOOD AVAILABILITY? ERICA W. LUNDBERG, LUNDBERGE@KENYON.EDU, P. O. BOX 1601, GAMBIER OH 43022 AND E. RAYMOND HEITHAUS, HEITHAUS@KENYON.EDU, KENYON COLLEGE.

Evolutionary theory predicts shifts in sex ratios to higher male frequency when resource levels are especially high and mating success shows high variance. In 2003, *Sialia sialis* at the Brown Family Environmental Center at Kenyon College, Knox County, OH produced more males than females; this breeding season had high levels of rainfall (which may indicate more insects as food). To test for repetition of this pattern, bluebird breeding and feeding rates were monitored during the 2004 breeding season. To experimentally manipulate resource levels, randomly selected breeding pairs were given supplemental access to mealworms. The breeding season of 2004 had above average amounts of precipitation, but produced no significant deviation from a 50% sex ratio among hatchlings (27 males and 25 females). The enrichment experiment also had no effect on the weight or tarsus lengths of the young, though a slight effect was detected on wing length (GLM, $p=0.039$, $F=4.78$). Parents tended to consume the added mealworms rather than feed them directly to their offspring. An unexpected blowfly infestation within some bluebird boxes had a detrimental effect on the bluebirds due to the blowflies attaching to the hatchlings and feeding on them, thus decreasing size of the hatchlings and survival rates. In 2004, feeding rates were 60% lower than those of 2003 (7.2 trips/hr vs. 12.1 trips/hr, GLM, $F=6.87$, $p=0.012$). Assuming this reflects lower resource levels in 2004 than 2003, the observed one to one ratio of male to female hatchlings is tentatively consistent with the prediction that skewed sex ratios occur only under conditions of resource surplus.

BOARD 61 SMALL-SCALE SILVICULTURAL EFFECTS ON SOIL CO₂ EFFLUX AND SOIL TEMPERATURE IN MIXED OAK FORESTS OF SOUTHEASTERN OHIO. DAWN R. BLACK, DB642701@OHIO.EDU AND KIM J. BROWN BROWN4@OHIO.EDU, DEPT OF ENVIRONMENTAL & PLANT BIOLOGY, 317 PORTER HALL, OHIO UNIVERSITY, ATHENS, OH 45701.

Soil CO₂ efflux (R_s) is a good indicator of forest ecosystem health, since it is mainly a product of autotrophic and heterotrophic respiration. Studies examining the effects of forest thinning and/or prescribed fire on R_s at the landscape scale have resulted in varied effects, due to heterogeneity of soil properties. To examine thinning and burning effects on R_s, while controlling for variation in soil properties, we utilized a randomized complete block design with two effects, slope position (upper or lower) and canopy cover (full or 50%). Five replicates (total of 20 blocks) were implemented in mixed oak forests of southeastern Ohio. Each block consisted of five 2x2 m treatments: control, low fire intensity, high fire intensity, fertilization, and litter removal. The fertilization treatment was intended to simulate the effects of ash deposition following fire, while litter removal was meant to simulate the effects of litter consumption by fire, without the heat. R_s, soil temperature, and soil moisture was measured from April to November 2004. Continuous monitoring of soil temperature (-2 cm) from May to December 2004 in the upper slope blocks revealed greater temperatures in the full CC high burn, 50% CC low burn, and 50% CC litter removal treatments. R_s measurements showed no clear treatment effect throughout the season, although blocks located on upper slopes tended to have greater R_s rates than blocks located on lower slopes. Continued measurements should provide further enlightenment into the effects of silviculture on R_s and associated soil properties.

BOARD 62 MEASURING FEMALE AND MALE DOMINANCE OF *PASSER DOMESTICUS* WITHIN CAPTIVE POPULATIONS. JENNIFER L. ZANGMEISTER, ZANGMEISTERJ@KENYON.EDU, P. O. BOX 1842, GAMBIER OH 43022, E. RAYMOND HEITHAUS, HEITHAUS@KENYON.EDU, KENYON COLLEGE.

Establishing the factors that distinguish dominance ranks among individuals in avian flocks provides a tool by which to predict behavior and interactions with other individuals, including different avian species. Within flocks of *Passer domesticus*, the English House Sparrow, badge size predicts male dominance over other males. However, female versus male dominance patterns are less clear. Previous studies are contradictory when describing female vs. male dominance, disagreeing over the

presence of seasonality in dominance hierarchy. We studied dominance behaviors in captive sparrows in a 24' by 24' by 10' aviary at the Brown Family Environmental Center at Kenyon College in Knox County, Ohio. Sunflower seeds were provided in a feeder (preferred) or scattered on the ground mixed with wood chips (requiring more time and effort to collect). Measurements included badge width and length, length of wing, tarsus, and beak, and body weight. All birds were banded with a color band with a Passive Integrated Transponder (PIT) tag, which allowed constant monitoring of access to the feeder (N = 9 and 11 birds and 20 and 13 days for two flocks). As measured by time at the feeder, rank varied consistently over days for individual birds. Male dominance was predicted by badge size in both flocks as previously reported (Regression, R-Sq = 52.8%, $p = 0.016$). There was no significant pattern in male versus female dominance (ANOVA $F = 0.84$, $df_{\text{gender}} = 1$, $df_{\text{error}} = 15$, $p = 0.374$). The reason is unclear for a lack of a pattern in dominance associated with sex. No breeding behaviors were observed while the flocks were in the aviary, so the importance of sex in determining dominance roles may have decreased.

BOARD 63 THE EFFECT OF HABITAT TYPE ON THE REPRODUCTIVE SUCCESS OF BLUEBIRDS (*SIALIA SIALIS*). KATELIN P. ZALUSKI, ZALUSKIK@KENYON.EDU, (E. RAYMOND HEITHAUS, HEITHAUS@KENYON.EDU), KENYON COLLEGE, P.O. BOX 942, GAMBIER OH 43022.

Habitat quality is hypothesized to influence sex ratios in broods of certain species of birds including *Sialia sialis*, the Eastern Bluebird. In 2004, breeding success was monitored for 16 nesting attempts at the Brown Family Environmental Center at Kenyon College in Knox County, Ohio. Nest boxes along a bluebird trail were classified as embedded in agricultural, prairie, sparse tree, yard, and roadside habitats. Measures of reproductive success included fledgling weight, wing length, and tarsus length as well as the number of eggs produced and eggs hatched. Seventy eggs were laid, leading to 57 hatchlings and 48 fledglings. Habitat type had no detectable influence on egg production, hatchling number, or sex ratio which did not deviate significantly from 50% (Chi-square tests, all $P > 0.34$). Contrary to the results from a similar study in 2003, nest boxes classified as adjacent to agriculture did not produce a higher rate of reproductive success based on fledgling weight. Rather, nest boxes close to short, mowed grass produced heavier fledglings (27.9 g vs 25.7 g, 2-sample T test, $P = 0.03$). Proximity to roads tended to negatively influence success as indicated by fledgling weight, but with marginal statistical significance (25.8 g vs 26.4 g, 2-sample T test, $P = 0.07$). Preference for habitats with short grass has been reported previously; success near agricultural fields is expected to depend on crop type and form of pest control and may be more variable in effect over space and years.

BOARD 64 DISPLACEMENT OF NATIVE FLORA BY INVASIVE SPECIES *RANUNCULUS FICARIA* L. AND EFFECTIVENESS OF REMEDIATION IN SOUTHWEST OHIO. BREANN M. HOHMAN, HOHMAN.4@WRIGHT.EDU, JAMES R. RUNKLE, JAMES.RUNKLE@WRIGHT.EDU, WRIGHT STATE UNIVERSITY, DEPT. OF BIOLOGY, DAYTON OH 45435-0001.

Ranunculus ficaria L. (lesser celandine), an exotic species, is altering the herbaceous layer of riparian zones and forest floors in both Canada and the United States. Its key invasive characteristics include vegetative reproduction through tuber production and the ability to leaf out before most native species. This study, conducted in spring and summer of 2004, investigated which species were being displaced by this invasion and which species would be the first to reestablish remediated areas adjacent to existing *R. ficaria* populations in Taylorsville and Englewood Metroparks in Montgomery County. We hypothesized that *R. ficaria*'s presence would have a negative impact on the native diversity and that *R. ficaria* would reestablish in remediated areas faster than native flora. Species identification and percent cover were recorded within thirty-five to forty 50cm x50cm plots in riparian areas with and without *R. ficaria*. T-tests revealed a significant displacement of eight species: *Floerkea proserpinacoides*, *Mertensia virginica*, *Erythronium albidum*, *Claytonia virginica*, *Pilea pumila*, *Polygonum persicaria*, *Alliaria petiolata*, and *Carex* sp. (p -values < 0.05). Percent cover vegetation analysis was also used to assess the success of a remediated ravine surrounded by existing populations. Number of species per plot was analyzed using ANOVA followed by Tukey's procedure. Removal sites showed a higher average number of species than sites inhabited by *R. ficaria* (p -value < 0.05). The importance of ecological and remedial data of invasive species is crucial in the control success. Studies on the effects of invasion and remediation of *R. ficaria* will help prioritize and control the spread of this species.

BOARD 65 CHARACTERIZATION OF MICROORGANISMS FROM LAKE VOSTOK ACCRETION ICE USING MOLECULAR AND EPIFLUORESCENT MICROSCOPY ANALYSIS. TOM D'ELIA ,TDELIA@BGNET.BGSU.EDU, RAM VEERAPANENI, RAMV@BGNET.BGSU.EDU, VINCENT THERAISNATHAN TVINCEN@BGNET.BGSU.EDU, SCOTT O. ROGERS ROGERS@BGNET.BGSU.EDU. **BOWLING GREEN STATE UNIVERSITY, DEPT OF BIOLOGY, BOWLING GREEN, OHIO 43402.**

The primary objective of this study is to isolate and characterize accretion ice from Lake Vostok, Antarctica. Lake Vostok is one of many subglacial lakes in Antarctica, and represents a unique site for microbial investigation. It is approximately the same size as Lake Ontario, but is located below the 4000m thick Antarctic Ice Sheet. The ice at the base of the Antarctic Ice Sheet accreted to the overhead glacier 21,000-33,000 years ago, and is composed of water from various locations across the lake. A diverse range of microbes has already been revealed in the ice including algae, diatoms, bacteria, filamentous fungi, yeasts and actinobacteria. Due to the constant problem of contamination, there has been some dispute over the number of microbial cells/ml reported, which have ranged from 1-36,000 cells/ml. Our 5% sodium hypochlorite decontamination procedure has been demonstrated to be effective at removing extant microorganisms. Accretion ice from depths ranging from 3567, 3581, 3584 and 3619m are being analyzed using PCR (polymerase chain reaction) amplification of fungal and bacterial ribosomal DNA intergenic spacer regions, culturing and epifluorescent analysis of viable and nonviable cells. Members of the alpha-proteobacteria, beta-proteobacteria, gamma-proteobacteria and gram positive bacteria have been found. This analysis of microbial diversity in the accretion ice will provide an initial sampling of what microorganisms are present and active in Lake Vostok.

BOARD 66 THE IN VIVO AND IN VITRO EFFECTS OF JUNIPERUS COMMUNIS ON TYPE 1 PILI OF UROPATHOGENIC ESCHERICHIA COLI. ELIZABETH M. HERBERT, EHERBERT@WOOSTER.EDU, (TERESA A. JOHNSON, TJOHNSON2@WOOSTER.EDU), MICHAEL KERN, MKERN@WOOSTER.EDU, 931 COLLEGE MALL, DEPARTMENT OF BIOLOGY, COLLEGE OF WOOSTER WOOSTER, OH 44691.

Uropathogenic *Escherichia coli* (UPEC) is the primary cause of urinary tract infection (UTIs). The most important virulence factor of UPEC is the presence of adhesions, with type 1 pili as the most common form. Type 1 pili aid in bacterial binding and envelopment into uroepithelial cells. Multiple antibiotic resistant cases of UTIs are increasing. Since *Escherichia coli* is becoming less responsive to typical measures of treatment and control, alternate methods must be found. *Juniperus communis* has been used in certain native cultures to treat symptoms similar to those caused by UTIs and is recommended for treatment of such symptoms in numerous herbal medicine books. This experiment addresses in vitro effects of *Juniperus communis* on type 1 pili formation of the pathogen by examining the ability of *Juniperus communis* to alter the pH and osmolarity of urine, making the environment inhospitable for the growth of *Escherichia coli*. The research also investigates *Juniperus communis* as an in vivo treatment for UTIs in mice. This will be performed by inducing UTIs and giving oral treatments of *Juniperus communis* oil twice daily. Then at the end of the treatment session the mice will be tested for the presence or absence of UTI.

BOARD 69 TEMPORAL ANALYSIS, CHARACTERIZATION AND GEOGRAPHICAL DISTRIBUTION OF MICROBES FROM ANCIENT GLACIAL ICE. RAM S VEERAPANENI, RAMV@BGNET.BGSU.EDU, TOM D'ELIA, TDELIA@BGNET.BGSU.EDU, VINCENT THERAISNATHAN, TVINCEN@BGNET.BGSU.EDU, SCOTT O ROGERS, ROGERS@BGNET.BGSU.EDU, **BOWLING GREEN STATE UNIVERSITY, DEPT OF BIOLOGY, BOWLING GREEN, OH 43402.**

A glacier is a large slow moving mass of ice formed over hundreds of thousands of years. They act as a valuable reservoir of microbes, trapped and preserved in ice over this long period of time. We have isolated viable microbes like bacteria and fungi from Greenland and Antarctica ice cores at several depths (depth indicates the time period during which the microbe was trapped). Most of these microbes have been identified and are similar in their genotypes to contemporary organisms (although some differ in their ribosomal DNA intergenic spacers from described taxa). The aim of this study was to determine the geographical and temporal distribution of these microbes entrapped in ice. Ice cores from Antarctica (Vostok) and Greenland (GISP2) were used in this study. We isolated viable microbes at four different depths from these ice cores, correlating to 10,000, 50,000, 100,000 and 150,000 YBP. The genotypes of the same organisms from the same depth were compared to one another and to those of the contemporary organisms and phylogenetic analysis was done using maximum parsimony.

BOARD 70 DETERMINATION OF ADHERENCE PATTERNS AND CYTOTOXIC EFFECTS OF P. AERUGINOSA ON SEVERAL DIFFERENT HUMAN CELL LINES. AARON RICHARD COOK, ACOOK@BGNET.BGSU.EDU AND (ROUDABEH J. JAMASBI, RJAMASBI@BGNET.BGSU.EDU.) DEPARTMENT OF BIOLOGICAL SCIENCES, 217 LIFE SCIENCES BUILDING, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

Pseudomonas aeruginosa is a non-fermentative, gram-negative bacterium most frequently isolated from clinical samples. This organism is especially prevalent among immunocompromised individuals and patients affected with cystic fibrosis. The majority of infections caused by *Pseudomonas aeruginosa* are difficult to eradicate, due to multi-drug resistance. The frequency and distribution of the 17 serotypes of *Pseudomonas aeruginosa* in Regional Northwest Ohio hospitals was recently determined in our laboratory. Our main objective of the present investigation was to demonstrate the adhesiveness and cytotoxic effects of the 60 isolates of *Pseudomonas aeruginosa* (serotypes O:3, O:6, O:11) for two different human cell lines: A-549 cell line (derived from the respiratory tract) and SKR-C7 cell line (derived from the urinary tract). Attempts were also made to determine if these effects could be reversed by specific monoclonal antibody to each serotype. In addition, susceptibility of these isolates to seven different antibiotics was examined. Certain serotypes may maintain better degrees of antigenicity and mechanisms of attachment and cytotoxicity correlating with antibiotic resistance mechanisms referenced by regional prevalence. Based on modified ELISA results and the blocking assays we can conclude that certain strains within a serotype are also better equipped for attachment but can be blocked by monoclonal antibody interaction with the lipopolysaccharide (LPS) membrane molecule.

BOARD 71 DETERMINATION OF PSEUDOMONAS AERUGINOSA ADHERENCE PATTERN TO HUMAN CELL LINES AS DETERMINED BY ELISA AND SCANNING ELECTRON MICROSCOPY. ROUDABEH J. JAMASBI, RJAMASBI@BGNET.BGSU.EDU, AND NATHANIEL M. TAYLOR, DEPARTMENTS OF PUBLIC AND ALLIED HEALTH AND BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

Pseudomonas aeruginosa is the Pseudomonad most frequently recovered from clinical specimens accounting for 10-15% of all nosocomial infections. Recently the frequency and distribution of three clinically significant serotypes of *P. aeruginosa* (serotypes O:3, O:6, and O:11) in three Northwest Ohio hospitals were determined in our laboratory (Ohio J Sci. 99: 10-15, 1999). The aim of the present investigation was to examine the degree of adhesiveness of these three serotypes for human respiratory and kidney cell lines, because these selected serotypes were isolated from either respiratory or urinary tract infections. The degree of adhesiveness was determined by ELISA and scanning electron microscopy. The antibiotic susceptibility of the strains was examined by disk-diffusion method. The results showed that 1) different strains of *P. aeruginosa* exhibit different degrees of adhesiveness as well as different attachment patterns; 2) the bacteria strains did not show obvious preference for attachment to the cell lines from the tissues of origin; for example, isolates recovered from the urinary tract infections did not show preference for the kidney cell line; 3) serotype O:11 showed a higher degree of adhesiveness and antibiotic resistance, and 4) the ELISA results did not always correlate with the results of scanning electron microscopy. The higher degree of adhesiveness and antibiotic resistance of serotype O:11 may contribute to a higher degree of pathogenicity and a more frequent isolation of this serotype in health care facilities.

BOARD 72 THE ANTIMICROBIAL EFFECTS OF THE ORGANOSULFA-COMPOUNDS, ALLICIN AND S-ALLYLCYSTEINE FOUND IN ALLIUM SATIVUM AGAINST STAPHYLOCOCCUS AUREUS. KELLY D. KNAPP, KKNAPP08@WOOSTER.EDU. 7478 GREENFIELD TRAIL, CHESTERLAND OH. 44026.

The increasing frequency of Methicillin resistant *Staphylococcus aureus* (MRSA) and Vancomycin intermediate *Staphylococcus aureus* (VISA) is causing care providers to consider the study of botanicals as antimicrobials. One such botanical, *Allium sativum* (Garlic) contains antimicrobially active organosulfa-compounds. These compounds are allin, allacin, and S-allylcysteine (SAC). The objective is to investigate the killing effect of the compounds against *S. aureus*. Antimicrobial susceptibility testing was performed on MRSA and MSSA using pure garlic oil, allacin-free odorless garlic oil, garlic capsules containing allin, allacin, and allinase, Kyolic containing SAC, and penicillin for comparison in Minimal Inhibitory Concentration (MIC) trays. Time kill was performed in duplicate to test the rate of bactericidal activity of the garlic oil and its components against MRSA and MSSA.

Checkerboard Synergy plates containing penicillin and the organosulfa-compounds were tested against both the MRSA and MSSA also in duplicate. The Susceptibility testing results of the MIC plates for MRSA and MSSA respectively were: garlic oil 8000ug/ml and 400ug/ml, Capsules 500ug/ml and 500ug/ml, odorless oil 16000ug/ml and 16000ug/ml and Kyolic at a solution greater than 16%. The bactericidal activity was studied at concentrations of 1X, 2X, and 4X the known MIC of the compounds and penicillin. The garlic oil at 1X effectively killed the MRSA at 2 hrs. The garlic capsules were only effective against the MSSA and killed it within 2 hrs, with regrowth apparent after 24 hrs. The odorless oil was effective at 64000ug/ml against the MSSA at 4 hrs and MRSA at 6 hrs. The penicillin did effectively kill the MRSA and MSSA at 4X from 4 to 6 hrs, with regrowth apparent at 24 hrs. Synergistic results were obtained combining penicillin with the garlic oil, odorless oil, and Kyolic against both the MSSA and the MRSA. This study suggests that all of the organosulfa-compounds within *Allium sativum* are necessary in order for it to be most effective against MRSA.

BOARD 73 WATER QUALITY IN DRAINAGE DITCHES IN THE UPPER PORTAGE RIVER WATERSHED WHEN FLOW IS DOMINATED BY AGRICULTURAL SUBSURFACE DRAINAGE. ROBERT D. MCCALL¹, RMCCALL@POSTOFFICE.AG.OHIO-STATE.EDU, R. PETER RICHARDS², PRICHARD@HEIDELBERG.EDU, ¹OHIO STATE UNIVERSITY EXTENSION, 1219 W. MAIN CROSS, SUITE 202, FINDLAY OH 45840-0702 AND ²HEIDELBERG COLLEGE, WATER QUALITY LABORATORY, 310 E. MARKET ST., TIFFIN OH 44883-2462.

In northwest Ohio, drainage ditches are the headwaters of many rivers and streams. Subsurface drainage of agricultural lands is an important source of water and nutrients to these drainage systems. This research characterized drainage ditch water quality during intermediate flow levels dominated by inputs from subsurface drainage during recent storm events. High flow levels to drainage ditches are associated with excess surface runoff while low flow levels occur during dry periods in late summer and fall and are fed primarily by groundwater and septic drainage. Water samples (n=240) were collected monthly at 16 sites within the upper Portage River watershed (Northwest Ohio) between May 2001 and November 2002. Suspended sediment, phosphorus, and nitrogen species were analyzed. Median concentrations (mg/L) were suspended sediment 14.5, total phosphorus 0.084, soluble reactive phosphorus 0.038, total nitrogen 8.80, nitrate plus nitrite 7.92, and total Kjeldahl nitrogen 0.69. These concentrations were comparable to those measured in the Maumee River at Waterville over the same period of time by the Heidelberg Water Quality Laboratory. Concentrations of suspended solids however, were lower. Total nitrogen/total phosphorus ratios were typically 20 to 200 or more by weight (median 94), much higher than would be ideal (Redfield ratio 7.2) for biological assimilation of these nutrients. This suggests that nutrient uptake will often be phosphorus-limited and much of the nitrogen will not be taken up by the aquatic ecosystem. Unless denitrification is an active process at these times, substantial nitrogen export may result.

Poster Session B 10:00 – 11:00 AM

BOARD 77 EFFECTS OF PRENATAL STRESS ON THE DEVELOPMENT OF SOCIAL BEHAVIOR RYAN WARD, RJWARD@BGNET.BGSU.EDU, KELLEY HARMON, KHARMON@BGNET.BGSU.EDU, (HOWARD C. CROMWELL) DEPARTMENT OF PSYCHOLOGY AND THE JP SCOTT CENTER FOR NEUROSCIENCE, MIND AND BEHAVIOR, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH, 43402

Prenatal stress has deleterious effects on several organ systems of the body. Using the rodent model, acute, moderate stressors have included handling, exposure to novel environments, short-term exposure to cold and systemic injections. These stressors have led to impairments in learning and memory. Recent work has shown that moderate stress during gestation is sufficient to lead to alterations in the development of brain structures such as the amygdala. The amygdala has been proposed to be important in the production of social behavior and learning. Our hypothesis is that mild prenatal stress will reduce social behavior in the developing animal. The experiment will use the Sprague-Dawley rat strain and expose the pregnant dam to a set of stressors (previously mentioned) during gestational days 14-21. Data from prenatal stressed litters will be compared to non-stressed controls. Unfamiliar handlers will present all stressors

unpredictably. Each group will contain 3-5 litters with approximately 12 rat pups/litter. Tests used to examine social behavior include: 1) Conditioned odor preference- to measure the preference by young animals for maternal-paired olfactory cues, 2) Play behavior- to measure amounts of actual social interactions in juvenile rats and 3) Social port test- to measure the level of discriminative social investigation young adult animals display. Observers blind to the stress exposure condition will score behavioral data. We predict that mild-to-moderate stress will reduce levels of pro-social activities and lead to general, less socially directed behavior. Our results will have important implications for understanding the effects of mild stress on social behavioral development.

BOARD 78 REGENERATION IN CRAYFISH ANTENNULES. JULIANNE R. MCCALL, MCCALL_J@DENISON.EDU, (KRISTINA S. MEAD, MEADK@DENISON.EDU), DENISON UNIVERSITY, SLAYTER BOX 1678, GRANVILLE OH 43023.

Crayfish, like most decapod crustaceans, are capable of regenerating structures such as their antennules. These sensory structures allow the animals to receive stimuli from the environment such as information about food or mates. Located on the lateral filaments of the antennules are aesthetascs (olfactory sensilla). The ability to regenerate such vital sensory structures is an advantage in an environment where damage due to fights, infection, and age is common. Individuals from two local species, *Cambarus robustus* (N=5) and *Orconectes sanbornii* (N=26), and ranging from 16-93mm total body length, were collected and antennulectomized to initiate the regenerating process. We are developing a new method of analysis in order to avoid destructive sampling and thus permit continuous sampling of a regenerating antennule. We will use low viscosity dental polymers to create progressive impression molds of the regenerating antennules. Spurr's epoxy resin will be used to make copies of the antennules in the molds. The copies will be examined via a scanning electron microscope. We hypothesize that the pattern and rate of regeneration will be related to the size of the individual.

BOARD 79 PHENOTYPIC ANALYSIS OF DOMINANT ENHANCERS OF THE TRIO MUTANT PHENOTYPE IN DROSOPHILA MELANOGASTER. JULIANNE R. MCCALL, MCCALL_J@DENISON.EDU, (ERIC LIEBL, LIEBL@DENISON.EDU), DENISON UNIVERSITY, SLAYTER BOX 1678, GRANVILLE OH 43023.

Drosophila melanogaster is an excellent model for the study of central nervous system (CNS) development. Trio, a guanine-nucleotide exchange factor expressed in axons, is involved in axon outgrowth. A screen for dominant enhancers of the *trio* mutant phenotype has been performed. To date, over five thousand mutagenized chromosomes have been examined, and fourteen dominant enhancers were recovered in balanced stocks. The endpoint of the screen was lethality. Since we are interested in *trio*'s role in axon guidance, we are exploring whether any of these dominant enhancers have an effect on the CNS. Embryos of the appropriate genotype are collected, fixed in formaldehyde, and prepared for staining. Utilizing an HRP immunohistochemical procedure, we are currently applying both monoclonal antibodies BP102 and 1D4 to characterize the CNS of the mutant embryos. BP102 visualizes the general axon scaffolding of the embryonic CNS, while 1D4 visualizes a specific set of longitudinal axon fascicles. After staining, embryos are filleted for photo microscopy and phenotypic assessment. Axon defects, such as inappropriate midline crossing, are being quantified. We hypothesize that some dominant enhancers will identify proteins that share common biochemical pathways with Trio.

BOARD 80 VOLUME OF THE PITUITARY GLAND IN WOMEN SUFFERING FROM ANXIETY AND PTSD. LISA LOPEZ S05.LLOPEZ@WITTENBERG.EDU, MICHAEL FRANKHAUSER S03.TFRANKHAUSER@WITTENBERG.EDU, (CATHY L. PEDERSON CPEDERSON@WITTENBERG.EDU), DEPARTMENT OF BIOLOGY, WITTENBERG UNIVERSITY, SPRINGFIELD, OH 45501.

Anxiety can be associated with over-stimulation of the hypothalamo-pituitary-adrenal axis. The hypothesis was that anxiety coupled with posttraumatic stress disorder (PTSD) would decrease the volume of the pituitary gland when compared with women who were either anxious without PTSD or control participants that had neither anxiety nor PTSD. Twenty-four women were selected from a database and placed into one of three groups: Anxiety and PTSD, Anxiety alone, and a control group (n=8 in each group). The women were screened for disorders using a demographic sheet, the Wonderlic Personal Test, and the Millon Clinical Multiaxial Inventory. Groups were found to have no significant difference in age, intelligence, body mass index, number of drinks last year, pack years, total sessions of cocaine, total sessions of marijuana, or number of births (p>0.06 for each). The groups were designed

for anxiety levels to be significantly different between groups ($p < 0.001$), and the presence of PTSD was determined during clinical interview. Pituitary volume was found by tracing the gland on computerized coronal MRIs taken of all twenty-four women. Each slice was traced once by two researchers blind to group membership using 3D Brainstation. An average of each slice was calculated and the total pituitary volumes were compared between the three groups. No significant difference ($F(2,21) = 2.499$, $p = 0.106$) was found when comparing the total averaged volumes of the pituitary between the three groups. There was no correlation between pituitary size and anxiety ($p = 0.203$). PTSD and anxiety appear to have no effect on the volume of the pituitary gland.

BOARD 81 THE EFFECTS OF SELF-DEFEATING PERSONALITY TRAITS IN PATIENTS WITH MAJOR DEPRESSION ON THE RIGHT CAUDATE NUCLEUS.

JANNA R. WILLOUGHBY s05.JWILLOUGHBY@WITTENBERG.EDU, ABIGAIL L. KLENE s04.AKLENE@WITTENBERG.EDU, CATHY L. PEDERSON CPEDERSON@WITTENBERG.EDU, DEPARTMENT OF BIOLOGY, WITTENBERG UNIVERSITY, SPRINGFIELD, OH 45501.

Self-defeating personality traits and major depression have similar symptoms, including negative feelings during positive life events, decreased functioning in social and occupational situations, and feelings of hopelessness and discouragement. In addition, self-defeating traits often lead to major depression, which is associated with high levels of glutamate in the caudate nucleus. Because of the possibility of glutamate excitotoxicity in the caudate, the volume was hypothesized to be smaller in individuals in the experimental group ($n = 8$) who had scores over 85 in the *Millon Clinical Multiaxial Inventory* (MCMI) for self-defeating personality traits and major depression, than the control ($n = 8$) who had scores below 83 for self-defeating personality traits and 45 for major depression on the MCMI scales. Women were chosen from an existing database containing information obtained from a demographic sheet, *Wonderlic Personnel Test*, *MCMI*, *Childhood Trauma Questionnaire*, and a magnetic resonance imaging (MRI) scan. Groups were matched based on age, intelligence, abuse factors, as well as alcohol consumption in the past year, packyears of cigarettes, lifetime marijuana, LSD, cocaine, and speed exposure. There was no significant difference between groups for any of the demographics ($p > 0.143$), but significance was found for both self-defeating personality and major depressive disorder ($p < 0.001$). In order to determine caudate size, MRIs were traced in the transaxial view, using 3-D Brainstation. No significant difference in volume was found [$F(1,14) = 0.270$, $p = 0.611$] between groups indicating no degeneration in the caudate due to test variables. Depression and self-defeating personality traits do not appear to affect caudate volume.

BOARD 82 GLUCOSE RESPONSES OF A VIRAL PROMOTER IN MOUSE PANCREATIC ISLETS IMAGED USING LUCIFERASE BIOLUMINESCENCE

SIMA RAHMAN, SIMA_PECO@YAHOO.COM, AND MICHAEL E. GEUSZ, MGEUSZ@BGNET.BGSU.EDU, DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

The islets of Langerhans in the mammalian pancreas appear to contain a circadian pacemaker that produces daily rhythms in gene expression and insulin release. Transgenic mice expressing the firefly luciferase gene controlled by the promoter and enhancer of the major immediate-early (MIE) gene of the human cytomegalovirus (CMV::luc) show daily rhythms in pancreas bioluminescence. Because the CMV::luc transgene is induced by depolarization in neural cultures, we hypothesized that glucose-induced depolarization of islet beta cells would also produce bioluminescence. To test whether glucose induces this critical gene promoter for viral replication, bioluminescence was imaged in pancreatic islet and cell cultures from CMV::luc mice. Before treatment, expression was significantly higher (40.7 ± 10.7 % SD) in the islets than in clusters of acini ($p < 0.017$, Student's t-test, $n = 3$). Increases in islet expression from elevated KCl (20 mM) and glucose (17 or 25 mM) were as much as 35% and 95%, respectively. The increase in luminescence seen after these depolarizing treatments could have been from influx of calcium ions and activation of a cAMP-response element of the transgene promoter. Human cytomegalovirus infection is considered one possible cause of type I diabetes through autoimmune islet destruction. According to these results, glucose could facilitate viral infection at a particular time of day by depolarizing islet beta cells and inducing MIE gene expression followed by cell death. Supported by the National Institutes of Health grant 5R21RR12654-2 and the J.P. Scott Center for Neuroscience, Mind, and Behavior.

BOARD 83 THE VOLUME OF THE CEREBELLUM AND ITS ROLE IN DETERMINING INTELLIGENCE AND COGNITION. TODD KIMBALL

s06.TKIMBALL@WITTENBERG.EDU, LUKE MARTINSON

s04.LMARTINSON@WITTENBERG.EDU (CATHY PEDERSON CPEDERSON@WITTENBERG.EDU) DEPARTMENT OF BIOLOGY, WITTENBERG UNIVERSITY, SPRINGFIELD, OH 45501.

The cerebellum is a brain structure known to have a role in motor function. Research has led scientists to believe that the cerebellum may also contribute to cognition and intelligence. Testing this hypothesis has proved to be difficult due to the complex interaction among parallel functioning brain pathways. It is hypothesized that individuals with higher acuity on the *Wonderlic Personnel (IQ) Test* will have larger cerebellar volumes. Two groups of 8 women were selected from a database of 70 potential participants. The two groups of 8 women were selected by intelligence using Wonderlic scores 12-19 and 28-36. Other variables such as abuse (using the *Childhood Trauma Questionnaire*), drug and alcohol use, depression (*Millon Clinical Multiaxial Inventory*), age, pack years of cigarettes, and body mass index (demographic sheet) were also put through statistical analysis to test for a significant difference; $p < 0.05$. All participants also had an MRI on their brains. Cerebellar volumes were traced in horizontal sections on the MRI using 3D Brainstation. The cerebellum was traced every fifth slice twice by researchers blinded to group membership to ensure accuracy. The sum of these areas were calculated and multiplied by 5 to account for the non-traced slices. There was no significant difference in cerebellar volume between groups [$F(1,14) = 2.709$, $p = .122$]. Thus, the test score on the *Wonderlic Personnel (IQ) Test* of the participants had no relation to total volume of the cerebellum.

BOARD 84 CORRELATION BETWEEN ESTROGEN AND TOTAL CHOLESTEROL LEVELS IN WHOLE BLOOD IN PRE-MENOPAUSAL WOMEN. MEREDITH L.

BARFIELD, M-BARFIELD@ONU.EDU, 1807 LAKELAND DR., FINDLAY, OH 45840.

Previous investigations show that estrogens through impact on cholesterol levels may help prevent cardiovascular disease or myocardial infarctions. To test this relationship, ten pre-menopausal women (5 on oral contraceptives; 5 not) and three men (control group) were given cholesterol tests at designated intervals for a two months on days 2, 7, 14, 21, and 28 of a 28-day menstrual cycle. Total cholesterol was measured to see if there was any correlation between this parameter and the varying estrogen levels in the test subjects, such that a high cholesterol level would indicate an increased risk of myocardial infarction or heart disease. The participants' fasting cholesterol levels were obtained from a finger prick blood sample and analyzed with a Bio Scanner 2000 monitor. Designated testing days were selected for their correlation with changes in estrogen levels. Preliminary analysis of the results shows a noticeable drop ($43.06 \pm .48$ points) in cholesterol on day 14 of the cycle for the participants on oral contraceptives as compared to the stable values maintained in the other two groups. Participants on oral contraceptives also had a noticeably higher overall cholesterol level (21 ± 4) than the participants not on oral contraceptives. These results tend to support the hypothesis cholesterol levels vary with the estrogen cycle in pre-menopausal women.

BOARD 85 THE EFFECTS OF BEE POLLEN ON

YOUNG MALE RATS. MICHELLE S. GASEK, GASEKMS@STU.LEMOYNE.EDU, (BETH B. PRITTS, PRITTSBB@LEMOYNE.EDU), LE MOYNE COLLEGE, 1419 SALT SPRINGS ROAD, SYRACUSE NY 13214.

Bee pollen, advertised as a "miracle health supplement," is said to enhance virility, immune system function, memory, weight loss and regulate blood sugar. Because it is a dietary supplement, manufacturers' claims do not require proof. The purpose of this experiment was to examine physiological and behavioral effects of bee pollen in young IG-CDS male rats (Charles Rivers Labs). Three treatment groups of eight rats each (controls (C) rat chow only, bee pollen only (BPO), and bee pollen in mixed into the chow (BPC) proportional to the recommended human dosage) were allowed access to their specific diet and water *ad libitum*. After 7 days of treatment, the Morris water maze was used to assess learning and memory. The time to reach a podium submerged under opaque water was recorded for each trial. Following completion of 10 trials, the rats were anesthetized and decapitated. Colorimetric assays were performed to test serum glucose levels. Lowry protein assays determined protein content of the liver and heart. Radioimmunoassay determined the amount of serum insulin. Relative weights of several organs were obtained. Bee pollen consumption resulted in no improvement in learning or memory nor any difference in body weight in BPC rats compared to controls. The testes were enlarged in BPC rats compared to controls, indicating potential alteration of androgen levels. In the BPO and BPC groups, serum insulin and glucose levels were both depressed compared to controls, leading to uncertainty regarding bee pollen's effects on blood sugar regulation. More investigation of this relationship is required.

BOARD 86 IMMUNOHISTOCHEMICAL DETECTION OF ESTROGEN RECEPTOR-2 IN THE SUPERIOR CERVICAL GANGLION OF NEONATAL MALE RATS. CHRISTINE CHIAPPINI-WILLIAMSON, CCHIAP2@YAHOO.COM, OMAR NAZIR, OFN1@UAKRON.EDU, RONALD L. SALISBURY, RONALD2@UAKRON.EDU,*THE UNIVERSITY OF AKRON, AKRON, OH 44325 AND KENT STATE UNIVERSITY, KENT OH 44242 .

The superior cervical ganglion (SCG) of the adult male rat contains 20%-30% more neurons than that of the female. This difference is not present at birth but appears by postnatal day 15. Neonatal castration decreases neuron number in males and treatment of gonadally intact animals with aromatizable androgens increases neuron number in both sexes. This may be an aromatase dependent effect of estrogen in the developing SCG. In this experiment immunohistochemical techniques were used to identify potential target cells of estrogen in neonatal male rats on postnatal days 5, 10 and 15 (n=6 per age). Ganglia were fixed in 4% paraformaldehyde, frozen and cut at 6 μ m. Following the block to endogenous peroxidase and protein, rabbit anti-rat ER-2 (Zymed) was applied and incubated 48 hours at 4 $^{\circ}$ C. Following incubation of primary antibody, biotinylated goat anti rabbit IgG was applied for 1 hour at 37 $^{\circ}$ C. Sections were incubated in peroxidase labeled ABC reagent (Vector Labs), developed in Vector NovaRED (Vector Labs), dehydrated and coverslipped with Permount. Positive staining appeared in the nucleus and cytoplasm of neurons in all animals at all ages. These observations provide evidence that neuroblasts in the developing superior cervical ganglion of male rats are direct targets for estrogen during the critical period of sexual differentiation.

BOARD 87 THE EFFECTS OF NIGHTSHADE (SOLANUM TRIFLORUM) ON PORCINE RENAL ARTERIES. KAREN D. LEE, K-LEE@ONU.EDU, 402 W. COLLEGE AVE, UNIT 2499, ADA OH 45810.

Members of the nightshade complex *Solanum* have been reported to have anticholinergic properties resulting in increased heart rate, blood pressure, and respiratory rate; however, contradictory literature has cited that members of the *Solanum* complex produce calming, sedative effects. Porcine renal arteries (n=28) were harvested, and endothelium-intact rings were mounted in organ chambers containing Krebs's bicarbonate buffer that were gassed with 95% O₂ and 5% CO₂ and maintained at 37 $^{\circ}$ C throughout the experiment. Following a one-hour equilibration, the rings were activated with phenylephrine (10⁻⁶ M) to provide an appropriate tension level. After reaching a steady tension level, acetylcholine (10⁻⁶ M) was added, followed by sodium nitroprusside (10⁻⁶ M). After a series of washes, *Solanum triflorum* extract (2 mg/mL) was added to one ring, and Scopolamine (10⁻⁶ M), a known cholinergic antagonist, was added to another ring. Two additional rings served as vehicle controls. The rings were again contracted with phenylephrine and challenged with acetylcholine (10⁻⁶ M) and sodium nitroprusside (10⁻⁶ M). There was no significant difference in the active tension generated by phenylephrine in both experimental and control rings (6.33 \pm 0.90g). There was also no difference between experimental and control rings with respect to both the relaxation due to acetylcholine (-1.71 \pm 0.56 g) and sodium nitroprusside (-0.05 \pm 0.12 g). The addition of the blocker to the rings reduced the maximum relaxation due to acetylcholine in the experimental rings as compared to controls, but this trend was not statistically significant. *Solanum triflorum* failed to block the effects of acetylcholine; however, it eliminated the relaxation due to sodium nitroprusside, indicating a non-specific effect on the vascular smooth muscle.

BOARD 88 A NEUROPHYSIOLOGICAL ANALYSIS OF INHIBITORY GATING IN THE STRIATUM OF FREELY MOVING RATS. ANDREW KLEIN, ANDREW@BGNET.BGSU.EDU, RYAN MEARS, RMEARS@BGNET.BGSU.EDU, AND (HOWARD C. CROMWELL). DEPARTMENT OF PSYCHOLOGY AND J.P. SCOTT CENTER FOR NEUROSCIENCE, MIND AND BEHAVIOR, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43402.

Inhibitory gating has been proposed as a filtering process located within central nervous system networks. The integrity of the inhibitory networks can be evaluated by presenting two identical sensory stimuli in rapid succession. Inhibition of the response to the second stimulus represents robust gating of the input. Inhibitory gating has been demonstrated in several brain regions both within and outside primary sensory pathways. Our goal is to examine whether the sensory inhibitory process would be observed in a traditional motor structure, the striatum. The striatum is part of the basal ganglia system and has been thought to be involved primarily in movement initiation and postural control. More recent evidence has suggested the striatum plays a key role in sensory and motivational processes. The significance of the study includes

a potential reevaluation of the basic function of the basal ganglia that could include incorporating sensory inhibitory mechanisms to the well-established behavioral operations. To complete this goal, we have implanted animals with chronic recording wires into the striatum to measure the amplitude of single unit and local field potential responses during repetitive auditory stimulus presentation. Tones were presented for 10 ms with a 500 ms interstimulus interval. Pairs of identical tones were presented every 10 s. Preliminary results include observations of single unit tone responses from the striatum that clearly show a persistent inhibition over 100 trials. This reduction in sensory responsiveness was observed in diverse auditory-responsive units with different firing characteristics including different response latencies and durations and baseline firing rates.

BOARD 89 THE EFFECTS OF MAGNOLIA BARK COMPONENTS ON WEIGHT GAIN AND LEARNING AND MEMORY IN YOUNG FEMALE RATS. JESSICA E. OGORCHOCK, OGORCHJE@STU.LEMOYNE.EDU, (BETH B. PRITTS, PRITTSBB@LEMOYNE.EDU), LE MOYNE COLLEGE, 1419 SALT SPRINGS ROAD, SYRACUSE NY 13214.

In response to the overwhelming rise of obesity in the United States, several over-the-counter weight loss supplements (Cortislim[®] and Relacore[™]) have been designed to aid in weight loss by decreasing cortisol levels. Magnolia bark components, magnolol and honokiol, are common to both and depress central and autonomic nervous system activity. Depressed cortisol levels should result from hypothalamo-pituitary-adrenal (HPA) axis suppression. The current study will assess the impact of magnolol and honokiol on the HPA axis, cortisol levels and ultimately decreased weight gain, and learning and memory. Female IG-CDS rats (n = 8/treatment group) (Charles River Labs) will consume the magnolia bark components mixed into their rat chow at doses proportional to humans, while the controls (n = 8) will consume plain chow. All animals will have unlimited access to food and water and be maintained in a twelve-hour light/dark cycle. Body weight and food and water consumption will be measured every other day. After two weeks of treatment all rats (n = 24) will participate in Morris water maze trials to assess any alteration of learning and memory. Urine samples will be collected in metabolic chambers and tested for glucose and pH to assess any supplement-induced changes. Following completion of ten Morris water maze trials, the rats will be terminated and their organs harvested, weighed, and protein content of the liver and heart will be determined with the Lowry assay. The serum glucose levels will be determined by colorimetric assay, and radioimmunoassay determination of serum corticosterone, adrenocorticotropic hormone, and estrogen will also be performed.

BOARD 90 THE INFLUENCE OF STRESS ON THE RATE OF DELETERIOUS MUTATIONS IN DROSOPHILA MELANOGASTER. MARIA D. BROWN, MARIADB@BGNET.BGSU.EDU, (R. C. WOODRUFF, RWOODRU@BGNET.BGSU.EDU), BOWLING GREEN STATE UNIVERSITY, DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN OH 43403

The objective of the study is to determine if environmental stresses increase the rate of deleterious mutations in the model system *Drosophila melanogaster* (fruit flies). The goal is to better understand the intrinsic (genetic) or extrinsic (environmental) factors that can modify rates of mutations. It is our hypothesis that the slope of mean viability decline under stress will be steeper than the controls because of an increase in deleterious mutations in the stressed flies. From the decrease in mean viability and increase in variance, we will also estimate the genomic mutation rate and determine if the rate is higher under stress. Stress will be induced by sudden agitation of *Drosophila*. The flies will be agitated using a shaker for ten seconds every twenty minutes. This goes on 24 hours per day. One hundred vials of flies will be used as the control, the unshaken group. One hundred vials of flies will be used as the experimental group, those being shaken. Each vial has one male and one female for mating. The influence of stress on mutations will be measured by use of a *Binscy* mating scheme, where deleterious mutations accumulate on the X chromosome over time. The impact of mutations on viability will be determined by measuring the ratio of *Binscy* males to their sibling males. Graphs will be designed to show the change in mean viability and variance.

BOARD 92 JUNCTIONAL COMPLEXES AND EVIDENCE OF A FUNCTIONING BLOOD TESTIS BARRIER WITHIN THE TESTIS OF THE SWAMP SNAKE, SEMINATRIX PYGAEA. CARRIE S. HAPP, S05.CHAPP@WITTENBERG.EDU, KEVIN GRIBBINS, KGRIIBBINS@WITTENBERG.EDU, WITTENBERG UNIVERSITY, DEPARTMENT OF BIOLOGY, PO Box 720, SPRINGFIELD OH 45501-0720.

Junctional complexes between Sertoli cells and between Sertoli cells and germ cells were examined within the swamp snake

(*Seminatrix pygea*) testis. Three mm pieces of testis were fixed in 0.2M cacodylate buffer containing 2% glutaraldehyde and 2% lanthanum nitrate, dehydrated through a graded series of alcohols, and embedded in Spurr's plastic. 90nm sections were cut and stained with uranyl acetate and lead citrate. Junctional complexes similar to other amniotes are observed within the swamp snake testis. They include desmosome-like and tight junctions, which show ectoplasmic specializations including smooth endoplasmic reticulum (SER), subsurface densities, and 7-9nm filaments. Tight junctions are often associated between spermatogonia/preleptotene cells and late meiotic/spermiogenic cells. Furthermore, lanthanum nitrate, an intercellular tracer, is prohibited from traveling interstitial pathways deep to premeiotic cells. Therefore, tight junctions in the swamp snake may serve as a functional blood testis barrier. These tight junctions separate late developing germ cells from the blood supply, suggesting immunological protection to developing sperm. Desmosome-like junctions are most often located between Sertoli cells and spermatogonia or early spermatocytes in the snake testis. Their placement suggests these junctions prevent shedding of premeiotic cells from the basement membrane during sperm release. Although the ultrastructure and function of swamp snake junctions seems similar to that of derived amniotes, there is greater disorganization and inconsistency in number and location of the associated SER and 7-9nm filaments. Thus, snake testicular junctions appear to be more complicated than that of anamniotes but simpler than those found in birds and mammals signifying phylogenetic significance.

BOARD 93 THE CYTOLOGICAL EVALUATION OF SPERMATOGENESIS WITHIN THE TESTIS OF THE TROPICAL LIZARD, *ANOLIS LINEATOPUS*. JEREMY C. TOFFLE, S06.JTOFFLE@WITTENBERG.EDU, KEVIN GRIBBINS, KGRIIBINS@WITTENBERG.EDU, WITTENBERG UNIVERSITY, DEPT OF BIOLOGY, PO BOX 720, SPRINGFIELD OH, 45501-0720.

Most studies on spermatogenesis within amniotes provide evidence for spatial relationships between generations of germ cells within the testis. Spermatogenesis is synchronized in its development and generations of germ cells are consistently grouped together in cellular associations. However, recent research has produced evidence for an alternate germ cell development strategy within reptiles representing 3 different taxonomic orders (alligators, slider turtles, wall lizards). These seasonal-breeding reptiles (reproduce only during a few months out the year) have germ cells that progress through spermatogenesis as a single population similar to anamniotic testes (temporal germ cell development). Although recent information on the testis of an equatorial lizard, *Sceloporus bicanthalis*, furnished evidence for continuous spermatogenesis with no seasonality, no information is provided on its germ cell development strategy. Therefore, the purpose of the following study is to investigate germ cell development within a tropical anole, *Anolis lineatopus*. The hypothesis of this study is that *A. lineatopus* possesses a temporal germ cell development strategy similar to seasonal reptiles. Anoles were collected monthly (N=24) in Jamaica, three mm pieces of testis were fixed in 0.2M cacodylate and 2% glutaraldehyde, dehydrated through a graded series of alcohols, and embedded in Spurr's plastic. Sections (2 μ m) were cut on an ultramicrotome and stained with toluidine blue and basic fuchsin. Initial observation from a September testis provided histological evidence that germ cells progress through spermatogenesis as a single population with no observable cellular associations. Thus, *A. lineatopus* may have a temperate germ cell development strategy similar to seasonally breeding reptiles.

BOARD 94 BETA-CATENIN EXPRESSION IN HUMAN BONE MARROW-DERIVED CONNECTIVE TISSUE PROGENITOR CELLS. BA HOOVER (BAH14@CWRU.EDU), CA BOEHM (BOEHM@BME.RI.CCF.ORG), GF MUSCHLER (MUSCHLG@CCF.ORG) THE CLEVELAND CLINIC FOUNDATION, DEPARTMENT OF BIOMEDICAL ENGINEERING ND-20, CLEVELAND OH 44195.

This study aimed to characterize the expression of the Wnt-signaling protein Beta-catenin. Beta-catenin is important for early proliferation and differentiation of human connective tissue progenitor cells (CTPs) and has been specifically linked to osteogenic differentiation. Wnt-signaling causes Beta-catenin to accumulate in the cytosol where it is eventually translocated into the nucleus to affect target gene transcription. Beta-catenin, detectable by cell specific staining, can serve as a convenient marker in *in vitro* assessment of strategies that serve to both characterize and manipulate Wnt signaling events. As such, efforts can be made to modify the *in vitro* behavior of CTPs. Marrow was aspirated under IRB approved protocol from the anterior iliac crest of 8 elective orthopedic surgery patients. The marrow was processed to isolate CTPs *in vitro* using established cell culture methods. Cells were then plated onto three 16-well Lab-Tech chamber slides. On day 2, 4, and 6, cells were fixed using 4% paraformaldehyde in

PBS, and were incubated first with a mouse anti-Beta-catenin antibody followed by a Fit-C secondary Ab. Positive cytoplasmic staining was seen to slightly increase in intensity from day 2 through day 6. This was consistent with the expectation that Beta-catenin is gradually expressed over the course of the 6 day culture period. These data suggest that Beta-catenin expression within human CTPs may follow a specific developmental timeline. Furthermore, it allows for the characterization of the early events of differentiation within human CTPs.

BOARD 95 ON THE CONVERGENCE OF PFDR. IGOR V. MELNYKOV, IGOR@BGNET.BGSU.EDU, JOHN T. CHEN, DEPT OF MATHEMATICS AND STATISTICS, BGSU, BOWLING GREEN OH 43403.

Methods related to false discovery rates (FDR) present powerful means of detecting differentially expressed genes in genetic microarrays. Positive FDR (pFDR) is defined as the expected proportion of false rejections given that the total number of rejections is positive. It was previously shown that pFDR converges uniformly to a continuous limit provided that the proportion of true null hypotheses, number of rejected true null hypotheses, and number of rejected alternative hypotheses all converge pointwise. In Bayesian setting, the convergence value is interpreted as the posterior probability of a true null hypothesis. The same convergence result can be obtained under milder assumptions. In particular, it can be required that the number of rejected alternative hypotheses converges in L1 rather than pointwise. This allows obtaining the approximation for the pFDR in the conditions when less information regarding genes is available.

BOARD 96 THE EFFECTS OF TWO ANTI-FIBROTIC AGENTS, DECORIN AND PENTOXIFYLLINE, ON MUSCLE WOUND HEALING IN RATS (*RATTUS RATTUS*). ALLISON E. KENT, AKENT@WOOSTER.EDU, (SHARON LYNN, SLYNN@WOOSTER.EDU), THE COLLEGE OF WOOSTER, BOX C-1970, 1189 BEALL AVENUE, WOOSTER OH 44691.

Scar tissue as the result of a muscle wound can be a major hindrance to the healing process and impede muscle function, flexibility and strength. The purpose of this experiment is to reduce the amount of scar tissue formed in a muscle during the wound healing process by using two anti-fibrotic drugs: decorin and pentoxifylline. To test the effectiveness of these drugs on reducing scar tissue formation in muscle wounds in a rat (*Rattus rattus*) animal model, twenty-two animals were given a transverse laceration of a uniform size on the gastrocnemius muscle. Ten days later each animal was given one of four treatments: an injection into the muscle along the suture line of saline (control), decorin, pentoxifylline, or both decorin and pentoxifylline. To determine the effects of the drugs on the wounded muscle, the muscle strength of both the injured muscle and the opposite healthy gastrocnemius muscle of each animal will be measured. The amount of collagen present will also be assessed histologically. These two factors along with a visual assessment of the wound will be used to examine the amount of healing and scar tissue present in the wound.

BOARD 97 IMMIGRATION AND ECONOMIC RESTRUCTURING IN TWO OHIO CITIES, 1940-2000. BRUCE W. SMITH, BSMITH4@BGSU.EDU, KEFA M. OTISO, KMOTISO@BGSU.EDU, DEPT OF GEOGRAPHY, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

This research used Census data to examine trends within the foreign-born populations of Ohio's largest cities from 1940 to 2000. The observed trends are linked to economic changes in the cities. In 1940, many Ohio cities attracted significant numbers of foreign-born immigrants due to manufacturing job opportunities. However, economic changes between 1940 and 2000 eroded the manufacturing bases of most Ohio cities, making the cities less attractive to immigrants. As a result, the percentage of Cleveland's foreign-born population dropped from 20.5% in 1940 to 4.5% in 2000. Another major change is that Columbus now has the largest percentage foreign-born population in Ohio, having grown from 3.9% in 1940 to 6.7% in 2000, replacing Cleveland as the primary location of the foreign-born population. Because of its more diversified economy, role as the state capital, and home of Ohio's largest university, Columbus has higher employment in the high skill service sector than does Cleveland. Consequently, Columbus has been able to better withstand the economic changes that have negatively impacted Cleveland. Based on census data, Columbus is also better endowed than Cleveland in talent or human resources, which accounts in part for its higher level of employment and population growth, and which makes it a more attractive destination for recent immigrants. Ohio cities' ability to attract immigrants, who are critical to population and economic growth, depends on the cities' ability to nurture industries, such as the service and information sectors, that will generate the jobs that will draw immigrants.

BOARD 98 COMPARISON OF GUIDED IMAGERY AND POSITIVE PLACE ASSOCIATION AS STRESS REDUCING TECHNIQUES FOR THE MIDLIFE MALE;

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Guided imagery (GI) has long been a useful stress reduction technique incorporating visualizations of suggested pleasant and imaginary situations such as reclining on the beach or relaxing under a tree. In this method a mental health professional guides an individual through an idyllic landscape to the goal of relaxation. Unlike GI, the positive place association (PPA) technique elicits known, specific, and valued place images. A preliminary study hypothesized that using PPA, rather than GI, would be reported as more effective in stress reduction. A voluntary sample of 40 Midwestern Caucasian males, ages 45-60, was chosen based upon gender study, sociological, and psychological research suggesting that middle-aged males are particularly communication and psychotherapy-resistant. A clinical psychologist administered both instruments, each taking under 45 minutes, to all subjects in a confidential clinical setting. One-half were randomly chosen for initial exposure to GI while the other half initially received PPA. The second instrument was administered one week later followed by a survey form to be returned within 48 hours. Data collected revealed the following: 92% judged PPA as the faster and more effective stress-reducing technique; 87% were more comfortable with the concrete image of a known personal place than utilizing an artificial non-experienced landscape; 72% experienced impatience and irritability with GI; and, 35% wished to discuss their positive places in future sessions. For this sample midlife male population, PPA was preferable to GI. A more comprehensive study is recommended, including a larger and more geographically and ethnically diverse midlife male population.

BOARD 99 ANNOTATION OF THE CHROMOHALOBACTER SALEXIGENS GENOME: ISOELECTRIC POINTS OF THE PROTEINS.

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Chromohalobacter salexigens is a γ -proteobacterium that can tolerate salt concentrations exceeding 3 M NaCl while requiring concentrations of at least 0.5 M NaCl. Denaturation and precipitation of proteins in most organisms occurs under high salt conditions, but it has been suggested that the incorporation of acidic amino acid residues, resulting in lower isoelectric point (pI) values for proteins, protects proteins of *C. salexigens*. If more acidic proteins are protected in high salt environments, then we predicted that *C. salexigens* proteins would have overall lower pI values as compared to homologous proteins in the non-halophile relatives, *Escherichia coli* and *Pseudomonas aeruginosa*. We further predicted that extracellular, outer membrane, and periplasmic proteins would have lower pI values than inner membrane and cytoplasmic proteins of *C. salexigens*. Isoelectric points were determined *in silico* for putative proteins from each region of the bacterial cell. Of the approximately 350 proteins examined, 74% of the proteins of *C. salexigens* had lower pI values as compared to *E. coli* homologs. The proportion of extracellular, outer membrane, and periplasmic proteins with lower pI values was 82%, whereas 67% of inner membrane and cytosolic proteins had pI values less than those of their *E. coli* homologs. These results support the hypothesis that more acidic bacterial proteins are correlated with success in high salt environments, and that cellular location of proteins is correlated with isoelectric point.

BOARD 100 α 3 β 1 INTEGRIN EXPRESSION ON HUMAN ESOPHAGEAL CANCEROUS CELL LINES.

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Integrins are heterodimeric transmembrane glycoproteins consisting of α and β subunits. These adhesive receptors interact with extracellular matrix proteins, which not only influence cell survival and proliferation, but also adhesiveness and the migratory process. Cancer progression is associated with a variety of changes

in cell growth and proliferation, including changes in integrin expression, rearrangement and redistribution on cell surface. This study evaluated the expression of the membrane-associated α 3 β 1 molecule on a panel of human esophageal cancer cell lines. Six human esophageal cancerous cell lines (YES 1, YES 3, TE 2, TE 3, TE 7 and TE13), a human kidney carcinoma cell line (SKRC-7), and normal human red blood cells (RBC-B) were used. The RBC-B and SKRC-7 cells served as control. The expression of α 3 β 1 integrin molecule was determined by ELISA and Immunohistochemistry, using anti- α 3 β 1 monoclonal antibody (MAB#22), produced in our laboratory. Cell line YES-1 showed the highest level of expression of α 3 β 1 molecules followed by TE-7, YES-3, TE-3, TE-2 and TE-13. The antibody also reacted slightly with B blood group cells, but did not react with other blood group antigens or SKRC-7 cell line. The results clearly demonstrated that the above cell lines express different levels of the α 3 β 1 molecule. The significance of the differential expression of this integrin molecule on esophageal cancer progression is under investigation in our laboratory.

BOARD 101 CRAYFISH AESTHETASC MORPHOLOGY IN TWO NORTHERN POPULATIONS OF ORCONECTES VIRILIS.

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Many aquatic crustaceans interpret their environment through the use of water-borne chemical clues. Crayfish utilize specialized chemoreceptor structures located on their antennules to decode the chemical "scents" in their environment. Crayfish move their antennules in rapid "flicks," thus sampling the chemicals in the area. Differences in aesthetasc morphology could affect the chemical information available to the animal. Two populations of *Orconectes virilis* were obtained from two different habitats: Hebron Fish Hatchery in Ohio, a low-flow habitat of artificial muddy lake bottoms in, and Burt Lake, a natural habitat for this species located in Michigan. The question if aesthetasc morphology varies with animal size and between populations will also be examined. Scanning electron micrographs of the aesthetascs were taken and digitized using Scion Imaging to produce the scaled measurements. The measurements will be studied and analyzed using Stat View to perform several ANOVA tests. It is hypothesized that aesthetasc morphology and thus perhaps the ability to sample chemicals in the environment will vary with animal size.

BOARD 102 MORPHOLOGICAL STUDY OF THE ADULT MOTH FLY (PSYCHODIDAE: PSYCHODA CINEREA) BY LIGHT AND SCANNING ELECTRON MICROSCOPY (SEM).

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The focus of this study was to investigate the external morphology by means of light and scanning electron microscopy (SEM). Flies were captured in John Bryan State Park in Yellow Springs, OH, between mid July and mid October for two summer periods (2003-2004). The results from light and SEM microscopy revealed the head, thorax, and abdominal segments of the adult fly to be covered with scales giving them a hirsute (hairy) appearance. The scales are of two morphological types, one pinnate and the other sickle-shaped. Sparsely plumose antennae with 12 flagellomeres constructed with whorls of modified scales called verticals and thin walled sensilla were observed extending from anteriorly emerginate eyes. The terminal segment of the abdomen in a female revealed an ovipositor from which eggs were observed being released. Male flies revealed larger, hook-shaped, terminal appendages that have been observed in other fly species to secure females during mating. In nature, these flies were periodically observed copulating in a posterior position supporting the theorized function of the terminal abdominal structures of the males. To our knowledge, this is the first complete investigation of the external structures of the moth fly using a scanning electron microscope.

BOARD 103 VARIATION OF HERMIT CRAB SPECIES AND SHELL SPECIES OCCUPIED ON FOUR BEACHES OF SAN SALVADOR, BAHAMAS KIRA A.

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Hermit crabs inhabiting San Salvador, the Bahamas, often congregate in piles of over 750 individuals. We hypothesized that within these piles, the crab species, species of gastropod shell inhabited, and the number of crabs in a pile would not vary with geographic location on San Salvador. Twenty-nine hermit crab piles

were analyzed in 4 locations on San Salvador between 2 June 2004 and 13 June 2004. At each location, a transect line was randomly placed in the low intertidal to shallow subtidal zones, and all crabs from the first 5 piles encountered along the line were collected. Piles varied in size, ranging from 7 individuals to 766. However, the pile sizes did not vary significantly across the locations (ANOVA; $p=0.064$). The crab species and shell species were identified for each individual of each pile. Only 2 species of hermit crabs were present. *Clibanarius tricolor* were found from subtidal to mid-intertidal zones, whereas *Calcinus tibicen* were found only in the low-intertidal to subtidal zones. Of the gastropod species identified, *Cerithium eburneum*, *Cerithium algicola*, and *Cerithium litteratum* were most commonly inhabited by crabs of both species. *Clibanarius tricolor* used these 3 shells in significantly different proportions ($\chi^2_4=776.8$, $p<0.001$) across the 4 locations. *C. tricolor* inhabited *Cerithium eburneum* most often at North Point, but inhabited *Cerithium litteratum* most often at all other locations. *Calcinus tibicen* were only found in 2 locations and inhabited *Cerithium litteratum* most often in both. However, *C. tibicen* did not use shells in significantly different proportions ($\chi^2_2=2.4$, n.s.).

BOARD 104 ANTIMICROBIAL PEPTIDE DEFENSE AGAINST SKIN PATHOGENS OF DUSKY SALAMANDERS, DESMOGNATHUS FUSCUS. MEREDITH A. BOLEY, BOLEYMA@MUC.EDU, (BRANDON SHEAFOR, SHEAFORBR@MUC.EDU), MOUNT UNION COLLEGE, 1972 CLARK AVE., ALLIANCE OH 44601.

Amphibian populations have been declining throughout the world over the past 25 years, in part due to chytridmycosis, an emerging infectious disease caused by the fungal pathogen *Batrachochytrium dendrobatidis*. The primary means of defense that amphibians possess to fight off skin pathogens such as *B. dendrobatidis* and cutaneous bacterial infections are antimicrobial peptides (AMPs). These 10-50 amino acid long molecules are made in the granular skin glands of amphibians and functionally destroy pathogen cells. Dusky salamanders (*Desmognathus fuscus*) are a common species of lungless salamander found in Ohio. Because dusky salamanders rely almost exclusively on cutaneous gas exchange, it is likely that they produce highly effective AMPs to ensure that respiratory surfaces are not compromised. This project will examine the AMPs synthesized by dusky salamanders. Animals will be placed in a collecting buffer containing norepinephrine to stimulate AMP release. Peptides will be filtered from the collecting buffer using C-18 sep-pak filters. AMPs will be eluted, dried and reconstituted with deionized water. The crude peptide mixture will be assayed against skin pathogens to test for the inhibition of fungal and bacterial cutaneous pathogens. If *D. fuscus* AMPs are strong enough to inhibit growth of cutaneous pathogens, the AMPs can be separated from the crude mixture using HPLC and each AMP can be analyzed for individual effectiveness. If effective antimicrobial peptides are not present in *D. fuscus*, this may indicate that the population is susceptible to infection and conservation measures may be warranted for this species (e.g. protecting species from human contact).

BOARD 105 DIVERSITY OF FOREST LEPIDOPTERA AND ASSOCIATED PARASITIDS IN A FRAGMENTED LANDSCAPE LAURA HUGHES-WILLIAMS, HUGHESL@BGNET.BGSU.EDU, MELANIE L. BERGOLC, BERGOLC@BGNET.BGSU.EDU, DANIEL M. PAVUK, DMPAVUK@BGNET.BGSU.EDU. DEPT OF BIOLOGICAL SCIENCES, 217 LIFE SCIENCES BUILDING, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403-0212.

A study was initiated in 2003 and continued in 2004 to examine the species diversity of forest Lepidoptera and determine larval parasitoid assemblages in forest fragments in northwest Ohio. Three primary questions are being addressed: 1) Is the diversity of Lepidoptera lower in small compared to large forest fragments? 2) Is the percentage of Lepidoptera larvae attacked by insect parasitoids lower in small forest fragments compared to large forest fragments? 3) Is the larval parasitoid diversity lower in small forest fragments versus large forest fragments? We selected 12 forest fragments ranging from 5 ha to over 1000 ha. Beginning in the third week of June, 2003, and the third week of May, 2004, we sampled each woods every 3-4 weeks over the summer and early fall, collecting as many larvae of tree-feeding Lepidoptera as possible during each visit. Species from the lepidopteran families Arctiidae, Geometridae, Notodontidae, Noctuidae, Coleophoridae, Gelechiidae, Nymphalidae, Lymantriidae, Sphingidae, and Saturniidae were collected. Caterpillars were reared in the laboratory on their host plant material until they completed development or until parasitoids emerged. There appeared to be no apparent effect of wood fragment size on either species richness or levels of larval parasitism of forest Lepidoptera. Nearly all larval parasitoids reared from collected larvae were from the families Braconidae and Ichneumonidae. Parasitoid species diversity remains to be determined.

BOARD 106 THE EFFECT OF IRON DEFICIENCY ON THE ELEMENTAL STOICHIOMETRY OF DIATOM MICROPLANKTON OF THE PACIFIC OCEAN. MAMOONA M.D. AL-RSHADAT, MAMOONA@BGNET.BGSU.EDU, R. MICHAEL L. MCKAY, RMMCKAY@BGNET.BGSU.EDU. DEPARTMENT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

Low iron availability is an important constraint controlling biomass and primary production of the world's oceans. This includes both High Nitrate, Low Chlorophyll (HNLC) waters as well as the ultraoligotrophic LNLC regions. Although not numerically abundant, the diatom microplankton ($> 20 \mu\text{m}$) are important contributors to new production in these regions. To understand the contributions made to production by diatoms in iron-depleted waters, we examined the iron-specific ecology of this taxa as part of two field efforts in the Central North Pacific (CNP) gyre. During the two (06/2002 and 08/2003) research cruises, we focused on the vertically migrating buoyant diatom genera *Rhizosolenia* and *Ethmodiscus*. Whereas mats of *Rhizosolenia* along the easterly transect from Hawaii to San Diego showed elevated values ($n = 159$) of F_v/F_m , a measure of photochemical energy conversion efficiency, a decline in this parameter measured at locations west of 165°W provided evidence of nutrient limitation. By contrast, cells of *Ethmodiscus* showed consistently high values of F_v/F_m (~ 0.7 , $n = 82$). Some support for the pattern of F_v/F_m observed was provided by measuring the Ferredoxin (Fd) Index, a parameter relating the amounts of the redox catalysts Fd and flavodoxin. A separate study, the 14 day FeCycle cruise (02/2003), provided an opportunity to sample a nearly monophyletic assemblage of the diatom *Pseudo-nitzschia* sp. in the HNLC subantarctic Pacific. Unlike the CNP gyre, photosynthetic efficiency in the subantarctic was consistently low ($F_v/F_m \sim 0.2$, $n = 20$), suggestive of iron limitation. This was supported by the Fd Index which demonstrated the presence of flavodoxin, but not Fd. A stoichiometric analysis of the *Pseudo-nitzschia* dominated microplankton assemblage showed C:N to indicate the nitrate-sufficient status of these waters. A low Fe:C ratio was consistent with the iron deficient status of these HNLC waters.

BOARD 107 DOES PROXIMITY TO NECTAR FLOWERS ALTER POLLINATOR VISITATION TO POLLEN FLOWERS? SCOTT HEVNER, HEVNER@BGNET.BGSU.EDU, BOWLING GREEN STATE UNIVERSITY, DEPT BIOLOGICAL SCIENCES, BOWLING GREEN OH 43403.

Distances among resources affects the movement of individual foragers as they attempt to maximize a given resource currency. Individual flowers of different species, bearing different resources, may compete for or facilitate each other's visitation. Alteration of pollinator visitation may affect plant fecundity and parent and offspring fitness. This study considers whether visitation to pollen bearing flowers differs with proximity to nectar bearing flowers. Individual bumblebees (*Bombus impatiens*) were allowed to forage on four artificial flowers bearing 0.016 g pollen arranged in the corners of a 10×10 cm square. Nectar flowers contained 0.016 g of sucrose dissolved in 75 mL of water. Two nectar flowers were adjacent (1 cm) to two of the pollen flowers and the others were 20 cm distant from the nearest pollen flower. These distances approximate field conditions in which flowers of exotic hairy vetch (*Vicia villosa*) are interspersed with wild lupine (*Lupinus perennis*) flowers. Each bumblebee was allowed to forage until it returned to the colony. Pollen flowers adjacent to nectar flowers received a greater proportion of visits indicating a possible facilitating effect of hairy vetch, a nectar bearing exotic, on visitation to wild lupine.

BOARD 108 NEST-SITE TENACITY IN GRASSLAND SPARROWS AND BOBOLINKS ON THE WILDS, A RECLAIMED STRIPMINE IN EAST-CENTRAL OHIO. DANNY J. INGOLD, INGOLD@MUSKINGUM.EDU; DANIEL M. HOLLENBAUGH, DANIELH@MUSKINGUM.EDU; BIOLOGY DEPT., MUSKINGUM COLLEGE, NEW CONCORD, OH 43762.

Reclaimed stripmines provide suitable nesting habitat for a variety of grassland nesting bird species. The propensity for nesting individuals to return during consecutive years may serve as a barometer of the overall health and usefulness of such disturbed ecosystems. From May through mid-July 2004 we observed returning color-banded sparrows and bobolinks that were banded during the summers of 2000-2003. We also considered return data from each of the previous three breeding seasons. Twenty three percent of grasshopper sparrows (*Ammodramus savannarum*; 29/126) banded during 2000-2003 returned to nest on the same 90×180 meter rectangular plot during one or more subsequent years. Thirty one percent of savannah sparrows (*Passerculus sandwichensis*; 25/80) banded during this period returned during subsequent years, while 18% of bobolinks (*Dolichonyx oryzivorus*; 4/22) and only 5.5% of Henslow's sparrows (*A. henslowii*; 3/55) returned. The frequency with which savannah sparrows returned to

plots that had been mowed in April of each year did not differ from the return rate of individuals to unmowed plots (34% vs. 36% respectively); however, significantly more grasshopper sparrows (39 vs. 20%; $X^2 = 4.35$, $DF = 1$, $P < 0.05$) and bobolinks (57 vs. 0%; $X^2 = 6.99$, $DF = 1$, $P < 0.01$) returned to mowed versus unmowed plots in subsequent years. Thirty one percent of returning grasshopper sparrows (9/29) and 40% of returning savannah sparrows (10/25) were recaptured or sighted during two consecutive years or in one or more alternate years. These data suggest that this reclaimed stripmine is minimally providing adequate nesting habitat for these grassland species.

BOARD 109 SPATIAL ECOLOGY OF THE FUNNEL-WEB SPIDER *AGELENOPSIS UTAHANA* IN THE BEECH MAPLE FOREST AT THE J. H. BARROW FIELD STATION, HIRAM TOWNSHIP, KEELY M. DAVIDSON, DAVIDSONKM@HIRAM.EDU, SAMUEL D. MARSHALL, IAN BENNETT BENNETTIM@HIRAM.EDU P.O. Box 827, HIRAM, OH 44234

Because web construction represents an energetic investment for agelenids and is a determinant of foraging success, web-site selection is predicted to be an important decision in the life of the spider. In order to study web-site selection of *Agelenopsis utahana*, 20 5.0 m x 5.0 m randomly-placed quadrats located in the beech maple forest of the J.H. Barrow Field Station in Hiram Township, Portage County, Ohio, were censused for presence of *Agelenopsis utahana* webs on May 27-June 1, June 21-22, July 5-7, and July 19 of 2004 and nearest neighbor distances were recorded. Census data revealed aggregation at the plot level using the mean/variance test ($P < .01$) and a trend towards uniform spacing within the quadrats using the Clark Evans Nearest Neighbor Statistic ($R = 1.54$, $P > .05$). To examine the influence of habitat, substratum, herbaceous and woody vegetation, and dead wood were scored for three randomly placed transects within each quadrat. Tree dominance was also considered for each quadrat. Principle Component Analysis of the habitat data failed to uncover any clear differences between plots with 0 or 1 spider vs. plots with 2 or more spiders. This indicates that habitat is not a significant factor in determining web placement, but presence of other spiders is a determinant.

BOARD 110 PROTEIN PROFILES OF 3 REGIONS OF THE *MEDICAGO TRUNCATULA* PRIMARY ROOT. PRUDENCE J. HALL¹, HALLPJ@HIRAM.EDU, PETA HOLMES², U4102214@ANU.EDU.AU, BARRY ROLFE², BARRY.ROLFE@ANU.EDU.AU, ¹DEPARTMENT OF BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234 AND ²GENOMIC INTERACTIONS GROUP, RESEARCH SCHOOL OF BIOLOGICAL SCIENCES, THE AUSTRALIAN NATIONAL UNIVERSITY, CANBERRA ACT 2601, AUSTRALIA.

Different cell types in the primary plant root are derived from cell divisions in the root meristem. Proteomic analysis was used to develop protein profiles from 3 zones in the primary root corresponding to the root tip (<5mm) including the zone of cell division, the adjacent 10 mm region, and the next 10 mm region. Because of differences in stages of cellular development in the 3 zones, it was hypothesized that the profiles of proteins would differ. Proteins extracted from specified regions of *Medicago truncatula* roots were separated by 2-dimensional gel electrophoresis. Three silver-stained protein gels were prepared from each region of the root. The computer program Melanie 4 was used to determine the volumes of 110 different spots at defined positions on the gels. Only one unidentified protein appeared to be unique to the zone of cell division, although 6 other proteins were present at significantly greater levels ($P < 0.05$) than in upper root zones. The relative abundance of 6 proteins, including 2 plant resistance pathogenesis-related (PR) PR10-1 proteins, was significantly greater ($P < 0.05$) in the two upper regions of the root while at least 9 upper root proteins were undetected in tip extracts. Proteins visualized on Coomassie-stained gels were further analyzed by mass spectrometry and 30 have been tentatively identified. These results confirm that proteomic analysis can be a valuable tool for identifying proteins present in meristem and elongation zones of the primary root and for comparing their level of expression during root development.

BOARD 111 EXPLOITATION OF CARBON DIOXIDE AND PHOTOSYNTHETICALLY ACTIVE RADIATION BY SPRING FLOWERING *ERYTHRONIUM AMERICANUM* AND *TRILLIUM GRANDIFLORUM* AS COMPARED TO SUMMER FLOWERING *SMILACINA RACEMOSA*. LAURA L. FUDELLA (FUDELLLL@MUC.EDU). MOUNT UNION COLLEGE, 1972 CLARK AVE, ALLIANCE OH 44601.

Spring wildflowers are subjected to a distinct and short growing season. However, they are able to thrive, bloom and reproduce very effectively. This experiment was designed to measure how efficient two spring species (*Erythronium americanum* and *Trillium grandiflorum*) are at assimilating carbon. Both species were then compared to one summer species (*Smilacina racemosa*). Using a

Li-Cor 6400 the photosynthetic rate of *E. americanum*, *T. grandiflorum* and *S. racemosa* were measured in response to changes in light intensity (PAR) and carbon dioxide (CO₂) availability. Photosynthetic rates of *E. americanum* and *T. grandiflorum* were measured from April 28 to May 6, 2004 in the mature beech-maple forest at the Huston-Brumbaugh Nature Center, Stark Co., OH. *S. racemosa* was monitored from July 5 – 25, 2004 at the same location. It was hypothesized that *E. americanum* and *T. grandiflorum* would show a significant increase in net CO₂ assimilation in response to increasing CO₂ concentrations and increasing light intensities as compared to *S. racemosa*. Collected data strongly supported the hypothesis and in addition suggested *E. americanum* was the most efficient of all three species. The different photosynthetic strategies among these species reflect the natural differences between spring and summer light and CO₂ environments on the forest floor.

BOARD 112 THE EFFECTS OF THE INVASIVE SPECIES JAPANESE KNOTWEED, *POLYGONUM CUSPIDATUM* ON THE DIVERSITY OF RIPARIAN PLANT COMMUNITIES IN THE CUYAHOGA VALLEY NATIONAL PARK. ALEXIS K. MOHNEY¹, LEXIEMOHNEY711@HOTMAIL.COM, CHARLES MCCLAUGHERTY², MCCLAUCA@MUC.EDU, ¹6710 STEWART SHARON RD., BROOKFIELD OH 44403, MOUNT UNION COLLEGE, DEPT OF BIOLOGY, ²1972 CLARK AVE, ALLIANCE, OH, 44403.

Japanese knotweed, *Polygonum cuspidatum*, is an invasive plant species that produces large mono-specific stands and is thought to reduce plant diversity along waterways and in disturbed areas. In this study the diversity of seven riparian plant communities located along the Cuyahoga River between Cleveland and Akron in the Cuyahoga Valley National Park was studied in both invaded and uninvaded areas during May, June and August 2004. Three aspects of community diversity were compared: 1) Seasonal changes 2) Diversity in uninvaded and invaded sites 3) Changes in diversity along transects from uninvaded to invaded sites. Diversity was measured by Shannon-Weiner Index (H') and species richness (S). Contrary to our expectations there were no significant changes in H' within sites through the course of the study, (average H' ranged from 0.166-2.02). Statistical differences were found between the diversity of invaded plots (with average H' range from 0.28-1.16) and uninvaded plots (average H' 0.83- 2.01). Diversity along transects showed a decreasing trend from uninvaded to invaded plots, but this trend is only significant by regression statistics in half of the transects. During the study more than fifty species of plants were collected, identified, and preserved; these included many other non-native species. This study showed that Japanese knotweed had a clear negative effect on the diversity of riparian plant communities.

BOARD 113 EVIDENCE OF ECOTYPIC DIFFERENTIATION IN *ARABIDOPSIS THALIANA* GROWN IN THREE SIMULATED ENVIRONMENTS. RYAN W. MCEWAN, RYAN.W.MCEWAN.1@OHIO.EDU, JYH-MIN CHIANG, HARVEY E. BALLARD JR. AND SARAH E. WYATT OHIO UNIVERSITY, DEPARTMENT OF ENVIRONMENTAL AND PLANT BIOLOGY, 317 PORTER HALL, ATHENS OH 45701.

A fundamental problem in evolutionary biology is understanding the relationship between an organism's functional response to its environment and its adherence to genotypic boundaries. This relationship represents tension between natural selection and gene flow and is expressed as sub-species level, or ecotypic, differentiation. Potential ecotype differentiation within *Arabidopsis thaliana* was examined by planting seeds from Helsinki, the United Kingdom and Cape Verde Island, into controlled environments mimicking those three locales. For comparison, we also included seeds from Kazakhstan and from the "wild type" *A. thaliana* (WT) typically used in molecular research. The environments differed in terms of day length (Helsinki > Manchester > Cape Verde, long to short) and temperature (Cape Verde > Helsinki > Manchester, high to low). Germination rates varied: WT and Cape Verde reached 100%, while Helsinki (66%), United Kingdom (25%) and Kazakhstan (25%) were markedly lower. There was dramatic temporal variation in silique production, as WT first produced mature siliques 35 days after planting, while some Finland replicates produced siliques > 100 days after WT had begun production. Total silique production per replicate differed among populations ($P < 0.0001$), with WT (2306 ± 133) nearly twice that of Cape Verde (1169 ± 152). Environmental conditions influenced total silique production ($P = 0.014$); however, populations did not always exhibit fidelity to their environmental origin, and WT silique production was greatest across all conditions. Our work provides strong evidence for ecotypic differentiation in *A. thaliana* and sets the stage for ongoing molecular investigations of the population-level speciation process.

BOARD 114 SEED GERMINATION ECOLOGY OF BLOODROOT (*SANGUINARIA CANADENSIS* L.) AND GOLDENSEAL (*HYDRASTIS CANADENSIS* L.). MATTHEW A. ALBRECHT, MATTHEW.ALBRECHT@OHIO.EDU AND BRIAN C. MCCARTHY, MCCARTHY@OHIO.EDU. ENVIRONMENTAL AND PLANT BIOLOGY, OHIO UNIVERSITY, ATHENS, OH 45701.

Non-timber forest products (NTFPs) represent an important, yet often overlooked component of the Appalachian forest landscape. In particular, many Appalachian forest herbs possess medicinal properties and, therefore, are harvested from wild populations for personal use, economic gain, and agroforestry production. However, the paucity of autecological information is often cited as an impediment to effective conservation-based management strategies. In a southern Ohio successional forest we examined how habitat heterogeneity influences the seed regeneration ecology of two notable NTFPs, bloodroot (*Sanguinaria canadensis* L.) and goldenseal (*Hydrastis canadensis* L.). We conducted a 2 × 3 factorial field experiment by sowing seed (summer 2003) of each species into replicated plots at two topographic aspects (North and South) in three forest floor microenvironments (ambient leaf litter, leaf litter removed, leaf litter addition). Goldenseal germination was significantly greater on north plots relative to south plots ($P = 0.02$), while topographic aspect had no effect on bloodroot germination ($P = 0.50$). Goldenseal cotyledon emergence was significantly greater in disturbed and ambient litter microenvironments ($P = 0.04$) compared to plots where leaf litter was added, although no interactive effect was observed ($P = 0.16$). Conservation management efforts with goldenseal will benefit from sowing seed in mesic areas, with slightly disturbed forest floor microenvironments. In the case of bloodroot, management efforts will have to account for low germination rates when establishing populations from seed.

BOARD 115 HISTORY OF BUILDING STONE USE IN TOLEDO, OHIO JAMES M. MEINHART JMEINHA@YAHOO.COM DEPT. OF EEES, UNIVERSITY OF TOLEDO, TOLEDO, OH 43606-3390 AND MARK J. CAMP MARK.CAMP@UTOLEDO.EDU

Toledo, like most large cities, has a significant number of buildings, bridges, and monuments of stone construction, but a number have been lost in the last 25 years. Documentation of these structures is necessary before more are lost to age or reconstruction. Restoration of existing buildings will be helped by the identification of stone types and the location of the original sources of the stone. Over 155 buildings and monuments were identified for study based on significant stone use, stone type, construction date, location, and historic significance. Structures were grouped according to innovative methods of construction, last surviving work of a particular architect, stone type, and example of a product of a particular quarry or company. Stone for the oldest structures came from the Cleveland and Sandusky areas. By the late 1850s, railroads also served these areas increasing the marketability of the Devonian Amherst and Berea sandstones and Columbus and Delaware limestones, both widely used in churches. Local Silurian age dolostones were used in many early foundations and bridge abutments. Glacial erratics and dressed fieldstone found use in a number of residences. By 1900 imported stone from around the world was beginning to be used in residences, corporate offices, and many downtown buildings. Mississippian Indiana (Salem) limestone became favored for many financial institutions. Toledo's Woodlawn Cemetery contains excellent examples of most of the monumental dimension stones used in Toledo.

BOARD 116 GASTROPOD ECOLOGICAL SURVEY AND 3RD STAGE LARVAE ISOLATION OF *PARELAPHOSTRONGYLUS TENUIS* AT THE WILDS, NOBLE COUNTY, OHIO. SARAH J. OLESAK SOLESAK@MUSKINGUM.EDU (JIM DOOLEY JDOOLEY@MUSKINGUM.EDU.), MUSKINGUM COLLEGE, BIOLOGY DEPT, 163 STORMONT ST, NEW CONCORD OH 43762.

Parelaphostromylus tenuis is a widespread parasite carried by the white-tailed deer *Odocoileus virginianus*. It has been associated with a debilitating neurological disease in native cervids and non-native hosts such as exotic ungulates in The Wilds and other conservation management facilities. Concern about exposure of non-native ungulates to *Parelaphostromylus tenuis* in captive management settings has fueled efforts to improve options for both prevention and treatment. The two objectives of this research were to focus on the ecology of the intermediate gastropod carrier of the parasite and the isolation of the parasite's 3rd stage larvae. Gastropods were collected at The Wilds in Cumberland, Ohio, during the summer and fall of 2004. Corresponding data of gastropod species, habitat type, time, and temperature at collection was also recorded. Six cardboard panels were placed at three sites frequented by white-tailed deer, each consisting of a forest and field habitat. Each 2 foot square panel served as a collecting unit

that gastropods clung to. Collected gastropods were chemically digested with a porcine pepsin-HCl mixture and the residue examined for parasites. It is expected that species *Derocerus laevae* gastropods, which have been found most abundant in the given habitats, will be most likely to carry the parasite. At the completion of this research project patterns in the ecological data of habitat type and temperature will be compared with patterns in the gastropod population collected.

BOARD 117 SPECIES GROUPS IN *PERIDINIUM* I. THE UMBONATUM GROUP. SUSAN CARTY SCARTY@HEIDELBERG.EDU DEPT OF BIOLOGY, HEIDELBERG COLLEGE, TIFFIN, OH 44883

The genus *Peridinium* was described in 1830 by Ehrenberg for thecate dinoflagellates lacking an eyespot. Many species have been removed from *Peridinium* into their own genera. *Peridinium* still contains nine groups of species with morphological characteristics different than the type species, *Peridinium cinctum*. *Peridinium cinctum* is large, heavily thecate, lacks an apical pore, has three apical intercalary plates in an asymmetrical arrangement, five circular plates, and five sulcal plates. The Umbonatum Group, which contains *P. umbonatum*, *P. africanum*, *P. belizensis*, *P. centenniale*, *P. deflandrei*, *P. goslaviense*, *P. inconspicuum*, *P. lubieniense*, *P. morzinense*, and *P. pusillum*, are small cells, lightly thecate, have apical pores, two apical intercalary plates in plastic positions, six circular plates and five sulcal plates unlike those in *P. cinctum*. Seven of the species in the Umbonatum Group have been examined by scanning electron microscopy (SEM) for details about thecal construction, as have several other species in the genus *Peridinium*. This is the first of several proposals to move species groups within *Peridinium* to new genera.

BOARD 118 GROWTH-LIMITATION BY PHOSPHORUS AND CARBON ON AN OFFSHORE STATION OF LAKE ERIE. JAMES P. HURLEY IV, JPHURLEY@KENT.EDU, ROBERT T. HEATH, RHEATH@KENT.EDU, 1227 CLIFTON AVE., AKRON OH 44310.

The purpose of this study was to determine whether a natural bacterial assemblage collected from a station 16 km offshore in the Sandusky Sub-basin of Lake Erie was growth-limited by phosphorus or carbon availability, both, or neither. Bacteria was grown under controlled lab conditions, and growth was measured by increase in cell numbers and average cell biovolume at t=1 (24 hrs), t=2 (48 hrs), and t=3 (72 hrs). The control was determined at t=0. Potassium phosphate was used as the phosphorus source, while glucose was the carbon source. This study was performed using a factorial design of nine 250mL flasks with designations of "No", "Low" (80 nM phosphate or 25 μM glucose), and "Hi" (400 nM phosphate or 125 μM glucose) to represent concentrations of both phosphorus and carbon, respectively. A repeated measures ANOVA test showed that bacterial numbers increased due to additions of phosphorus ($P = 0.0178$) or carbon ($P < 0.0001$), but not by the combination of phosphorus and carbon together. Time had a profound influence on bacterial growth as well ($P < 0.0001$). Bacterial biovolume, measured by epifluorescence microscopy and image analysis (Metamorph 4.1), showed no significant increase. We conclude that although both phosphorus and carbon independently stimulated growth, carbon had a stronger effect. This study was supported by grants from the NSF (UMEB-0305126) and Ohio Sea Grant College Program (R/ER-60).

BOARD 119 COMPARISON OF CHIRONOMID HABITATS IN THE ST. MARYS RIVER HEADWATERS. LUANN CHRISTENSEN LEE, LHLEE@BUS.EDU AND GARY DODSON GDODSON@BSU.EDU, DEPARTMENT OF BIOLOGY, BALL STATE UNIVERSITY, MUNCIE, INDIANA 47306

Chironomidae and Ephemeroptera are important indicators of stream water quality. They are tolerant of poor water conditions and are useful in sediment toxicity studies. The St. Marys River begins in western Auglaize County and flows through agricultural, industrial, urban, and wooded areas before turning northwest toward Ft. Wayne, Indiana. Four sample sites were selected based on their proximity to anthropogenic disturbances such as agricultural runoff, industry, urban areas, and examined for impact on macroinvertebrate populations in comparison to a relatively pristine wooded site. Sixteen samples of macroinvertebrates were collected from two riffles and two pools at each site using a kick net. Sediment was gathered from each sample location and sieved for particle size. Water and sediment were analyzed for Cd, Cr, Ni, Fe, and Cu. Dissolved oxygen was measured using a modified Winkler titration. Temperature and depth were measured. It is hypothesized that numbers of chironomids and ephemeroptera would be greater as dissolved oxygen increased.

No ephemeroptera were collected. Chironomid numbers were not related to temperature, dissolved oxygen, or metals, but were associated with site and sediment size. Sites in agricultural areas had more silt (depth >5 cm) and correspondingly lower numbers of chironomid larva (N=9) than the sites with less silt (depth < 3 cm) and particle size > 2 mm. The greatest number of chironomids (N=210) were found at the site nearest the headwaters.

BOARD 120 DOES OTOLITH CHEMICAL SIGNATURE DIFFERENTIATE FISH STOCKS? TODD A. HAYDEN, THAYDEN@BGNET.BGSU.EDU, ROBERT GETZ, JOHN FARVER, DEPARTMENT OF GEOLOGY, BOWLING GREEN STATE UNIVERSITY, JFARVER@BGNET.BGSU.EDU, JEFFREY G. MINER, JMINER@BGNET.BGSU.EDU, TODD HAYDEN, DEPARTMENT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

White bass (*Morone chrysops*), an important Lake Erie sportfish, annually migrate into western basin tributaries and shallow offshore reefs to spawn. Although many life history characteristics of white bass are well understood, little research has focused on white bass philopatry (*i.e.* adults returning to the natal site for spawning). Otolith chemistry (using LA-ICPMS) was used to determine adult white bass philopatry in western Lake Erie. The otolith is a biomineralized structure in the head of fish that grows sequentially around a central point (primordium) throughout the life of the fish. Although the otolith is mostly calcium carbonate, some trace metals (Sr, Ba, Mg) substitute into the otolith in proportion to levels found in the environment. Because trace metal concentrations in the environment are spatially variable, we used otolith trace metal concentrations in the primordium of adult spawning fish (time they hatched from eggs) to determine if all fish at a spawning location originated from a single spawning area. Fish were collected from the Maumee and Sandusky rivers and from the Canadian waters of the central basin (total N=32) in spring 2001. If adult spawning white bass have similar primordial otolith chemistries, then it suggests these fish have returned to the natal site as adults to spawn. Spawning white bass that do not have similar primordial regions suggests these fish were spawned outside of the collection location (in a different water mass). Data were statistically analyzed using a discriminate function analysis to determine underlying similarities in the multivariate otolith signatures between and among fish collection sites. While 57-82% of the white bass at any spawning site were classified together, this suggests strict philopatry and subsequent genetic isolation does not occur for this species.

BOARD 121 ROUND GOBY AND DREISSENIID EFFECTS ON YOUNG-OF-THE-YEAR SMALLMOUTH BASS GROWTH AND SURVIVORSHIP. CHRISTOPHER J. WINSLOW, CJWINSL@BGNET.BGSU.EDU, DANIEL WIEGMANN, DDWIEGM@BGNET.BGSU.EDU, JEFFREY G. MINER, JMINER@BGNET.BGSU.EDU DEPARTMENT OF BIOLOGICAL SCIENCES, BOWLING GREEN OHIO 43403.

The Lake Erie biological community has fluctuated considerably over the past century due to introduction of invasive species. Invasives impact communities through food-web shifts and alterations of the physical environment. We used mesocosms to quantify how two invasives, dresseids (mollusc) and round gobies (RG, a fish), affect growth and vulnerability of young smallmouth bass (YSMB), an important sport fish. Dresseids may indirectly aid YSMB by providing structural complexity which increases invertebrate resources. RG may directly influence YSMB by interfering with habitat use (decreasing foraging and increasing predation), but they may also indirectly affect YSMB by reducing abundance of invertebrates found among dresseids. Our goals were to evaluate how dresseids mediate YSMB growth through their influence on food density, and to evaluate how RG directly and indirectly affect YSMB growth. Treatments within mesocosms (N=54, 0.3-m²) included varying densities of YSMB, dresseids (presence/absence), and RG (presence/absence), and in these growth, diet, and survivorship of YSMB were quantified. In the presence of conspecifics or RG, YSMB growth was 66 and 65% lower, respectively, than YSMB alone (ANOVA, P=0.013, and Tukey's LSD, P<0.05). This suggests that intraspecific and interspecific competition are equivalent. Because Lake Erie RG are found at high densities (up to 15-m⁻²), the competitive effects of RG on YSMB appear to be substantial. Currently, the impact of invasive species on YSMB population dynamics in Lake Erie is largely unknown. Understanding these interactions are important because fisheries management has shifted from an individual species perspective to the level of the fish community supporting it.

Pre-College Posters - Session C 3:00 – 4:30 PM

BOARD 122 CAN RECYCLED PLASTICS BE USED AS A PACKAGING MATERIAL TO REDUCE ENVIRONMENTAL WASTE FOR COMPANIES, COMMUNITIES AND HOUSEHOLDS AS WELL AS REDUCE SHIPPING COST AND HELP PROTECT THE EARTH'S ENVIRONMENT? CRYSTAL M. BOYKIN. JCB58@AOL.COM, 3383 FAULKNER DRIVE, BRUNSWICK OH 44212. (WALSH JESUIT HIGH SCHOOL).

The purpose of this project is to determine if recycled plastics can be used as a packaging material to reduce environmental waste for companies, communities and households as well as reduce cost and help protect the earth's environment. This project proposes to use, reuse and shred plastics obtained from everyday products and make them into packaging materials for households and businesses. The hypothesis is that recycled plastics from bottles cans, containers and bags can be used as packaging materials to reduce environmental waste because the plastics can be separated with ease and put in categories. Six different types of recycled plastics were tested (PETE) Polyethylene Terephthalate, (HDPE) High Density Polyethylene, (V) Vinyl, (LDPE) Low Density Polyethylene, (PP) Polypropylene, and (PS) Polystyrene. 150 tests were run. Tests included measuring plastic temperature, orientation, moisture, stain, absorbency and impact when shredded into 1, 1 ½" & 2" packaging materials. All tests were repeated three times for accuracy. Recycled shredded plastics were ranked from the packaging tests. V =1, PP=2, PETE=3, HDPE=4, LDPE=5, and PS=6. The test control was 1" shredded newspaper. It was determined that all six recycled plastics can be used as packaging materials. Recycled vinyl and polypropylene were ranked first and second based on test data. Test results of the recycled plastics showed that recycled plastics can be used as packaging materials.

BOARD 123 HERBS FOR THE HEART. SUZANNE B. MAZHUVANCHERY, BOBBY0524@SBCGLOBAL.NET, 6669 RENWOOD RD. INDEPENDENCE OH 44131.

The objective of this scientific investigation was to determine if various herbs would decrease or increase heart rate of *Daphnia*, commonly known as water fleas. It was hypothesized that Cayenne pepper would have the greatest effect in decreasing the heart rate of *daphnia*. Ginger and Black Cohosh would also decrease the heart rate, but not as dramatically as Cayenne. Motherwort would decrease the heart rate the least. Hawthorn, Ginseng, and Garlic would also have a decreasing affect. Orange essential oil could also be used to decrease the heart rate of *daphnia*, however the results could not be used accurately in this study. The heart rates of *daphnia* were studied under a microscope. Three drops of each of the herbal concentrated solutions were placed on the slide of the *daphnia*. The solution contained a half cup of water and 15-20 drops of each herb in liquid form. The respiration rate was recorded before each trial began by looking under the microscope, counting the heart rate for 10 seconds, and then multiplying it by 6. After solutions were added, the heart rate of the *daphnia* was tested again. Three trials were conducted and the heart rate differences were averaged. Ginger and Black Cohosh decreased the most (196 beats per minute-116 beats per minute -Ginger) (188 bpm - 108 bpm for Black Cohosh), followed by Cayenne and Garlic (210 bpm-138 bpm-Cayenne) (202 bpm-156 bpm-Garlic). Hawthorn and Motherwort decreased less than Garlic (208 bpm-166 bpm-Hawthorn) (182 bpm-140 bpm-Motherwort). Ginseng decreased the least.(212 bpm-174 bpm). In conclusion, based on the results of the testing in this scientific study, these herbs have a dramatic effect on decreasing the heart rate of *daphnia*. The result of this study indicate that of the herbs tested in this study, people with increased heart rate should take Cayenne, Black Cohosh, or Ginger for the greatest effect, and Hawthorn, Motherwort, Ginseng, or Garlic for a lesser effect.

BOARD 125 A SURVEY OF FUNGAL INFECTIONS IN AN INPATIENT BURN UNIT. MARIAM KHAN¹, MXK88@HOTMAIL.COM, LYNNE L. YURKO², TAMERA L. COFFEE², C. P BRANDT², CHARLES J YOWLER², 13905 GRENVILLE ROAD, UNIVERSITY HEIGHTS, OH 44118. (HATHAWAY BROWN SCHOOL) AND ²METROHEALTH MEDICAL CENTER 2500 METROHEALTH DR., CLEVELAND OH 44109-1998.

Since the 1980s, there has been a 400% increase in the incidence of nosocomial fungal infection in the U.S. Though burn patients are at a particularly high risk, the absence of a burn registry makes it difficult to determine the implications of fungal infection in the overall burn population. Therefore, we conducted a single center retrospective study to determine the impact of

fungal infection in the intensive burn population at the Cleveland MetroHealth Hospital. We predicted that older patients (50 or greater) with greater severity burns (25% or higher) would be more at risk for infection. We also predicted that fungal infection would increase length of stay, mortality, and the use of antifungal medication. Charts of 357 patients with positive fungal cultures from January 2002 to December 2003 were assessed for age, comorbidities, etiology of burn, total body surface area (TBSA), percent full-thickness (3rd degree burns), use of antifungal medications, fungal species, culture site, length of stay, and mortality. Forty two patients were positive for fungal growth. Patients with positive cultures had an average age of 42 years old, an average TBSA of 23.8% (range 3-85%), and an average full-thickness of 15.8% (range 6-80%). The most common fungus was *Candida* (94.8%), and the least common *Aspergillus* (5.2%). A burn wound was the most common culture site. 76% of the patients had no significant comorbidity. 31 of 104 cultures were treated with medication; Fluconazole was the most common medication used. The mortality rate of patients with a positive fungal culture was 9.5%, greater than the average historical rate for the Cleveland MetroHealth Hospital Burn Unit (4%). This showed that there was an increased mortality rate of the fungal patients considering that it was much larger than the average rate of the entire burn population at MetroHealth. We concluded that positive fungal cultures appeared in middle aged patients with larger TBSA and full-thickness burns at the burn wound itself. Also, a majority of the patients with positive fungal infections did not receive antifungal treatment with a mortality rate greater than MetroHealth's average.

BOARD 128 β -LAPACHONE- INDUCED DEATH MORPHOLOGY. LINDSAY M. CIERI, MUBICUO3@AOL.COM, 3025 FONTENAY ROAD, SHAKER HEIGHTS OH, 44120, KATHRYN E. REINICKE, KER5@PO.CWRU.EDU, DAVID A. BOOTHMAN, PH.D, DAB30@PO.CWRU.EDU, CASE WESTERN RESERVE UNIVERSITY, DEPT. OF RADIATION ONCOLOGY, CLEVELAND OH, 44106.

The effect of the drug β -lap, a naturally occurring compound from the South American Napacho tree, was observed in cells that did or did not contain NAD(P)H:quinine oxidoreductase 1 (NQO1), to see whether they would show apoptotic morphology. Cells undergoing apoptosis first condense their nuclei, then package their DNA into vesicles that are excreted. NQO1 uses NAD(P)H as an electron donor, reducing β -lap to a hydroquinone, which is unstable and converts back to the parent molecule. In order to observe apoptotic morphology, NQO1⁻ 468-Vec4 and NQO1⁺ 468-NQ3 breast cancer cells were used in experiments involving harvesting, fixing and staining for fluorescent microscopy. Cells were treated with β -lap to induce apoptosis. Twenty-four hours after a 2 hour pulse of drug, the cells were washed and fixed with 3:1 Methanol:Glacial Acetic acid, and stained with Hoechst dye. The cells were then covered with coverslips. This allowed the cells to be observed by fluorescent microscopy under UV light with a DAPI filter using a 100X oil immersion lens. Because the 468-NQ3 cell line contains NQO1 and the 468-Vec4 cell lines do not, β -lap induced apoptosis only in the 468-NQ3 cells. Dicoumarol, an inhibitor of NQO1, keeps β -lap from killing NQO1⁺ cells. Thus, the NQO1 containing 468-NQ3 cells were not killed when treated with both β -lap and dicoumarol. BAPTA, a calcium chelator, blocks calcium signaling and prevents β -lap-induced cell death in NQO1 containing cells. As a result, the 468-NQ3 cells survived when co-treated with BAPTA and β -lap. 468-Vec4 cells are resistant to β -lap because of their lack of NQO1. These data show that β -lap induces apoptotic morphology only in cells expressing NQO1. This can be blocked by inhibiting NQO1 with dicoumarol, or chelating calcium with BAPTA.

BOARD 129 INVESTIGATING TETRACYCLINE RESISTANCE IN BACTERIA. MICHAELA G. MARGIDA, COUNTRY_NIGHTINGALE@YAHOO.COM, 11592 McCALLUM AVE., ALLIANCE OH 44601.

A growing problem in the medical field is that many bacteria are becoming resistant to the very antibiotics most commonly used to fight them. Many doctors think that bacteria develop resistance due to an overexposure to antibiotics. If this is true, then is it possible for bacteria to be resistant to antibiotics without previous exposure to them? An experiment was conducted to answer this question with the hypothesis that bacteria that had not been previously exposed to antibiotics would not harbor resistance toward them. To test this hypothesis, forty-one bacterial cultures were harvested from an untreated pond on the campus of Mount Union College in Alliance, where the work was done, then grown in agar with concentrations of 10, 15, 25, and 50 μ g/ml of tetracycline. The process was repeated using liquid cultures and results were quantified using a spectrophotometer. The results were unexpected: 73% of the bacteria grown demonstrated

resistance to at least 25 μ g /ml of tetracycline. After this was determined, the presence of plasmid DNA from bacteria that demonstrated resistance was confirmed using electrophoresis. Then, the DNA was isolated and implanted into nonresistant bacteria. Over half of the *E-coli* cultures to which the DNA was transferred showed resistance to 25 μ g /ml tetracycline. Therefore, antibiotic resistance in bacteria was shown to occur in cultures that had not previously been exposed to antibiotics, and that resistance was shown to be transferable to other bacteria by way of DNA implantation.

BOARD 131 THE DETECTION OF ALKALINE PHOSPHATASE USING AN ELECTROCHEMICAL SENSOR IN A SINGLE STEP APPROACH. JOANNE HELEN WANG (DANSEXMACABRE@GMAIL.COM 946 BRAINARD ROAD, HIGHLAND HEIGHTS, OH 44143), LAWRENCE CHOU (CASE WESTERN RESERVE UNIVERSITY), KEVIN WANG (CASE WESTERN RESERVE UNIVERSITY), CHUNG-CHIUN LIU (CASE WESTERN RESERVE UNIVERSITY).

Alkaline phosphatase (ALP) is an enzyme that is a biological marker for various diseases, primarily bone and liver disease. Normal levels of ALP generally range from 25-100 IU/L, and concentrations outside of this range generally indicate disease. Currently, clinical detection of ALP uses spectrophotometric analysis. In addition, according to various reports, electrochemical detection of ALP requires a complex, two-step reaction, involving two separate enzymes and a change in pH from 10 to 6.5. In addition to detecting ALP using an electrochemical sensor, a greatly simplified process of detection was derived in a single-step approach. ALP's substrate, phenol phosphate, was decomposed, and its product was oxidized and reduced for detection. This was contrary to the two-step reaction, which involved decomposition of phenol with enzyme tyrosinase, a pH change to 6, and detection of hydrogen peroxide, the final product. The sensor itself was a three-electrode sensor; the reference electrode was silver-silver chloride, and the working and counter electrodes were carbon, because metal electrodes would have caused interference in the signal. With the production of phenol in the single step approach, cyclic voltammograms were taken in both positive and negative polarities in a -0.2~0.6V scanning window, using a CH Instruments, Inc. electrochemical analyzer. The oxidation peaks of the graphs were analyzed and compared to the peaks of background solutions of buffer solution and unreacted phenol phosphate in buffer solution. The currents obtained from the oxidation peaks were plotted and demonstrated a linear relationship between current and varying concentrations of ALP, from 28.57-171.42 IU. The data, in this linear relationship, show that the sensor developed was able to successfully detect varying concentrations of ALP in a single-step reaction and can be useful for detecting abnormal levels of ALP in the body, indicating certain diseases.

BOARD 132 EPIDERMAL GROWTH FACTOR RECEPTOR (EGFR) GENE MUTATION IN LUNG CANCER. YASMIN MEKHAIL YMEKHAIL06@HB.EDU, 7480 ROYAL PORTRUSH DR., SOLON OH, 44139.

Lung cancer is the leading cause of cancer death worldwide. Forty to 80% of patients with non-small cell lung cancer (NSCLC) have over-expression of the EGFR, which has been linked to cancer development. Gefitinib, a tyrosine kinase inhibitor (TKI), targets the tyrosine kinase domain of EGFR. Only 10% of NSCLC patients respond to gefitinib. Patients likely to respond were found to have specific mutations in the EGFR gene. The goal of this project was to identify the incidence of EGFR mutations in randomly selected NSCLC patients and to correlate these mutations to demographics, tumor type and stage. Charts for NSCLC patients enrolled in clinical trials (1996-1999) who had frozen archived tumor tissue were reviewed. Genomic DNA obtained from archived tissue (Qiagen Dneasy isolation kit) was screened for mutations in the EGFR gene through sequencing of exon 21 after PCR amplification. The 20 samples were then compared to published wild type sequence to determine the presence of mutations. Twenty patients were identified: 7 male, 10 female, 3 unknown (uk); 3 Black, 9 Caucasian, 8 uk; 13 smokers, 1 non-smoker; 6 uk, average age was 60.8 years (median 62, range 39-76); 16 adenocarcinoma, 1 squamous, 3 undifferentiated; 2 stage I, 14 stage III, 1 stage IV, 3 uk; adjuvant treatment; 8 yes, 9 no, 3 uk. None of the 20 samples that were analyzed were positive for exon 21 mutations. This small sample suggests that exon 21 mutation is uncommon in randomly selected NSCLC patients.

BOARD 133 CORRELATION OF SCHOOL LUNCH MENUS AT FAIRLAND MIDDLE SCHOOL. AYUSA SINHA OOSHKHOOSH@YAHOO.COM, 20 PVT. DR. 10467, PROCTORVILLE OH 45669.

The purpose was to determine whether the lunches provided by Fairland Middle School, Lawrence County, Ohio correspond with the Mediterranean, Asian, Latin American, and USDA food pyramids

and if the lunches promote unhealthy life styles. Another purpose was to determine the perception of the food served and the perception of the food consumed at Fairland Middle School by students. Surveys were given to every student attending Fairland Middle School in which the students rated the foods served by the school and gave a percentage of how much of the specific food was usually eaten. Another survey was given to five registered dietitians at V.A. Medical Center in Huntington, West Virginia. An alternative menu that agreed with the food pyramids and did not encourage unhealthy life styles was created. The hypothesis was that the school lunches provided by Fairland Middle School were inconsistent with the Mediterranean, Asian, Latin American, and USDA food pyramids and would encourage unhealthy life styles. The results suggested that French fries were the highest rated in terms of interest in eating and also most often, whereas salads were the lowest rated in interest of eating and least often eaten. However the french fries were rated least nutritious by the dietitian and salads were rated most nutritious. Results suggest that students preferred french fries, 4.52 out of 5, next was tater tots rates 3.55 out of 5. The least preferred food was salads which 2.2. Therefore it can be concluded that 68% of students preferred french fries and 31% preferred taco salad. Both of these foods are low nutritional foods and are high in fat content which suggest that there is a chance for students to lead unhealthy life styles.

BOARD 134 CAN JELLYFISH LEAD TO A CURE FOR CANCER KRISTOPER E. KRASNOSKY, KRIS@I-KIRS.COM 1215 COONPATH RD NW, LANCASTER OH, 43130.

The goal of this research was to isolate a binary GFP plasmid from the jellyfish *A. Victoria* capable of transforming *Agrobacterium tumefaciens* and rice as the first stage of a two-stage experiment where the second stage would be to use the transformed *A. tumefaciens* and the knowledge gained from stage one to transform mammalian cancer cells using transformed *A. tumefaciens*. It is hypothesized that if the binary plasmid pCambia 1303 (contains GUS [Blue protein] and GFP) was electroporated into *E. coli* and then into *Agrobacterium tumefaciens lba 1404* and the resulting transformed *Agrobacterium* was co-cultivated with rice calli, the rice would be transformed with at least a 70% transformation efficiency and produce the GFP and GUS proteins and thus verifying that pCambia 1303 is a viable plasmid for use in rice transformation requiring the GUS and GFP marker. The researcher concluded that the plasmid pCambia 1303 did transform *E. coli* 101 with over 95% efficiency out of 2253 colonies. *E. Coli* 101 did transfer the plasmid to *Agrobacterium tumefaciens lba1404* with over 95% transformation efficiency 2564 colonies. *Agrobacterium tumefaciens lba1404* co-cultivated with rice calli did successfully transform the rice calli with 70%+ transformation efficiency out of 349 calli (as verified through UV, GUS staining, antibiotic selection, and electrophoresis). These calli have produced and expressed the GFP and GUS proteins, thus *Agrobacterium tumefaciens lba 1404* transformed with the plasmid pCambia 1303 is a viable monocot binary vector. This research is a prerequisite to the testing of *Agrobacterium tumefaciens lba1404* transformed with pCambia 1303 as a bacterial vector capable of mammalian cancer cell transformations, not yet accomplished in the research community.

BOARD 135 THE RELATIONSHIP BETWEEN SEED DENSITY AND RATE OF GERMINATION. MINA SAMIR MAKARY, MINAMAKARY1@HOTMAIL.COM, 1311 SADDLE RIDGE LANE, WORTHINGTON OH 43085. THOMAS WORTHINGTON HIGH SCHOOL.

This experiment was conducted to determine the effect of seed density on the rate of germination and growth. Forty-eight seeds of white bush Earlserv beans (*Phaseolus vulgaris*) were potted into twelve pots. Three density ranges: (0.80-1.00 g/cm³), (1.01-1.23 g/cm³), and (1.24-1.50 g/cm³) were calculated by water displacement. Four seeds of each density group were planted in each pot. Controlled variables were the pot size, the amount of water given to the seeds, the type of potting soil, the exposure to sunlight, and the planting depth of each seed. The experiment was repeated four times over fifty-six days. Equations were derived and used to compare seed density and porosity. Data indicate the 0.80-1.00 g/cm³ seeds germinated at the fastest rate, followed by the 1.01-1.23 g/cm³ seeds, and finally the 1.24-1.50 g/cm³ seeds. On average, plants grown from seeds with density range 0.80-1.00 g/cm³ reached their maximum height after nine days. Plants grown from the 1.01-1.23 g/cm³ seeds took ten days to reach their maximum height. Finally, the 1.24-1.50 g/cm³ seeds stopped growing and leveled off after twelve days. Overall, the lower the density of the seed, the faster it germinated and grew. However, the maximum height attained of all seeds was not related to seed density. According to this project, farmers can use seed density to determine which kind of seeds to use. Densities can also be used to test weights of grains which is important in determining the quality and price of grains.

BOARD 136 EFFECTS OF PAPER SLUDGE ON RECLAIMED SURFACE MINED SITES JARED B. STEED HOBBIT_99@HOTMAIL.COM 5979 RADNOR ROAD, RADNOR, OH 43066.

Surface mining is the removal of overburden to reveal a seam of coal. The Federal Surface Mining Control and Reclamation Act (SMCRA) of 1977 and Ohio's 1972 strip mine and reclamation law requires that bonds be posted to the state redeemable five years after a strip mine has been reclaimed with live vegetation. Southern Ohio's pyrite rich soil oxidates when disturbed and forms iron hydroxides and sulfuric acid, which leaches to the soil years after reclamation. Yearly application of lime to neutralize the acidity is required to sustain vegetation. Paper sludge, a by-product of paper production, is a mixture of paper fibers and calcium carbonate (lime). One southern Ohio paper-producer produces three hundred wet tons of paper sludge a day. Application of paper sludge to remediated surface mine sites was tested in this study. Surface soil from a surface mine site and paper sludge were tested for pH, moisture, organic matter and electrical conductivity (EC). Eight 2800 cm² replicates of 0, 150, 300 and 450 tons per acre (T/A) paper sludge were mixed and placed in a controlled environment. Each pot was watered twice a week with 220 mls of purified water. Leachate was collected and water adsorption, pH and EC were recorded. Saturated pastes from ½" cores were tested for EC and pH weekly. Initial and ending water holding capacities (WHC) were determined. Samples at one, three and five weeks were seeded with tomato (*Lycopersicon esculentum*) 'Rutgers-Select'. Germination and stamina were recorded. Sludge addition delayed and lowered germination rates. WHC of untreated soil and 150 T/A sludge were relatively unchanged. Application of 300 and 350 T/A sludge doubled the WHC in eight weeks. A linear relationship between sludge addition rate and soil neutralization potential was found. WHC and neutralization potential for the 300 and 450 T/A treatments were significantly greater than the soil and 150 T/A sludge; pH and EC were not affected.

BOARD 137 SEASONAL WATER QUALITY IN BUCK CREEK, SPRINGFIELD, OHIO. KRISHNA D. VELLANKI KVELLANKI@WOH.RR.COM, 2735 KILKENNY DRIVE, SPRINGFIELD OH 45503.

Urbanization has negative effects on the water quality of watersheds by increasing the amount of pollutants in the water. Much of a watershed's future depends on the choices made every day by people who live within the watershed. Weather also plays a significant role. If the nitrate/nitrogen analysis, the orthophosphate analysis, and the pH analysis are performed on water collected from different sites (beginning of the city, middle of the city, and end of the city) of the same stream in different seasons, then the water that has been through the city will be the most polluted in Autumn. The water from the three test sites stated above on Buck Creek, Springfield Ohio was sampled and tested for various water quality parameters in winter, spring, summer, and autumn of 2003 using test kits provided by the Clark County Soil and Water Conservation District. Water from all three sites was tested for total nitrate/nitrogen, orthophosphates, and pH. The data were compared among the three test sites and in different seasons using charts and graphs. The nitrate/nitrogen levels ranged from 0.44 mg/L to 6.6 mg/L with the maximum in Autumn (October) and a minimum in Summer (July). The orthophosphate concentration levels ranged from 0.08 mg/L to 4 mg/L, with a maximum in Autumn (October) and a minimum in Winter (January). The pH levels remained the same throughout the year with a constant value of 8. Since the water went through the city, it collected more pollutants throughout the year, like nitrates, which are harmful to health. The Orthophosphate levels probably went up because of the cleaning detergents, fertilizer runoff, and animal wastes. There were no significant changes in the pH levels in different seasons because there were no considerable increases in nitrogen oxides and sulfur dioxides from automobile emissions.

BOARD 138 TESTING BEHAVIOR OF FERTILIZER CHEMICALS IN SOIL AS A FUNCTION OF TIME JOHN M. BUCHENIC BUCH57@AOL.COM 329 CHRISTIAN AVE. HUBBARD, OH 44425.

My project deals with the leaching of fertilizer chemicals in a synthetic fertilizer and an organic fertilizer. Fertilization is an important tool for the agriculture industry and its misuse has very undesirable side effects. The purpose for my experiment was to see how synthetic and organic fertilizers each reacted in soil as a function of time. Materials included Hach testing strips for Nitrate, Nitrite, Ammonia and Phosphate. Distilled water, 72 coffee filters (one per sample), 120g of soil per sample, and either 20g of synthetic

fertilizer (5-10-5) or 20g of organic fertilizer (4-12-0) per sample. Each test group consisted of nine samples - three synthetic, three organic, and three controls containing soil with no fertilizer. Fertilizer with no soil was also run through the testing process as a control. Using time as the independent variable, the first test group was prepared and immediately exposed to water by soaking samples individually in 750ml of distilled water for 30 minutes, then draining for ten minutes. Resulting nine water samples were each tested for ammonia, phosphate, nitrite and nitrate levels. In subsequent tests, fertilizers remained in soil samples for one, five, ten, fifteen, twenty, forty and 197 hours before soaking in water. This project hypothesized that as contact time with soil increased, the chemicals available to leach into water would steadily decrease. Organic test results were very similar to the control of unfertilized soil, with leaching of chemicals occurring in very small amounts. However, synthetic results varied. Ammonia levels were consistently 6ppm compared to trace amounts in the control. Phosphate levels increased and decreased over time in both test samples and controls, but were higher in test samples ranging from 10ppm to 40ppm. Nitrite levels of control and test samples were low until 20 hours, when synthetic showed a slight increase. Nitrate levels varied from 15ppm to 40ppm. Twenty hours of contact time resulted in a peak nitrate level of 48ppm. The lowest level of nitrate was 13ppm after 197 contact hours. My conclusion is that 3 of 4 synthetic fertilizer chemicals showed fluctuation in the leachate levels depending on how much contact time they had with soil prior to water exposure. But it was not the inverse reaction hypothesized.

BOARD 139 THE EFFECT OF DIFFERENT AUXIN APPLICATION METHODS ON ROOT MASS. TOM E. SOMMER, 4451 AKINS ROAD, NORTH ROYALTON, OH 44133, TRACTORDUDE2004@YAHOO.COM. JOSH G. THACKER, 6753 OAKES ROAD, BRECKSVILLE, OH 44141. (CUYAHOGA VALLEY CAREER CENTER, DEPARTMENT OF HORTICULTURE.)

Wandering Jew (*Tradescantia zebrina*), a small vine type plant that has purple and green leaves, was tested for response to different modes of auxin application. Three groups of plants were treated with commercial applications of auxins (dip, powder/dip, powder) with an untreated group serving as a control. Dip N' Grow was used for dip applications while Hormodin 2 was used for powder applications. Auxins were applied to the basal end of the cutting and were left to propagate for three weeks under a mist system. It was hypothesized that the powder/dip application would have the greatest mean root mass. Seventy-two cuttings were taken from the Wandering Jew and placed in flats with four groups of 18 per flat. The experiment was conducted in the controlled environment of a greenhouse. After three weeks, the root systems were rinsed, cleaned, and allowed to dry. The mean values for root mass were as follows (control group 0.96 grams, dip group 1.16 grams, powder group 0.98 grams, and powder/dip group 1.22 grams). A t-test was conducted to compare the mean masses of the control and dip/powder groups. The mass of the dip/powder application roots was significantly heavier than the control ($p < .02$). The data also suggested that powder applications had little effect on root mass as the difference between means (dip vs. powder/dip) was not statistically significant. These results supported the hypothesis that the auxin dip/powder application is more effective for promoting root growth than no treatment. However, it was most likely the dip application that affected root mass rather than the powder.

BOARD 140 THE EFFECT OF DIFFERENT COMMERCIAL SOILS ON THE GROWTH RATE OF SOLANUM SP. "VIVA ITALIA" TOMATO PLANTS. KELLY M. PERSELY, 10750-B RAVENNA ROAD, TWINSBURG, OH 44087, KPERSELY24@NETSCAPE.NET. NATHAN M. GOLDOWSKI 4725 MAIDSTONE DRIVE, BRECKSVILLE, OH 44141 NATEDOWG21@AOL.COM. (CUYAHOGA VALLEY CAREER CENTER, DEPARTMENT OF HORTICULTURE.)

Tomato plants (*Solanum sp.* "Viva Italia") were observed for the effect of different commercial soils on growth rate. Plants were placed into four different flats (each containing fifteen four and a half inch pots) filled with 165g of soil. There was slight variation in volumes between treatments. Brand A soil stood as the control and represents a typical greenhouse mix. Brand B consisted of Canadian sphagnum peat, Perlite and vermiculite. Brand C consisted of composted pine bark, Canadian sphagnum peat and Perlite. Brand D consisted of vermiculite, Canadian sphagnum peat, Perlite, washed sand and processed bark ash. The hypothesis was that Brand A would produce the best overall growth rate because it was a typical greenhouse mix. The plants were placed under an automatically timed mist system for three weeks. Plants were then placed in a controlled greenhouse environment. The plants were observed daily for a total of four weeks and were measured twice. The mean heights for each soil treatment were as follows: (Brand A = 34 cm, Brand B = 26 cm, Brand C = 26 cm, and Brand D = 30 cm). A t-test was conducted to compare the difference in

growth between the four flats of tomatoes. The growth rate was statistically significant when Brand A was compared to Brand B ($p < .001$) and when Brand A was compared to Brand C ($p < .001$). The results support the hypothesis that plants grown in Brand A soil would produce the best overall growth as compared to Brands B and C. Although Brand A had a greater mean growth than Brand D, the difference was not statistically significant.

BOARD 141 GIBBERELLIN APPLICATION DURING DIFFERENT GROWTH PERIODS OF THE COMMON BEAN PLANT (PHASEOLUS VULGARIS). STEVE HABA, 3411 MARK DRIVE, BROADVIEW HEIGHTS, OH 44147, HORTHABA@MSN.COM. JASON KELTNER, 15918 BENNETT ROAD, NORTH ROYALTON, OH 44133, YOUNGLIFEJASON@HOTMAIL.COM (CUYAHOGA VALLEY CAREER CENTER, DEPARTMENT OF HORTICULTURE.)

Bean plants (*Phaseolus vulgaris*) were observed for the effect of gibberellins on growth rates. Gibberellins affect plant growth by causing elongation of stems and leaves as well as promoting the germination of seeds. Plants treated were expected to show hyper-elongation of the stems. Three groups of fifteen bean plants were placed into flat trays. One flat (trial 1) was treated at day zero with 50g of ProGibb 4% per gallon of water. The second flat (trial 2) was treated with 50g of ProGibb 4% per gallon of water seven days after the seeds were sown. A third flat (trial 3) was not treated and served as a control. It was hypothesized that the second trial would have the most growth. The experiment was conducted in a controlled greenhouse environment. The plants were observed over a three-week period. The bean plants that were treated at the time that seeds were sown grew tall and lanky with weak, hyper-elongated stems and chlorotic leaves. The second trial, treated with ProGibb after seven days consisted of darker green plants, larger leaves and stronger stems as compared to the plants treated at day zero. The mean heights for the three trials were as follows: (control 21.8cm), (trial one 48.8cm), (trial two 66.4cm). A t-test comparing the height of control group and plants treated with gibberellins after seven days had a p-value of $1.97E^{-11}$. A comparison between plants treated with gibberellins upon sowing and the control group had a p-value of .00192. These results supported the hypothesis that plants treated (trial 2) with gibberellins would have the greatest amount of vertical growth.

BOARD 142 THE TRANSFER OF RECOMBINANT DNA IN SOIL. CASSIE K JACKSON, C_JACKSON87@HOTMAIL.COM, 6335 CR 158, EAST LIBERTY, OH 43319.

Some people have expressed concern over the large numbers of recombinant DNA being made in laboratories throughout the world because of the possible release into the environment. The purpose of this project is to determine if recombinant DNA can be transferred in soil microorganisms. If so, potential hazards and benefits to the environment could arise. Four different kanamycin-sensitive bacterial isolates were isolated from three locations in Logan County, Ohio. These isolates, which served as the recipients were introduced to increasing concentrations of rifampicin until capable of growth in 93.75 µg/ml. The plasmid pCPP-4, which carries a kanamycin resistance gene, was selected as the donor DNA. The bacterial isolates and *E. coli* containing pCPP-4, were mated overnight in L broth and grown on LB agar, followed by transfer to a selective medium containing both rifampicin and kanamycin. Only the recipient cells that picked up the antibiotic resistance gene for kanamycin and rifampicin resistance grew. The plasmid was isolated and analyzed by electrophoresis against the donor DNA to ensure the presence of the pCPP-4 DNA in the recipients. All four isolates were capable of plasmid transfer under laboratory conditions. The recipient and donor cells were remated in sterile soil overnight, and then transferred to a selective medium containing both antibiotics. Another plasmid DNA isolation and analysis by electrophoresis was done to ensure the presence of the pCPP-4 DNA in the mated bacteria. Three of the isolates were capable of lateral DNA transfer in sterile soil. The results demonstrated that recombinant DNA can be transferred in sterile soil.

BOARD 143 DOES SEA SURFACE SALINITY AFFECT EL NIÑO? LALI J. REDDY WWW.LOLLIPOP603@AOL.COM. 504 GREENBRIER COURT. STEUBENVILLE, OH 43952.

El Niño is an interference of the ocean-atmosphere system in the Tropical Pacific and has significant consequences for weather around the globe. Salinity is the totality of dissolved salts that are found in water. The average sea surface salinity is 35 parts per thousand (ppt) but varies significantly throughout the world. It was determined, using a bench-scale experiment, whether sea surface salinity can affect heat loss. It was hypothesized that sea surface salinity would have an effect on El Niño. Sea water with different salinities was made with distilled water and varying amounts of sea salt. Thirty-six beakers were filled with 50-mL of sand and

approximately 450 mL of "sea" water. The upper, middle, and lower temperatures of the saline water in each beaker were recorded before heating (using a Bunsen burner), after heating, and after cooling. The heating and cooling processes took five minutes each. Higher salinity water has a better heat-retaining capacity than lower salinity water. The average heat gained for the highest ppt (80 ppt) was 55, 046 joules. The average heat gained for the lowest ppt (0 ppt) was 44, 581 joules. Heat loss was directly proportional to salinity, varying linearly. This variation in salinity could cause variation in pressure changes, resulting in the El Niño wind currents.

BOARD 144 DEMONSTRATING DISTRIBUTED COMPUTING. ZACHARY J. TONG, ZACHARY@TONG-WEB.COM, 6171 MERE DRIVE, MASON OH 45040.

Distributed computing is the use of multiple host computers across the internet to solve a problem in parallel. It is a way to quickly solve computationally intensive problems using existing hardware of volunteers. This project's goal was to demonstrate the speed and power of distributed computing by creating a client (programmed in Visual Basic) that searched for emirps (a type of prime number). A server was programmed in PHP and was attached to a MySQL database. The PHP scripts allowed the clients to interface with the database. The database held all project data such as numbers yet to be processed, numbers already processed, emirps found and user information. It also generated real time statistics such as blocks sent/received, emirps found and biggest contributor. These statistics were available from the website. Participation was open to anyone owning an x86 Windows machine. The project recruited 69 participants. Many participants used multiple computers under one username. At the end of the three-week period, 1,900,000 numbers were searched and 505 emirps were found. The control computer, running at 1.6 GHz, completed 5000 numbers. The project searched 380 times more numbers than the control computer did on its own. The collective computing power of the project increased as new volunteers were added. The only limit was the donated computing power of the participants. Therefore, the project was infinitely scalable. In conclusion, the project demonstrated the speed and power of distributed computing when compared to the use of a single computer.

Lake Erie – Morning Session

9:00 AM Saturday April 2nd 2005

Olscamp Hall Room 121

Tracey Meilander - Presiding

9:00 MECHANISM FOR SPECIES SHIFT? OXYGEN TOLERANCES OF INVASIVE AND INDIGENOUS AMPHIPODS. APRIL M. HANNUM, AHANNUM@BGNET.BGS.EDU, AND JEFFREY G. MINER, DEPARTMENT OF BIOLOGICAL SCIENCES, BOWLING GREEN, OH 43403.

In the Great Lakes, dreissenids (bivalves) invading via ballast water from Europe in the 1980's, were followed by a suite of other species associated with dreissenids that include, *Echinogammarus ischnus*, which has a microscale distribution that appears tightly linked with dreissenids. Superficially, this species appears to have replaced the indigenous amphipod *Gammarus fasciatus* and numerous experiments have been conducted to address the potential for competitive displacement or differential vulnerability to predators. However, little attention has been paid to the abiotic conditions in the interstices of dreissenid druses (i.e., DO) and the ability of each species to tolerate these conditions. Preliminary experiments demonstrate that there is considerable difference in low oxygen tolerance and behavior between the two amphipods. Given that the dissolved oxygen (DO) concentration in detrital material among dreissenids can approach zero due to high bacterial respiration, I hypothesize that the invading amphipod occupies this habitat as an open niche and has not displaced the indigenous species via competition. Using SCUBA and a micro-DO probe experiments throughout this summer quantified DO within dreissenid interstices as well as detrital load. Preliminary results from samples collected from the western basin of Lake Erie suggest a seasonal change in amphipod composition that may be correlated with an increase in detrital load (low DO) among druse interstices.

9:15 MOLECULAR IDENTIFICATION OF CHIRONOMID SPECIES: EXPANDING THE UTILITY OF MIDGES IN BIOLOGICAL ASSESSMENT; CHAD D. FERGUSON, CHAD.FERGUSON@WRIGHT.EDU; MONITA SHARMA, MONITA.SHARMA@WRIGHT.EDU; DAN KRANE, PH.D., DAN.KRANE@WRIGHT.EDU; 128 BIOLOGICAL SCIENCES, WRIGHT STATE UNIVERSITY, 3640 COLONEL GLENN HIGHWAY, DAYTON, OH 45435.

The Chironomidae, commonly called non-biting midges or chironomids, represent one of the most widely distributed, biologically diverse, and abundant groups of insects and benthic macroinvertebrates in aquatic ecosystems throughout the Great Lakes. Sampling benthic macroinvertebrates in standardized bioassessment protocols, the Chironomidae are often the dominant taxa of aquatic macroinvertebrate fauna, in terms of both the number of species and the number of individuals present. Because of their wide distribution, high species diversity and abundance, and known sensitivity to various types and levels of pollution, the Chironomidae have long been used as bioindicators. In addition to being informative at various spatial and temporal scales, chironomids are exceptional and valuable indicators of ecological integrity as different species of chironomids are present along environmental stressor gradients. While chironomids are excellent biological indicators, they are also notoriously difficult to identify to species-level using larval morphological features. Molecular biology techniques for identifying the Chironomidae should significantly improve the reliability of difficult species identifications, clarify present taxonomic ambiguities with the potential for describing new species, and expand the utility of midges in bioassessments. Preliminary analyses of internal transcribed spacer regions (ITS) of chironomid ribosomal DNA provide sequence data that suggests high variation between species but low variation within species. The polymerase chain reaction (PCR) and restriction enzyme digests of these ITS regions have produced characteristic fragments for each species, and nucleotide sequence analyses of these regions confirm the interspecific diversity found in both the ITS-1 and ITS-2 regions. To date, five species of chironomids have been characterized this way: *Cricotopus bicinctus*, *Dicrotendipes fumidus*, *Thienemanniella xena*, *Xylotopus par*, and *Hayesomyia senata*. Phylogenetic analyses of these and 80 additional species of chironomids, predominantly European, are presented.

9:30 THE "NOT TOO DEAD ZONE" – A COMPARISON OF BACTERIAL ACTIVITY AT AEROBIC AND ANOXIC SITES IN LAKE ERIE. TRACEY TRZEBUCKOWSKI MEILANDER, TTRZEBUC@KENT.EDU, ROBERT T. HEATH, RHEATH@KENT.EDU, DEPARTMENT OF BIOLOGICAL SCIENCES, 256 CUNNINGHAM HALL, KENT STATE UNIVERSITY, KENT OH 44242.

During the 1970s, a large zone of hypolimnetic anoxia was observed in the Central Basin of Lake Erie. With limitations to phosphorus loading, the zone of anoxia decreased in size in the 1980s and 1990s. Recently, the zone of anoxia or "dead zone" has reappeared despite reaching target total phosphorus loading in the Central and Eastern Basins of Lake Erie. Renewed interest in the causes of the "dead zone" resulted in a comparison of bacterial activity in anoxic and aerobic profiles in the Central and Eastern Basins, respectively. Integrated, epilimnetic, metalimnetic, and hypolimnetic samples (n=3) were obtained from one Central Basin anoxic site and one Eastern Basin aerobic site in August 2004. Measurements of bacterial activity included bacterial cell counts, biovolume, and biomass as well as bacterial production, bacterial respiration, and bacterial growth efficiency. Bacterial cells were observed under epifluorescent microscopy and sized using image analysis software. Bacterial production (BP) was estimated using [³H]-leucine incorporation into bacterial protein; bacterial respiration (BR) was measured via Winkler titration; and, bacterial growth efficiency (BGE) was calculated as BP/(BP+BR). The Eastern Basin aerobic site exhibited two-fold greater production (max = 1.69 x 10⁻⁴ µg/ml/hr) and three-fold greater respiration (max = 4.14 x 10⁻³ µg/ml/hr). In contrast, the Central Basin anoxic site exhibited two-fold greater hypolimnetic bacterial number (1.42 x 10⁶ cells/ml), bacterial biomass (9.09 x 10⁴ µm³/ml); and, bacterial growth efficiency was ten-fold greater (7.95%). These results are consistent with the view that higher than normal bacterial activity at anoxic sites contributed to rapid oxygen depletion in the "dead zone" areas of Lake Erie. Ohio Sea Grant (R/ER-60) funded this research.

9:45 LAKE ERIE SPORT FISHERY ALTERATIONS BY NON-NATIVE SPECIES. FRED L. SNYDER, SNYDER.F@OSU.EDU, OHIO SEA GRANT EXTENSION PROGRAM, THE OHIO STATE UNIVERSITY, CAMP PERRY, BLDG. 1, PORT CLINTON OHIO 43452.

The arrival of several aquatic invasive species to Lake Erie in the 1980s and 1990s caused unprecedented changes in Lake Erie's ecosystem and fishery. Dreissenid mussels transferred energy and nutrients from pelagic waters to the benthic region, restructuring complex food webs. Zooplankton and phytoplankton decreased in average density while benthic invertebrates such as gammarids experienced marked increases. The burrowing mayfly (*Hexagenia*) decline of the 1950s was attributed to anoxic and polluted sediments, but recovered in the 1990s, possibly as less decaying algae reduced biological oxygen demand in bottom sediments. Water transparency increased by two to three-fold in the early 1990s and stimulated the emergence of aquatic macrophyte beds in Lake Erie's littoral zone, diversifying habitat types. Round gobies

(*Neogobius melanostomus*) were documented by 1993 and recently have reached densities ≈ 30 individuals/m². Impacts upon Lake Erie's most valuable sport fish species, walleye (*Sander vitreus*), include behavioral modification caused by increased light penetration. Round gobies compete with other benthic foragers for food but have raised alarm in the sport fishery as egg predators impacting spawning smallmouth bass (*Micropterus dolomieu*). The Ohio Division of Wildlife preemptively imposed a spring closed season on smallmouth bass beginning in 2004 to reduce round goby predation in smallmouth nests that results when parent fish are removed by angling. Anglers have not fully adapted fishing techniques to ecosystem and behavior changes, contributing to the 74 percent decline in walleye fishing participation measured since 1989, with a corresponding decrease in economic activity.

10:00 USING GENETIC MARKERS TO DIFFERENTIATE CRYPTIC MAYFLY (HEXAGENIA) SPECIES IN LAKE ERIE. ERICA L. CUNNINGHAM (CUNNINEL@MUOHIO.EDU), CURT L. ELDERKIN (ELDERKCL@MUOHIO.EDU), AND DAVID J. BERG (BERGDJ@MUOHIO.EDU). DEPARTMENT OF ZOOLOGY, MIAMI UNIVERSITY, OXFORD, OH 45056.

Burrowing mayflies of the genus *Hexagenia* are a widely used indicator of environmental quality. They were nearly eradicated from the western basin of Lake Erie in the early 1960s due to cultural eutrophication and anoxic conditions; populations have since recovered. Because mayfly abundance is correlated with overall lake health, understanding their population dynamics could greatly improve their utility as an environmental indicator. In the western basin, there are two mayfly species, *Hexagenia limbata* and *H. rigida*, which are morphologically indistinguishable as nymphs, the stage most indicative of water quality. The purpose of this project was to develop a genetic method to distinguish between the two species and to examine population structure in the basin. A 681 base pair sequence was discovered in the mitochondrial CO1 gene that exhibited a 36 base pair difference between *H. limbata* and *H. rigida*. Fifty nymphs from each of 10 sites in the western basin were sampled pre-emergence in spring 2004. Overall, *H. limbata* comprised 86.6% of the nymphs sampled. Individual sites varied between 71.9% and 100% *H. limbata*. In both species, haplotype frequencies did not differ among sites. A separate lineage closely related to *H. limbata* was discovered at several sites. Individual size was not significantly different between species ($n = 343$, $p = 0.4683$), but was dependent on site ($n = 343$, $p < 0.0001$). Although further sampling to determine the reason for site-to-site variation in size and the identity of the second lineage is necessary, the use of this genetic marker will support further understanding of the population biology of these two important species, which indicate a healthy ecosystem.

10:15 NINE YEAR STUDY OF THE INVASION OF WESTERN LAKE ERIE BY THE ROUND GOBY (NEOGOBIOUS MELANOSTOMUS): CHANGES IN DREISSENID MUSSEL DISTRIBUTIONS. KEN BAKER, KBAKER@HEIDLEBERG.EDU. DEPT. OF BIOLOGY, HEIDELBERG COLLEGE, TIFFIN, OH 44883.

By the late 1980's, exotic zebra mussels (*Dreissena polymorpha*) had colonized most hard surfaces in the western basin of Lake Erie. The more recently introduced quagga (*D. bugensis*) became common over soft sediments in deeper water a decade later. Round gobies (*Neogobius melanostomus*), important dreissenid predators, were first observed in the basin in 1996. From 1997-2004, 118 shallow-water, scuba-based transect surveys (40 x 2 m, 3-5 m depth) of round gobies and dreissenid mussels were conducted at three locations around Kelley's Island, two by South Bass Island, one by West Sister Island and at a number of locations on Crib, Cone, Locust, Niagara, Round and Toussaint Reefs. Percent coverage of hard surfaces by mussels was determined for 41 0.1 m² quadrats along each transect. Additionally, in 2002, 2003 and 2004, all mussels were removed from sample strips (20 x 2.5 cm) along three heavily encrusted cobbles from each site to evaluate species and size distributions. Percent coverage varied in complex ways both within and among the transects in all years. However, it seems likely that goby predation may have resulted in a relative dearth of small (< 15 mm) dreissenids and increasing patchiness of coverage during the latter years of the study. No consistent pattern emerged in changes in total dreissenid abundances between 2002-2004 although quagga mussels were much more abundant than zebra mussels in all sites and years for mussels < 15 mm width. Mean total densities varied from $9,494 \pm 1,554.0$ SE to $92,613 \pm 6,490.0$ SE.

10:30 NINE YEAR STUDY OF THE INVASION OF WESTERN LAKE ERIE BY THE ROUND GOBY (NEOGOBIOUS MELANOSTOMUS): CHANGES IN GOBY AND DARTER ABUNDANCES. KEN BAKER, KBAKER@HEIDLEBERG.EDU. DEPT. OF BIOLOGY, HEIDELBERG COLLEGE, TIFFIN, OH 44883.

The round goby, a benthic fish native to Eurasia's Ponto-Caspian region, was discovered in 1990 in the St. Clair River and quickly spread to all five Great Lakes. They were first observed in Lake Erie at Fairport Harbor in 1992, and first seen in the western basin (near Lakeside, OH and West Sister Island) in 1996. In 1996, no gobies were found during a scuba-based transect survey of benthic fish in shallow waters east of Kelley's Island. From 1997-2004, 118 shallow-water transect surveys (40 x 2 m, 3-5 m depth) of benthic fish were conducted at three locations around Kelley's Island, two by South Bass Island, one by West Sister Island and at a number of locations on Crib, Cone, Locust, Niagara, Round and Toussaint Reefs. During this period, yearly transect surveys were also performed along gravel bars (140 x 1 m, < 1.5 m depth) off North Bass, Sugar and Gibraltar Islands. Gobies were absent or at very low numbers at all sites in 1997 except West Sister Island (3.06 m⁻¹). Most sites reached peak densities (6.14-14.20 m⁻¹) in 2000 (Kelley's Island-East peaked in 1999), thereafter fluctuating around somewhat lower densities (ranging from 4.80-11.51 m⁻¹). Through 1999, it was not uncommon to observe darters (especially *Percina caprodes*, *P. copelandi* and *Etheostoma blenniodes*, but also *E. nigrum* and *E. flabellare*) but not thereafter. The near elimination of darters from these study sites may have been caused by goby predation on darter eggs and juveniles and possibly competition for food.

Lake Erie – Afternoon Session

3:00 PM Saturday April 2nd 2005

Olscamp Hall Room 121

Robert Heath - Presiding

3:00 EVALUATING THE ECONOMIC CONTRIBUTION OF OHIO'S LAKE ERIE TRIBUTARY STEELHEAD FISHERY, 2002-2003. DAVID O. KELCH (KELCH.3@OSU.EDU), FRANK R. LICHTKOPPLER (LICHTKOPPLER.1@OSU.EDU), BRENT SOHNGEN (SOHNGEN.1@OSU.EDU), AND KELLY RIESEN (RIESEN.4@OSU.EDU) THE OHIO STATE UNIVERSITY, OHIO SEA GRANT COLLEGE PROGRAM, OHIO STATE UNIVERSITY EXTENSION, 42110 RUSSIA ROAD, ELYRIA, OH 44035.

Interest in Lake Erie tributary Steelhead (*Onchorhynchus mykiss*) fishing has increased in recent years but little is known about the value of the Steelhead fishery in Lake Erie. In recent years over 400,000 Steelhead have been stocked into five Ohio Lake Erie tributaries (Conneaut Creek, Grand River, Chagrin River, Rocky River and Vermilion River) at an estimated annual cost of \$600,000. From October 2002 through April 2003 we contacted over 500 steelhead anglers and asked them to participate in a mail survey designed to obtain baseline information on Ohio Steelhead anglers. The 375 anglers responding to the survey made 44.3 trips per year and caught an estimated 58.4 fish per year. Several travel cost models using our Ohio Steelhead angler data suggests that consumer surplus associated with steelhead angling ranges from \$36 to \$46 per trip. This is greater than the \$26 per trip spent by our survey respondents. Depending on the size of the population of steelhead anglers, the annual value of the steelhead fishery could be as large as \$12 to \$14 million. A simple benefit cost analysis suggests that for just the anglers in the survey the benefits of the stocking program are approximately \$0.6 to \$1.1 million.

3:15 CHANGES IN DIATOM BENTHIC FOOD RESOURCE AVAILABILITY IN THE CENTRAL BASIN OF LAKE ERIE (1987 AND 2003). JULIE A. WOLIN, JWOLIN@CSUOHIO.EDU DEPARTMENT OF BIOLOGICAL, GEOLOGICAL & ENVIRONMENTAL SCIENCES, 2121 EUCLID AVE, SR 219, CLEVELAND STATE UNIVERSITY, CLEVELAND, OHIO 44115.

Zebra and quagga mussel invasions have changed food webs in the Great Lakes, dramatically altering phytoplankton communities. Studies commonly estimate shifts in available benthic food resources from water column phytoplankton data. The purpose of this study was to quantify diatom food resource availability in surface sediments from the central basin of Lake Erie to test the hypothesis that changes in these resources have occurred since the introduction of dreissenids. Diatoms are high in lipids and provide a high quality food resource for benthic organisms. Smaller diatom species or species size-

reductions result in lower available lipid resource per cell. Surficial sediments collected in 1987 (pre-*Dreissena*) and 2003 (post-*Dreissena*) from four sites were analyzed for diatom assemblage composition (%) and biomass (cell volume in μm^3). A minimum of 500 valves were identified and counted from each sample and biomass was quantified for a minimum of 20 individuals per species according to standard methods. *Fragilaria* dominated communities in 1987 were replaced by *Stephanodiscus* in 2003. Within genera, larger species (e.g. *S. alpinus* and *S. niagarae*) were replaced by smaller species (e.g. *S. parvus*). Diatom biomass estimates also indicate that within some species there is a shift to smaller individuals. These results indicate that changes in diatom benthic food resources have occurred since the introduction of dreissenids in Lake Erie. Diatom species size-reductions indicate fewer lipids are available as a food resource. This has implications for the amount and type of benthic organisms that can be supported in the Lake Erie ecosystem.

3:30 LAKE ERIE ECOSYSTEM CHANGE: PHYTOPLANKTON COMMUNITIES. JOSEPH D. CONROY, CONROY.27@OSU.EDU, DAVID A. CULVER, CULVER.3@OSU.EDU, THE OHIO STATE UNIVERSITY, DEPT. OF EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY, COLUMBUS OH 43210.

The biological, chemical, and physical factors that govern large lake phytoplankton abundance and dynamics are complicated by the socioeconomic demands of humans in the watershed. Lake Erie exemplifies a large lake where human-influenced land use changes and perturbations in the watershed directly affect lake function. The degradation of the Laurentian Great Lakes in the 1960's, as evidenced by phytoplankton blooms in Lake Erie among other problems, caused a public outcry that led to the passage of the binational Great Lakes Water Quality Agreement of 1978. By the mid-1980's, reduction of excess nutrient load decreased phytoplankton community biomass 68% from 1970 values. With the invasion of exotic dreissenid mussels, phytoplankton community biomass was expected to decrease even further due to the mussels' high filtering capacity (up to one liter per individual per day). We used a multi-agency (The Ohio State University; Division of Wildlife, Ohio Dept. of Natural Resources; National Water Research Institute, Environment Canada) supported study of Lake Erie plankton abundance from 1996 through 2003 to examine recent changes in the lake-wide phytoplankton community biomass and found that total phytoplankton biomass has increased over 100% from the lows of the mid-1980's. Potentially toxic cyanobacteria biomass has increased even more (>500%), whereas other taxa more edible to zooplankton (Chlorophyta, Cryptophyta) have increased by 60 to 250%. We conclude that Lake Erie is becoming more eutrophic even though management strategies continue to limit nutrient loading to levels found in the 1980's. We propose three hypotheses for recent changes: (1) unmonitored nutrients are entering the lake; (2) dreissenid mussels' excretion modified within-lake nutrient cycling; and/or (3) tributary phytoplankton populations significantly contribute to lake-wide phytoplankton blooms.

3:45 DIEL VARIATION IN THE HORIZONTAL DISTRIBUTION OF CRUSTACEAN ZOOPLANKTON IN THE WESTERN BASIN OF LAKE ERIE. DOUGLAS D. KANE¹, KANE.45@OSU.EDU, JOHN E. GANNON², GANNONJ@WINDSOR.IJC.ORG, DAVID J. JUDE³, DJUDE@UMICH.EDU, DAVID A. CULVER¹, CULVER.3@OSU.EDU, ¹DEPT OF EVOLUTION, ECOLOGY AND ORGANISMAL BIOLOGY, THE OHIO STATE UNIVERSITY, 1527 MUSEUM OF BIOLOGICAL DIVERSITY, 1315 KINNEAR RD., COLUMBUS, OH 43212, ²INTERNATIONAL JOINT COMMISSION, WINDSOR, ON, ³SCHOOL OF NATURAL RESOURCES AND ENVIRONMENT, UNIVERSITY OF MICHIGAN, ANN ARBOR, MI.

Diel movements in zooplankton and subsequent responses by fish are important in understanding predator-prey relationships between zooplanktivores and zooplankton. This study examined temporal and spatial differences in crustacean zooplankton densities and community composition, over 24 h in offshore, nearshore, and adjacent pond habitats in western Lake Erie during August 2000. Zooplankton samples (N = 16) were collected using a metered zooplankton net and preserved using a 4% sugar formaldehyde solution. Cladocerans were identified to species, calanoid and cyclopoid copepods and their nauplii were identified separately to suborder and densities (#/L) were compared between habitats using t-tests. The offshore (0.39 + 0.09) and pond (0.26 + 0.16) habitats were found to have higher zooplankton densities (mean + standard error) than the nearshore (0.02 + 0.01) habitat, but only the differences between offshore and nearshore communities were statistically significant (p < 0.05). Cladoceran community diversity was higher in the offshore and nearshore habitats than the pond habitat. Also, midday densities of crustacean zooplankton were higher in the highly vegetated

offshore site than the sparsely vegetated pond and nearshore habitats, suggesting a possible refuge there for zooplankters from predators. Zooplankton densities and community composition differed in western Lake Erie across temporal and habitat gradients, which has implications for the phytoplankton community through zooplankton grazing and for feeding, growth, and recruitment of zooplanktivorous young-of-year and adult fish. Further, alterations to Lake Erie habitat by introduced species may have consequences for zooplankton diversity and abundance in nearshore zones.

4:00 DAPHNIA RETROCURVA SIZE AT MATURITY IN THE WESTERN BASIN OF LAKE ERIE: A COMPARISON BEFORE AND AFTER THE INVASION OF DREISSENA SPP. DOUGLAS D. KANE¹, KANE.45@OSU.EDU, TERRY L. PHIPPS², PHIPPS.T@CEDARVILLE.EDU, DAVID A. CULVER¹, CULVER.3@OSU.EDU, ¹DEPT OF EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY, THE OHIO STATE UNIVERSITY, 1527 MUSEUM OF BIOLOGICAL DIVERSITY, 1315 KINNEAR RD., COLUMBUS, OH 43212. ²DEPT OF SCIENCE AND MATH, CEDARVILLE COLLEGE, CEDARVILLE, OH.

Size has important implications for life history, ecology, and evolution of animal taxa. We compared the size at maturity (SAM) of 254 individuals of the cladoceran zooplankter *Daphnia retrocurva* in the western basin of Lake Erie before (1986) and after (1996) the invasion of dreissenid mussels to determine whether changes in the Lake Erie ecosystem affected SAM. In addition to zebra mussel (*Dreissena polymorpha*) and quagga mussel (*Dr. bugensis*) invasions, numerous changes occurred in the Lake Erie ecosystem between 1986 and 1996, including changes in water chemistry, and the phytoplankton and fish communities all of which could directly or indirectly affect *Da. retrocurva* SAM. SAM may be determined by measuring the length of each female that is anatomically mature, based on the relative length of abdominal processes in *Daphnia*, whether or not eggs are present in the brood pouch, whereas size of first reproduction (SFR) is based on the size of females carrying eggs. In both 1986 and 1996, *Da. retrocurva* SAM increased from early June to early July and then declined, similar to the patterns previously found in SFR of *Da. retrocurva* in lakes Ontario and Erie. Only in late July did median length SAM differ significantly between 1986 (1.02 mm) and 1996 (1.18 mm) (p = 0.0093, W = 568.0). Thus, ecosystem changes did not result in a significant change in *Da. retrocurva* SAM, suggesting that the trade-offs between reproducing at a larger size while avoiding being eaten by size-selective predators have not been changed since dreissenid invasions.

4:15 MICROBIAL PHOSPHATE UPTAKE IN AEROBIC AND ANOXIC SITES IN LAKE ERIE ROBERT T. HEATH (RHEATH@KENT.EDU) AND TRACEY TRZEBUCKOWSKI MEILANDER (TTRZEBUC@KENT.EDU), DEPT OF BIOLOGICAL SCIENCES, 256 CUNNINGHAM HALL, KENT STATE UNIVERSITY, KENT, OH 44242.

The purpose of this work was to test the expectations of the Microbial Shunt Hypothesis (MSH) in controlling phosphate uptake by bacterioplankton in aerobic and anoxic sites in Lake Erie. According to the MSH, phosphate uptake by bacteria is controlled by concentrations of both labile dissolved organic carbon (LDOC) and phosphate (P). Phosphate uptake and labile dissolved organic carbon (LDOC) concentration were estimated from integrated, epilimnetic, metalimnetic, and hypolimnetic samples (n = 3) from an anoxic Central Basin (CB) site and an aerobic Eastern Basin (EB) site in Lake Erie, August 2004. Phosphate uptake was determined radiometrically (³²P₄) in triplicate; LDOC was determined as the increase in bacterial biomass ($\mu\text{M C}$) and total respiration in thirty days in triplicate BOD bottles. We found that bacterial phosphate uptake in aerobic samples was inconsistent with the MSH. Bacterial phosphate uptake was greatest in the epilimnion (10.8×10^{-10} nmol/cell/min) at the aerobic site, while at the anaerobic site phosphate uptake was greatest in the thermocline (11.0×10^{-10} nmol/cell/min). Phosphorus content per bacterial cell was consistent (ave = 8.9×10^{-8} nmol/cell), with the bacterial fraction accounting for the greatest phosphate uptake at both sites and all depths. Phosphate uptake in the upper aerobic waters was greater than that in anoxic waters. Hypolimnetic bacteria exhibited the slowest phosphate uptake ($0 - 1.7 \times 10^{-10}$ nmol/cell/min). These results suggest that processes controlling phosphate uptake and apportionment to bacteria differ in aerobic and anoxic environments. Ohio Sea Grant (R/ER-60) funded this research.

Education

9:00 AM Saturday April 2nd 2005

Olscamp Hall Room 103

Michael Homsher - Presiding

9:00 HIV/AIDS CURRICULA IN NORTHWEST OHIO SECONDARY SCHOOLS. JUDY L. ADAMS

ADAMSJ@BGNB.BGSU.EDU GLENN SHIELDS GSHIELD@BGNB.BGSU.EDU
LAURA P. ADAMS HJLADAMS@WOH.RR.COM, DEPT OF PUBLIC &
ALLIED HEALTH, BOWLING GREEN STATE UNIVERSITY, BOWLING
GREEN OH 43403.

Nearly two decades ago the Centers for Disease Control published guidelines for schools to address HIV/AIDS education, in particular for young people between the ages of 13-21. A variety of HIV/AIDS curricula are available. Recently, a study of secondary schools in Northwest Ohio was conducted to determine the scope and purpose of HIV/AIDS curricula, implementation of materials, source of materials/presenters, and presenter's training/background. Participation was solicited from 50 Northwest Ohio schools, public and private, with a 38% response rate. Information regarding HIV/AIDS curricula included: selection/implementation, type of program/curriculum, use of instructional activities, and demographics. Over two-thirds (68%) of the respondents reported having a regularly scheduled HIV/AIDS curriculum with the majority (89%) in the twelfth grade and 95% reporting implementation by a health teacher. Slightly over one-third (37%) reported utilizing a commercial program; the majority either developed their own program or used a combination of the two. All indicated the primary intent of their program was to reduce potential at-risk behavior; 47% reported allocating more time for instruction in the last year. The mean percent of time devoted to implementing the curriculum was 8.8%. Of the respondents 53% reported their program to be successful based on their own subjective analysis. Specific/special training in the previous year was reported by 21%, most of which (63%) was "outside" training. These data suggest a need to strengthen HIV/AIDS education in some Northwest Ohio schools and that some with established curricula may not be satisfied with their success as judged subjectively.

9:15 APPLYING A NATIONAL SCIENCE FOUNDATION EDUCATION MODEL TO TEACHING AT THE UNIVERSITY OF FINDLAY. MICHAEL T. HOMSHER,

HOMSHER@FINDLAY.EDU, COLLEGE OF SCIENCE, NOAH KREISCHER,
ACADEMIC TECHNOLOGY SERVICES, THE UNIVERSITY OF FINDLAY,
FINDLAY, OH, 45840, DONNA L. ELMLINGER (MONROVILLE HIGH
SCHOOL), SUZANNE HARTLEY (CLYDE-GREEN SPRINGS HIGH
SCHOOL), LUKE BURTON (ELGIN HIGH SCHOOL), AND RYAN BEAM
(DANBURY HIGH SCHOOL).

A combination of teaching strategies, distant learning technology and a national science education model is being applied at The University of Findlay. This approach draws on NSF interdisciplinary science teaching strategies developed and applied in secondary and postsecondary institutions. We provide advanced software and technology training to participating secondary teachers. We use Blackboard ©, Tegrity ©, and The IRydium Project © to teach science as it is practiced employing an inquiry method rather than providing content, thus incorporating facts as needed, to allow participants to learn in a problem-solving context. Significantly higher understanding and retention is reported in the literature using interactive engagement compared to lecture techniques. The USA First Program, a cooperative agreement has been formed with regional high schools to treat education graduate students as faculty adjunct instructors and to extend college credit to students of these high schools upon successful completion of a common set of instructional goals. Classroom instruction integrates field, laboratory, and computer-based training. The null hypothesis is that the grades between the high school and college students will not be significantly different ($P = 0.05$) using a t -test. Grades differed by more than 0.2 of a grade point ($P < 0.05$, $n = 24$). The difference between the two groups may result from student selection by test results into a college level Basic Chemistry class versus the AP nature of the high school class. The USA First Program has tripled the number of participating students and secondary teachers in 2003 to 2004.

9:30 ISSUE-SPECIFIC BARRIERS TO ADDRESSING ENVIRONMENTAL ISSUES IN THE CLASSROOM.

CHANKOOK KIM, KIM.1744@OSU.EDU, ROSANNE W. FORTNER,
FORTNER.2@OSU.EDU, THE OHIO STATE UNIVERSITY, 383 KOTTMAN
HALL, 2021 COFFEY RD, COLUMBUS OH 43210.

To identify issue-specific barriers to addressing environmental issues in the science classroom, this study investigated secondary teachers' perceived barriers to, and current/preferred levels of, teaching selected environmental issues. Twenty-three selected issues included science-related global issues such as global climate change and some local issues such as marine pollution. Forty-one in-service science teachers participated in this study. For 23 issues, current level of teaching (mean = 2.89) was significantly lower than preferred level (mean = 4.20; $p < 0.001$). Factor analysis extracted five barrier factors; lack of content/pedagogical knowledge (B1), interest and relevance (B2), standard and time (B3), information and natural environment (B4), and material and textbook (B5). There was no strong relationship between the barrier factors and teaching of 23 environmental issues on average; however, when examined with teaching of each issue, barrier factor B3 showed moderate negative relationships ($-0.6 < r < -0.3$) with 11 issues including biodiversity reduction (-.504) and solid waste disposal (-.479), and factor B1 with 7 issues including ozone depletion (-.378) and invasive species (-.351). Nuclear waste disposal (-.325) was the only issue which showed a moderate negative relationship with barrier factor B2. Results show that barriers to teaching environmental issues are issue-specific rather than general, and that content and pedagogical knowledge, which can be improved through taking environmental issue-related courses, facilitate the teaching of some environmental issues.

9:45 AN ANALYSIS OF ACADEMIC COURSES COMMON TO UNDERGRADUATE PRE-MEDICINE PROGRAMS IN THE WESTERN PENNSYLVANIA AREA.

KENNETH A. LASOTA, LASOTA@RMU.EDU, DANIEL SHORT,
SHORT@RMU.EDU, AND BERTHRAN A. MCCOY, MCCOY@RMU.EDU,
ROBERT MORRIS UNIVERSITY, DEPARTMENT OF NATURAL SCIENCES,
600 FIFTH AVENUE, PITTSBURGH PA 15219-3099.

A review of 45 colleges and universities within a 150 mile radius of Pittsburgh, PA during the summer of 2004 found 32 offered a program in pre-medicine. Commonly the program was incorporated into a traditional biology degree (16) with an additional six institutions housing the program in either a biology or a chemistry degree program. Ten programs were offered as pre-professional programs and prescribed a menu of courses to be added to any degree offered by the institution. Analysis of the academic courses was limited to science courses intended to prepare students for medical studies. All programs required a two semester series of courses in physical chemistry, with 22 requiring an additional two semester sequence of organic chemistry. Twenty programs required analytic chemistry and 18 required biochemistry in addition to or in place of a second semester of organic chemistry. All 32 programs required a two semester sequence of introductory biology courses. In addition, 21 programs required genetics, 22 cellular biology, 23 ecology, 25 microbiology and 19 molecular biology. Other commonly included biology courses were evolution (15), vertebrate anatomy (12), animal physiology (19), comparative vertebrate anatomy (13), histology (9) and embryology (7). In physics, 31 programs required a two semester series of courses. An exposure to calculus was required in 30 programs and 18 programs required statistics. The data here may be useful to institutions developing programs in pre-medicine in the western Pennsylvania area.

10:00 ACTIVE LEARNING IN LABORATORY CLASSES: EVIDENCE THAT IT IMPROVES UNDERSTANDING. MARY D GAHBAUER,

MGAHBAUER@OTTERBEIN.EDU, DEPT OF LIFE AND EARTH SCIENCE,
OTTERBEIN COLLEGE, MAIN STREET, WESTERVILLE OH 43081.

'Active learning' is an umbrella term covering pedagogical styles that fit current models of how people learn; less emphasis is placed on transmitting knowledge and more on developing students' explorations of practical and thinking skills. It comprises techniques such as collaborative learning, problem solving, inquiry learning, group learning, case-based learning, peer instruction, etc. National bodies promote active learning, but faculty have been wary because of their perceptions that these techniques are inappropriate for their course objectives, teaching style, and student cognitive level. Faculty have also expressed fear of loss of control, and fear of failing to cover the material. This study reports on five years of experience with modification of a traditional lecture-lab freshman non-major anatomy and physiology course to include inquiry based learning and group learning. The achievement in the final examination for the course was compared in the years before ($n = 2$) and after ($n = 3$) the introduction of such techniques, together with the scores on twenty eight questions embedded in all final examinations that pertain to the understanding of mechanisms in physiology. Analysis of covariance of the mean scores for the embedded questions (chosen to test understanding rather than knowledge) indicate significant improvements in the 'after' years. Overall final scores also showed a significant upward trend. These data indicate that modification of freshman lecture-lab courses to

include active learning increased understanding of physiological mechanisms, without reducing coverage of material or students' ultimate factual knowledge.

10:15 AN EXPLORATION INTO THE AVAILABILITY OF LOCAL DECISION-MAKER TRAINING ON THE ECONOMIC BENEFITS OF COASTAL AND WATERSHED STEWARDSHIP PRACTICES. ERICA M. MATHENY, ERICA_ECO@YAHOO.COM, WENDY A. KELLOGG, WENDY@URBAN.CSUOHIO.EDU. CLEVELAND STATE UNIVERSITY, COLLEGE OF URBAN AFFAIRS, 2121 EUCLID AVE., CLEVELAND, OH 44115

Ecological stewardship among local decision-makers depends upon their understanding of related benefits and costs. They will be motivated by the economic benefits of ecological stewardship. Their knowledge of these benefits depends, in part, on the availability of relevant formal training and information platforms. This research assesses the availability of information about the economic benefits of coastal and watershed stewardship in formal training programs in the Ohio Lake Erie basin. A literature review established a baseline of applicable training topics. Telephone interviews of 19 (of 35 contacted) current training providers established the present market. While seventeen providers offer training and technical assistance on economic benefits, they each offer only two to four economic-related topics (of 12 in the interview survey). Providers targeted a range of audiences, focusing on municipal officials and municipal employees. A focus group of 12 technical assistance practitioners evaluated the information on economic benefits available to local decision makers and identified opportunities for enhanced curriculum, partnerships and outreach activities in the basin. Focus group participants suggested that additional "hands-on" training curriculum and technical assistance opportunities regarding economic aspects of stewardship are needed. Results suggest that further research is needed to identify more clearly what economic benefits knowledge is in demand by local decision makers. The results also suggest a need for increased collaboration across biological and economic disciplines among training providers in the Lake Erie basin to develop additional curriculum on economic and fiscal aspects of coastal and watershed stewardship.

Environmental Science

9:00 AM Saturday April 2nd 2005

Olscamp Hall Room 104

James Hoorman - Presiding

9:00 OHIO DAIRY FARM MANURE APPLICATION SURVEY. JAMES J. HOORMAN¹, HOORMAN.1@OSU.EDU STEPHEN C. PROCHASKA², PROCHASKA.1@OSU.EDU JONATHAN N. RAUSCH³, RAUSCH.7@OSU.EDU MARK FRITZ⁴, MARK-FRITZ@OH.NACDNET.ORG, ¹OHIO STATE UNIVERSITY EXTENSION, ONE COURTHOUSE SQUARE, SUITE 40, KENTON OH 43326-2399, ²OHIO STATE UNIVERSITY EXTENSION, ³OHIO STATE UNIVERSITY, DEPT. OF FOOD, AGRICULTURAL, & BIOLOGICAL ENGINEERING, ⁴SENECA SOIL & WATER CONSERVATION DISTRICT.

Ohio dairy farms had 42 liquid manure spills to surface water (2000-2003) according to Ohio EPA manure violation reports. Acres available for manure application and time of application may be important factors in preventing manure from entering surface water. To better understand manure application practices of Ohio dairy producers, a survey was sent to 2760 Ohio Grade A dairies in April, 2004 with a 23.6% (n=653) return rate (sample size of 337 needed to achieve 95% confidence level). The average number of cows per operation was 96 (SD=146) and median of 60 cows per operation. Dairy producers had an average of 307 acres (SD=365) available to apply manure. The average individual farm ratio for the number of acres available per cow was 3.8. A rule of thumb is at least 2 acres per cow. Dairy producers traveled <1.4 miles on average to apply manure. Dairy producers on average estimated that they applied 25.2% of their manure from January to March, 23.6% April to June, 18.3% July to September, and 32.9% October to December. Segregating out 52 dairy producers with more than 200 cows (predominately liquid manure systems), these operations averaged 433 cows, 1040 acres of land, 2.5 acres/cow (individual farm ratio), 1,950,000 total gallons of liquid manure produced per operation, and traveled <2.3 miles to apply manure. Liquid manure was applied 15.3% January to March, 25.3% April to June, 25.6% July to September, and 33.8% October to December. These survey results may affect future Ohio livestock regulations and educational programs.

9:15 OHIO SWINE FARM MANURE APPLICATION SURVEY. JAMES J. HOORMAN¹, HOORMAN.1@OSU.EDU STEPHEN C. PROCHASKA², PROCHASKA.1@OSU.EDU JONATHAN N. RAUSCH³, RAUSCH.7@OSU.EDU MARK FRITZ⁴, MARK-FRITZ@OH.NACDNET.ORG, ¹OHIO STATE UNIVERSITY EXTENSION, ONE COURTHOUSE SQUARE, SUITE 40, KENTON OH 43326-2399, ²OHIO STATE UNIVERSITY

EXTENSION, ³OHIO STATE UNIVERSITY, DEPT. OF FOOD, AGRICULTURAL, & BIOLOGICAL ENGINEERING, ⁴SENECA SOIL & WATER CONSERVATION DISTRICT.

Swine production has changed from owner-operated facilities to integrated operations with corporate ownership of swine. Ohio swine farms had 42 liquid manure spills to surface water from 2000 to 2003 according to Ohio EPA manure violation reports. Acres available for manure application and time of application may be important factors in preventing manure from entering surface water. To better understand manure application practices of Ohio swine producers, a survey was sent to 1,809 Ohio swine operations in July and October, 2004 with a 19.5% (n=353) return rate (sample size of 317 needed to achieve 95% confidence level). Ninety-seven swine producers indicated they had stopped raising swine within the last 5 years and 10 surveys were not completed, leaving 246 (13.6%) completed surveys. The average number of sows per operation was 358 (n=97) with a standard deviation (SD) of 1,069. Nursery pig operations (n=93) averaged 7,952 nursery pigs (SD=9,944), wean to finish operations (n=56) averaged 3,085 pigs (SD=3,830), and finish hog operations (n=163) averaged 3,196 pigs, (SD=4,212). Swine producers had an average of 433 acres (SD=430) available to apply manure and traveled <1.4 miles on average to apply manure. Swine producers on average estimated that they applied 14.1% of their manure from January to March, 17.7% April to June, 33.8% July to September, and 34.5% October to December. Over two-thirds of the manure produced is applied in the last half of the year, after crops have been harvested. These survey results may affect future Ohio livestock regulations and educational programs.

9:30 OHIO LIQUID MANURE VIOLATION WATER QUALITY DATA (2000-2003). JAMES J. HOORMAN, HOORMAN.1@OSU.EDU, OHIO STATE UNIVERSITY EXTENSION, ONE COURTHOUSE SQUARE, SUITE 40, KENTON OH 43326-2399.

In the past three decades (1973-2002), the number of Ohio fish kills per decade from all sources decreased 37% (from 2330 to 1473 cases per decade) but the number of agriculture related fish kills per decade increased 72% (from 180 to 311 cases per decade). Manure from livestock accounts for 72% of all agricultural spills. Ninety-eight Ohio liquid manure violations were investigated from Ohio EPA and Ohio Division of Natural Resources reports (2000-2003). Thirty-three of the 98 cases had fish kills. Fish kill numbers ranged from 2 to 31,964 head. Ohio EPA tests on five-day biochemical oxygen demand (BOD5, n=11), ammonia (AM, n=18), and total phosphorous (TP, n=14) were conducted upstream and downstream of drainage outlets where liquid manure had entered surface waters. The null hypothesis is that there is no difference in BOD5, AM, or TP levels using a standard *t*-test for mean comparison. Upstream BOD5 averaged 3.73 mg/L versus 166.65 mg/L downstream (EPA target < 10 mg/L) and were significantly different at the 5% level of significance. Upstream AM averaged 0.94 mg/L versus 20.66 mg/L downstream (EPA upper limit < 13 mg/L) and were significantly different at the 1% level of significance. Upstream TP averaged 10.51 mg/L versus 44.94 mg/L downstream (EPA target < 0.17 mg/L) and were not significantly different at 5% level of significance. TP water quality on average was impaired before a liquid manure spill occurred. BOD5 and AM levels downstream of liquid manure spills were significantly higher and impacted fish health.

9:45 EFFECT OF SOIL PHYSICAL PROPERTIES ON CARBON SEQUESTRATION IN CREATED WETLANDS OF CENTRAL OHIO. KATIE HOSSLER, HOSSLER.3@OSU.EDU, VIRGINIE BOUCHARD, BOUCHARD.8@OSU.EDU, OHIO STATE UNIVERSITY, ENVIRONMENTAL SCIENCE GRADUATE PROGRAM, SCHOOL OF NATURAL RESOURCES, 2021 COFFEY RD., COLUMBUS OH 43210.

Created wetlands have been shown to contain significantly less soil carbon than natural wetlands. It is expected, that with time, the created wetlands will accumulate carbon and eventually reach levels observed in natural wetlands. However, the rate of carbon sequestration in the created wetlands may be hindered by changes in soil physical properties that occur during wetland construction. The purpose of this study was to evaluate the effects of soil structure, texture, and bulk density on the accumulation of carbon in created wetlands. Five created (ages 3-8 years) and four natural marsh wetlands in Delaware, Franklin, Knox, Marion, and Pickaway counties of Ohio, were selected for this study. Nine to fifteen soil cores were collected at each site and analyzed for soil carbon, water-stable aggregates, texture and bulk density. Peak standing plant biomass was also collected. The created wetlands contained significantly less soil organic carbon and plant biomass than the natural wetlands (MRPP, *p* = 0.009). The two carbon parameters were significantly correlated to the soil physical properties (Mantel, *p* = 0.004). Redundancy analysis showed that both soil organic

carbon and plant biomass increased with an increase in 2-8 mm aggregates and a decrease in 0.25-1 mm aggregates, 0.053-0.25 mm aggregates, and bulk density. Wetland construction that preserves soil structure and bulk density will help increase the rate of carbon sequestration in created wetlands and decrease the time required to reach equivalence with natural wetlands.

10:00 EFFECT OF THE INVASIVE SPECIES *PHRAGMITES AUSTRALIS* ON THE CARBON CYCLE IN A LAKE ERIE COASTAL WETLAND. ERIN K. ROTHMAN, ROTHMAN.23@OSU.EDU, AND VIRGINIE L. BOUCHARD, BOUCHARD.8@OSU.EDU, THE OHIO STATE UNIVERSITY SCHOOL OF NATURAL RESOURCES, 210 KOTTMAN HALL, 2021 COFFEY ROAD, COLUMBUS OH 43210.

Invasions by non-native species are a significant threat to global biodiversity and ecosystem function. Plant invasions in coastal wetlands may prove particularly devastating given the overall importance of these wetlands in maintaining the health of both coastal and terrestrial ecosystems. Several United States coastal wetlands are currently undergoing an invasion by *Phragmites australis*. The objective of this research was to compare carbon sinks and sources within invasive *P. australis* plots to those in *Typha* spp. and *Sagittaria latifolia* plots in a wetland located in the Ottawa National Wildlife Refuge on Lake Erie, Ohio. Litter and cotton strip decomposition rates, porewater dissolved organic carbon, microbial biomass and catabolic response profiles, sediment and porewater labile carbon, above- and belowground biomass, and plant and sediment C:N were analyzed. Preliminary results indicate that *P. australis* has significantly higher aboveground biomass (1523 g/m²) than *S. latifolia* (489.6 g/m², $p = 0.020$), but does not differ significantly from *Typha* spp. (1177 g/m²); likewise, litter decomposition in *P. australis* and *Typha* spp. plots was significantly slower than in *S. latifolia* plots ($p = 0.012$). Soil %C and %N were significantly lower in *P. australis* plots ($p = 0.006$ and 0.000 , respectively), and porewater total carbon and total organic carbon content was significantly lower in *P. australis* plots than for the other two species ($p = 0.000$ and 0.047 , respectively). These data suggest that *P. australis* impacts the coastal wetland carbon cycle by increasing biomass production but slowing decomposition and thus potentially reducing biologically available carbon.

Environmental Science

3:00 PM Saturday April 2nd 2005

Olscamp Hall Room 104

Greg Schumacher - Presiding

3:00 RAINFALL PREDICTIONS TO THE YEAR 2066 BASED ON E. L. MOSELEY'S FORECASTING METHODS. RONALD L. STUCKEY, THE OHIO STATE UNIVERSITY, 1315 KINNEAR RD., COLUMBUS, OH 43212-1192.

In March 1937, Edwin Lincoln Moseley (1865-1948), professor of science at Bowling Green State University (1914-1948), first made long-range predictions of rainfall in terms of wet or dry years for the Midwestern United States. Moseley based his predictions on data obtained from several sources, including tree ring widths, recorded water-level depths for Lake Erie, and published meteorological rainfall records. He developed the theory that the amount of rainfall in this region repeated itself in cycles of 90.4 years. Based on Moseley's information and precipitation records for Toledo, Ohio, rainfall for Ohio and the lower Great Lakes Region can be expected to be average or above average during the years 2006 to 2020, and fall below average creating droughts and low water-levels in Lake Erie during the decade of the 2020's. Drought conditions will occur in 2036-2037. Moseley made a similar prediction for the year 2037. The years 2044-2054 should be dry ones with lower water levels in Lake Erie, followed by a wet cycle during the years 2056-2066, when Lake Erie will again have high water levels.

3:15 OHIO'S TERRAIN: A FACTOR IN THE SUCCESS AND DEFEAT OF MORGAN'S RAIDERS DURING THE CIVIL WAR. GREGORY A. SCHUMACHER¹, GREG.SCHUMACHER@DNR.STATE.OH.US, DONOVAN M. POWERS¹, DONOVAN.POWERS@DNR.STATE.OH.US, LESTER V. HORWITZ², HORWITZ@AOL.COM, ¹OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGICAL SURVEY, 2045 MORSE RD., COLUMBUS OH 43229-6693 AND ²P.O. Box 42789, CINCINNATI OH 45242-0789.

Terrain and waterways have limited the mobility of military vehicles throughout the history of warfare. To examine terrain's influence on the mobility of Confederate General John Morgan's cavalry brigades,

supply wagons and artillery during their famous Ohio raid between July 13 and 26, 1863, we analyzed his route across southern Ohio from Harrison to Portland, Ohio. Historical accounts and Ohio's first topographic maps were used to determine the timeframe and route traveled. Morgan's route was then transferred onto the *Shaded Elevation Map of Ohio* and digitized. We calculated the speed his troops moved between rest stops, and using geographic information system (GIS) methods, we produced a topographic profile of his route. Morgan's troops took advantage of the gently rolling terrain of the glaciated till plains and Scioto/Teays drainage systems to move rapidly at speeds ranging from 4.0 to 6.8 km/hr., but the rugged terrain of the Allegheny Plateau slowed Morgan's advance from 4.3 to 2.2 km/hr in the 36 km traveled between Rutland and Portland, Ohio. Favorable terrain allowed Morgan to extend his lead over pursuing Federal troops. Rugged terrain, along with other factors like fatigue, lack of local guides, wagons of wounded, and stopping for a funeral procession, delayed Morgan's arrival at Portland and the Buffington Island Ford on the Ohio River until after sunset. Morgan decided to wait until the next morning to cross the flood-swollen river to avoid needless casualties. His delay allowed pursuing Federal troops and gunboats to arrive during the night and defeat Morgan's troops in the Battle of Buffington Island fought in the early morning of July 19, 1863.

3:30 IMPACT OF CLIPPING *PHRAGMITES AUSTRALIS* AND FLOODING ON WETLAND VEGETATION STRUCTURE AT EAST HARBOR STATE PARK. JENNIFER A. MORGAN, MORGAN.559@OSU.EDU, CRAIG B. DAVIS, DAVIS.80@OSU.EDU, FOOD, AGRICULTURE AND BIOLOGICAL ENGINEERING, AGRICULTURAL ENGINEERING, 590 WOODY HAYES DR., COLUMBUS OH 43210.

Disturbance events along the Lake Erie coastline have allowed *Phragmites australis* (Cav.) Trin. ex Steudel to form monodominant stands in many previously diverse wetlands. The specific objectives of this study were to assess: (1) the impact of manually cutting and removing *P. australis* and, (2) the effect of water depth on species richness, biomass and stem density of non-*P. australis* species at a Lake Erie coastal wetland. Changes in density, biomass and height of *P. australis* in response to inundation in 70 cm and 25 cm deep water were also examined. Four 30 m x 16 m treatment plots were established in East Harbor marsh, two at 70 cm and two at 25 cm water depth. The study was conducted over the 2003 growing season, throughout which *P. australis* was continually cut and removed from three subplots within each treatment plot. Data were analyzed using one-way ANOVA and Tukey-Kramer pairwise comparisons. Species richness and biomass of non-*P. australis* species were not affected by water depth (p -values > 0.05). Stem density of non-*P. australis* species in uncut subplots was significantly greater in shallow (54.83 and 111.17 per quarter meter square) than in deep plots (29.20 and 1.53 per quarter meter square) (p -value = 0.00). Cutting of *P. australis* had a significant effect on other species growth in only one plot. *Phragmites australis* densities were significantly lower (1.90 and 0.83 ramets per quarter meter) when cutting of *P. australis* was followed by flooding to 70 cm depth (p -value = 0.00).

3:45 EVALUATING OHIO SOIL TILLAGE SYSTEMS FOR CORN PRODUCTION. ALAN P. SUNDERMEIER, SUNDERMEIER.5@OSU.EDU, OHIO STATE UNIVERSITY EXTENSION, 440 EAST POE ROAD, BOWLING GREEN OH 43402.

The objective of this study is to evaluate five conservation tillage systems by measuring soil quality indicators, plant nutrient analysis, and crop yield. Field plots were established in 2002 on a Hoytville clay soil at the Northwest Branch of the Ohio Agricultural Research and Development Center in Wood County, Ohio. Experimental design is a randomized block with four replications. Tillage systems compared included: No-tillage, strip-tillage, zone tillage, AerWay, and field cultivator. In 2002, 2003, & 2004 multiple site sampling collected data on the following indicators: crop residue soil cover and crop yield. The % of soil cover was determined by counting the number of times that crop residue touched a measuring stick at every 3 inch mark within 36 inches. An increase in % crop residue improves soil conservation by protecting the soil surface from erosion. Crop residue soil cover analysis results were: 67% no-till, 67% strip-till, 54% Aerway, 25% zone tillage, 17% field cultivator. Average corn crop yield from three years of testing in bushels per acre were: 145.4 no-till, 152.4 strip-till, 147.2 Aerway, 153.5 zone tillage, and 153.9 field cultivator. Corn yields were not significantly different between soil conservation tillage systems. Results indicate that it is possible to reduce soil tillage while maintaining crop productivity.

Plant Ecology

9:00 AM Saturday April 2nd 2005

Olscamp Hall Room 106

Brian McCarthy - Presiding

9:00 ESTIMATING UNDERSTORY DIVERSITY IN MIXED OAK FORESTS. BRIAN C. MCCARTHY (MCCARTHY@OHIO.EDU), DEPT OF ENVIRONMENTAL AND PLANT BIOLOGY, OHIO UNIVERSITY, ATHENS, OH 45701.

Species diversity remains a central tenant of community ecology. Two questions are critical. First, how can we quantify the number of species present? Second, how can two or more samples be compared? A rich literature has developed around the quantification of species diversity, but only recently have the statistical and computational tools become available to probe these questions in a meaningful manner. Moreover, computer intensive resampling algorithms are now available which permit realistic estimates of variance around various estimators. Here a data set containing woody understory plants sampled from three southeastern Ohio mixed oak forests ($N = 2400$ 1-m² quadrats) was used to evaluate patterns of diversity and efficacy of sampling. This study system is ideal for evaluating diversity response at different scales because the diversity of species is restricted to a limited, well-known, woody flora—thus increasing both precision and accuracy of estimators and interpretation of results. Species richness was interpreted via two approaches: species accumulation & rarefaction curves and nonparametric estimators of total species richness. Results are not easily summarized from a large data set probed by so many methods. However, species accumulation curves suggest that most species were captured within a small number of quadrats within a forest. Rarefaction curves proved useful in interpreting species richness because of the often large discrepancies in numbers of plants from plot to plot. Asymptotic estimators of total species richness may be instructional, but are not likely to be necessary in a well-defined flora such as understory woody plants.

9:15 POPULATION DYNAMICS OF BLACK COHOSH (*ACTAEA RACEMOSA* L) IN SOUTHERN OHIO FORESTS. MATTHEW A. ALBRECHT, MATTHEW.ALBRECHT@OHIO.EDU AND BRIAN C. MCCARTHY, MCCARTHY@OHIO.EDU. ENVIRONMENTAL AND PLANT BIOLOGY, OHIO UNIVERSITY, ATHENS, OH 45701.

Black cohosh is a polycarpic forest herb whose rhizome is increasingly harvested for its medicinal properties. The potential for over-harvesting raises concern among land managers, yet a poor understanding of the population dynamics of this species hampers conservation-based management efforts. Over a two-year period we studied the demographic trends of four black cohosh populations located in varying light conditions in the southern Ohio forest landscape. The population structure was dominated by small and large sterile ramets that showed high survival rates in all populations. Seedlings were rare, except in patches characterized by canopy openings. Spatial and temporal variability in sexual reproduction and vegetative recruitment was linked to forest structure. Sexual reproduction was only observed in patches with > 8.0% canopy openness but the probability of producing viable seed in these patches was low because of floral herbivory by lepidoteran larvae, pre-dispersal seed predation, and stochastic disturbances (e.g., deer herbivory and branch-falls). In seed addition experiments, emergence rates were < 5% in controlled (protected from disturbance and predators) and uncontrolled field conditions. However, in laboratory studies, emergence rates were > 70%, suggesting that in natural populations seeds may undergo a protracted dormancy. Stage-based matrix population models indicated population growth rates were just below or above equilibrium ($\lambda = 0.94 - 1.03$). Black cohosh appears to be a light-flexible woodland herb since demographic parameters corresponded to forest canopy structure: fecundity and growth increased in canopy openings, while survival of already-established ramets maintained patches in closed-canopy conditions.

9:30A TREE-RING BASED FIRE HISTORY RECONSTRUCTION OF RED PINE (*PINUS RESINOSA*) FORESTS, LAKE ITASCA, MINNESOTA. RYAN W. MCEWAN, RYAN.W.MCEWAN.1@OHIO.EDU, 317 PORTER HALL, OHIO UNIVERSITY, ATHENS OH 45701, S. ALDRICH, J. BAUER, C. GENTRY, J. KERNAN, R. LUSTECK, P. MARTINEZ, L. SHAPIRO, C. SPRENGER, M. VINING AND PETER M. BROWN.

Fire is of crucial importance to the structure and function of red pine (*Pinus resinosa*) forests of the Lake States region.

Understanding the historical role of fire in these systems deepens scientific knowledge of their ecology and allows for the implementation of scientifically defensible prescribed fire regimes. As part of the 14th North American Dendroecology Fieldweek, in July of 2004, a fire chronology was developed based on red pine stands in a north-central Minnesota forest. Basal cross-sections, smaller wedges, and increment cores were analyzed from two red pine stands on the eastern edge of Lake Itasca, Minnesota and a third site across two "fingers" of the lake near its western shore. Over the period 1756 to 1910 we documented 16 fire events, three of which were noted in trees from across all three sites. Across all sites, fire return interval ranged from a maximum length of 63 years to a minimum of 4 years. All sites exhibited a fire free interval beginning ca. 1800 and culminating in an 1863 fire which created scars on virtually all samples, from all three sites. Superposed Epoch Analysis revealed a significant relationship between drought severity and fire occurrence, and a significant, but conflicting relationship between fire occurrence and the Southern and North Atlantic Oscillations. Fire, linked to climatic variables, is clearly a spatially and temporally dynamic disturbance factor in this landscape.

9:45 EFFECT OF SILVICULTURAL PRACTICES ON THE SOIL SEED BANK OF MIXED OAK FOREST IN SOUTHEASTERN OHIO. LISA R. SCHELLING, LS903103@OHIO.EDU, BRIAN C. MCCARTHY, MCCARTHY@OHIO.EDU, DEPARTMENT OF ENVIRONMENTAL AND PLANT BIOLOGY, 315 PORTER HALL, OHIO UNIVERSITY, ATHENS OH 45701.

Burning and thinning are commonly used forest management techniques in the eastern deciduous forest of the United States. The impact of these techniques on the soil seed bank has not been examined. This study compares the species composition of the soil seed bank under four forest management regimes, four years after treatments were applied. In the winter of 2000-2001, two sites in southeastern Ohio were subjected to four treatments: burning, thinning, thinning followed by burning, and an untreated control. Ten 20x50 m permanent plots were established in each treatment unit across a moisture gradient using an Integrated Moisture Index (eighty plots total). Eight systematically placed 10x10x5 cm soil samples were collected from each permanent plot in the early spring of 2004 and pooled in pairs. The seedling emergence method was used to assess the species composition of the samples. Soil samples ($n = 320$) were placed in the greenhouse, given a 12-hour photoperiod, and watered every other day. Both cluster analysis and a blocked multiple-response permutation procedure (MRPP) yielded no significant ($P > 0.05$) trend of difference among the treatments. Short-term disturbance regimes do not appear to markedly impact species composition of the soil seed bank. Species composition of soil seed banks is likely determined by other factors, or is so species-specific that disturbance mediated community level changes are difficult to detect.

10:00 FOREST FLOOR FUEL RESPONSES THREE-YEARS FOLLOWING FIRE AND THINNING TREATMENTS IN OHIO MIXED-OAK FORESTS. JOHN B. GRAHAM, JG396703@OHIO.EDU, BRIAN C. MCCARTHY (MCCARTHY@OHIO.EDU), DEPARTMENT OF ENVIRONMENTAL AND PLANT BIOLOGY, OHIO UNIVERSITY, PORTER HALL 315, ATHENS OH, 45701.

Prescribed fire is used as a tool in ecosystem restoration throughout the United States for multiple management goals. This study examines the dynamics of fuel composition and structure over a three-year period following fire and thinning at three sites in southeastern Ohio. Sites were treated over the winter of 2000 under four regimes: control (C), thinning (T), prescribed burning (B), and thinning followed by prescribed burning (TB). Fuels were measured before and after treatments (2000 and 2001) and again in 2004. Measurements were taken along seventy-two 20 m transects in each treatment unit ($n = 864$). Measurements were made to determine litter, duff, 1-hr (0-6 mm diameter), 10-hr (6-25 mm), 100-hr (25-75 mm), and 1000-hr (75+ mm) fuel mass. Coarse woody debris (CWD) was evaluated for species, length, large- and small-end diameters, and decay class on thirty-six additional 80 m² belt-transects within each unit ($n = 432$). Data were analyzed using a randomized-complete block design analysis of variance ($P = 0.05$). In 2001, T and TB increased 10-hr, 100-hr, 1000-hr, and CWD while B and TB decreased litter. In 2004, T and TB increased 100-hr and 1000-hr, and decreased 1-hr fuels, TB decreased duff, and B had no impacts. Treatment impacts varied over time with the most prevalent from thinning, alone or in combination. Since fires are influenced primarily by small fuels (litter and 1-hr), thinning treatments are likely to reduce future fires. Burning will have less of an impact on future fires than thinning.

10:15 DOES COMMUNITY STRUCTURE INFLUENCE FOREST SUSCEPTIBILITY AND RESPONSE TO EMERALD ASH BORER? ANNEMARIE SMITH¹, SMITH.3746@OSU.EDU, DANIEL A. HERMS², HERMS.2@OSU.EDU, ROBERT P. LONG³, RLONG@FS.FED.US, ¹THE OHIO STATE UNIVERSITY, ENVIRONMENTAL SCIENCE GRADUATE PROGRAM, 400 ARONOFF LABORATORY, 318 W. 12TH STREET, COLUMBUS OH 43210. ²THE OHIO STATE UNIVERSITY, OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER, ³USDA FOREST SERVICE.

Emerald ash borer (*Agrilus planipennis*) an exotic, invasive beetle has infested and killed more than 12 million ash trees (*Fraxinus* species) in southeastern Michigan. If emerald ash borer (EAB) is not contained and eradicated it has the potential to devastate ash throughout North America with substantial economic and ecological consequences. The objectives of this research are (1) determine effects of forest community composition and stand structure on susceptibility to EAB invasion, and (2) quantify effects of EAB-induced ash mortality on forest community composition. Transects were established in the summer of 2004 in 11 southeast Michigan forest stands across a range of habitats that vary from wet, low sites to dry, upland sites. Susceptibility to invasion was determined by quantifying EAB attack and subsequent ash mortality in relation to density, frequency and total basal area of ash and other trees, as well as percent canopy cover. Preliminary data from the first field season indicates that there is no relationship between ash density or relative dominance of ash and EAB-induced dieback. As ash trees are eliminated from infested stands, *Ulmus* (elm), *Acer* (maple) and *Prunus* (cherry) will eventually replace ash in the canopy. However, ash was the most common overstory species in the sapling and seedling layers and thus will provide a continual supply of host material for EAB, which will complicate eradication efforts. The EAB invasion has the potential to alter the composition of North American forest communities.

10:30 POPULATION SIZE AND DENSITY EFFECTS ON GENETIC VARIATION AND MATING SYSTEM IN LUPINUS PERENNIS. HELEN. J. MICHAELS¹ (HMICHAE@BGNET.BGSU.EDU), XIUJIE SHI¹ (XIUJIE.SHI@GMAIL.COM), AND RANDALL J. MITCHELL² (RJM2@UAKRON.EDU). ¹DEPARTMENT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403, USA ²DEPARTMENT OF BIOLOGY, UNIV. OF AKRON. OH 44325

Understanding the impacts of changes of population size and density on genetic variation and mating systems is critical to the evaluation of the effect of anthropogenic changes on reproduction in threatened plant populations. Genetic variation was surveyed in ten populations of the threatened species *Lupinus perennis* in northwest Ohio in 1999 using six microsatellite loci. ANOVA showed that although population size had no significant effect ($p = 0.17$) on levels of heterozygosity for adult plants, larger populations harbored significantly more alleles than smaller populations ($p < 0.02$). We further characterized the mating system of 8 populations varying in size and density, using data from 5 polymorphic microsatellite loci. Progeny arrays of 11 open-pollinated offspring from 15-20 maternal plants per population were used to estimate mating system parameters under the mixed mating model. Multilocus outcrossing rates ($t_m = 0.72$ to 0.95) indicated that *L. perennis* is predominately outcrossing. Outcrossing rate varied among populations, with large populations having significantly higher outcrossing rates than small populations. Furthermore, outcrossing rate increased with population size but decreased with density. Given that all populations show considerable inbreeding depression regardless of size, these results help explain why previous studies have shown that small populations have lower seed production and higher abortion rates.

10:45 GROWTH AND MYCORRHIZAL RESPONSE OF OAK SEEDLINGS TO INCREASED LIGHT UNDER NATURAL CONDITIONS. CAROLYN J. McQUATTIE¹, CMQUATTIE@FS.FED.US, JOANNE REBBECK¹, JREBBECK@FS.FED.US, PATRICK H. BROSE², PBROSE@FS.FED.US, ¹USDA FOREST SERVICE, NRS, 359 MAIN RD., DELAWARE OH 43015 AND ²USDA FOREST SERVICE, WARREN PA.

In many forests poor natural oak regeneration is related to low light levels reaching the forest floor. To more fully understand light effects on black oak (*Quercus velutina*) and chestnut oak (*Quercus montana*) seedling growth and mycorrhizal colonization of roots, acorns were planted in fall 2001 (chestnut oak) or spring 2002 (black oak) in two mixed-oak forests in northwestern Pennsylvania: the glaciated Allegheny Plateau (GAP) and the unglaciated Pittsburgh Lower Plateau (PLP). Soils at both sites are acidic (pH 3.7 to 4.8), but GAP has higher calcium and nitrogen levels. Plots from both sites represented three light levels: <5% canopy opening (UC, uncut control), 10-15% canopy opening (LS, light shelterwood cutting), or 30-40% canopy opening (HS, heavy shelterwood

cutting). In August 2003 and 2004, six black oak and chestnut oak seedlings per light level were excavated at both sites. Seedlings from both species grown in HS at PLP had significantly greater growth and biomass compared with LS or UC (ANOVA, $P \leq 0.05$); however at GAP, only chestnut oak growth increased significantly with increased light (HS). For both years, chestnut oak had significantly greater mycorrhizal colonization at PLP (75%) than at GAP (52%), while a significant increase in black oak mycorrhizae occurred only in 2004 at PLP (62%) compared to GAP (41%). At both sites for both species, starch accumulation in leaf chloroplasts was greatest in HS. Overall, increased light (HS) was strongly related to increased seedling growth, while increased light coupled with lower site nutrition likely enhanced mycorrhizal colonization at PLP.

Zoology

3:00 PM Saturday April 2nd 2005

Oiscamp Hall Room 106

Mark Headings - Presiding

3:00 EFFECTS OF VARYING HABITATS ON FEEDING PREFERENCES OF *BELOSTOMA* SARAH M. NUSKE S-NUSKE@ONU.EDU., DR. BRIAN KEAS OHIO NORTHERN UNIVERSITY 402 WEST COLLEGE AVE., UNIT 2015 ADA, OH 45810

Belostoma flumineum, the giant water bug, feed on the internal fluids of other invertebrates, small amphibians, fish, and mollusks. Feeding preference experiments were performed in the laboratory to determine if habitat variation has an effect on *Belostoma*'s preferences of varying sizes and mobility rates of its prey. In a controlled mesocosm, a common snail species, *Helisoma trivolvis*, one small and one large Odonate larvae and one beetle were offered to the predator in different habitats to determine if the environment has an effect on the preferences of *Belostoma*. The three habitats consisted of different plant densities: a densely vegetated habitat, a moderately vegetated habitat, and a lightly vegetated habitat. The average size varied about fifty percent between the small, medium, and large prey. Three trials, using six different *Belostomatids* and two of each habitat, were performed. The type and size of the prey consumed by *Belostoma* in each tank was recorded to determine if there was a preference in prey size or prey type in the three environments. A two way ANOVA test and a two-sample t-test will be used on the collected data. It is hypothesized that *Belostoma* will consume larger, more mobile prey in the denser vegetated habitats. *Belostomatids* will be able to see larger prey easier in addition to mobility increasing the occurrence of predator-prey interaction. It is also hypothesized that *Belostomatids* will consume the less mobile prey in the less vegetated habitats, because the prey will not be able to escape the predator as easily and there will be less vegetation to hide in.

3:15 HABITAT PREFERENCE AND AGE DISTRIBUTION OF ROAD MORTALITY SNAKES IN THE KILLDEER PLAINS WILDLIFE AREA, WYANDOT COUNTY, OHIO. NATHAN J. YAUSSY, YAUSSYJ@HIRAM.EDU. P.O. Box 763, HIRAM, OH 44234.

Serious concerns exist regarding declines in numbers of eastern plains garter snakes (*Thamnophis radix radix*) and eastern massasauga rattlesnakes (*Sistrurus catenatus catenatus*), which are listed as endangered on Ohio's threatened and endangered species list and found in Killdeer Plains Wildlife Area (KPWA) in Wyandot County, Ohio, USA. Observations during fieldwork at KPWA have indicated that virtually all species of snakes native to the area are frequently killed by vehicular traffic. A method for determining habitat preferences was explored. All roads in the KPWA were driven twice weekly during the fall migration period, September to November 2003. Snakes were identified, location recorded by Global Positioning System (GPS), and animal length recorded by digital photograph. After three years, falls 2000 through 2002 of decreasing numbers, the fact that there was a greater number of snakes, 469 individuals, found in this season show that four years of road surveys are not enough to determine population trends. The percentage of live snakes did not increase proportionally to the total number of snakes. The largest age group of snakes was preadults. Linear analysis of habitat was not able to discriminate among species by habitat preference when all species were included in analysis. The removal of species with wider habitat range allowed for a more accurate analysis of the habitats for other snakes, allowing for the creation of probability maps to predict where the individual species of snakes may be found within the wildlife area.

3:30 HOW DOES AMBIENT FLOW AFFECT ODOR SAMPLING IN MANTIS SHRIMP? KRISTINA S. MEAD
MEADK@DENISON.EDU BIOLOGY DEPARTMENT, DENISON UNIVERSITY,
 350 RIDGE RD, GRANVILLE, OH 43023.

Many aquatic crustaceans use water-borne chemical cues in ecologically critical activities such as finding food, mates, suitable habitat, detecting predators, and communicating with conspecifics. These chemical cues are often present as odor plumes, which consist of fine filaments containing high concentrations of odor molecules interspersed with the surrounding fluid. The mantis shrimp *Hemisquilla ensiguera californica*, like many crustaceans, detect odors from distant sources by using chemosensory sensilla (aesthetascs) on their antennules. Mantis shrimp sample odors by flicking their antennules in a rapid out and back movement. Physical and mathematical models show that in still water flicking improves odor molecule access to the aesthetascs. Since changes in water speed will affect the relative velocity of the antennule to the water, one might expect that antennule flicking velocity might be affected. To study the effect of ambient flow on flicking, thirteen *H. ensiguera californica* were filmed in the field (Willow Cove, Catalina Island, CA) over four days over several tidal cycles as they flicked in response to squid juice (154 observations). Ambient flow near the antennules was measured simultaneously by filming the movement of particulate matter. In this wavy setting, water velocities at the level of the antennule ranged from -7 to +7 cm/s in the direction of the flick. Digitizing the video (Image J; NIH) showed that *H. ensiguera* altered the flicking velocity of either the outward or the return movement so that the relative velocities of the two portions of the flick were substantially different from each other. Physical and mathematical models suggest that this flicking asymmetry helps ensure that each flick is a discrete sample of waterborne odorants.

3:45 A TWO YEAR COMPARISON OF A STREAM MACROINVERTEBRATE FUNCTIONAL GROUP BIOASSESSMENT PROTOCOL FOR THE REPUBLIC OF PALAU ARCHIPELAGO. ALYSON A. OLESEN¹
OLESENA@NOTES.UDAYTON.EDU, LYNN WATERHOUSE¹, M. ERIC BENBOW², TARITA HOLM³, ALBERT J. BURKY¹, DEPT OF BIOLOGY, UNIVERSITY OF DAYTON, DAYTON OH 45469-2320; ²DEPT OF ENTOMOLOGY, MICHIGAN STATE UNIVERSITY, MI; ³FORESTRY UNIT-BUREAU OF AGRICULTURE MINISTRY OF RESOURCES AND DEVELOPMENT, KOROR, REPUBLIC OF PALAU.

Archipelagoes of Pacific Oceania, dependant on tourism for economic stability, are on the brink of commercial development. The island Republic of Palau is located 885 km west of the Philippines, where coral reefs and mangroves are threatened by stream silt load. We collected macroinvertebrate functional feeding group data in 2003 and 2004 to develop a rapid bioassessment protocol for Palauan streams. One reference stream, Ngardmau, was selected to test functional group ratios and associated ecosystem attributes against streams of variable impact from road construction. In both years qualitative samples were collected using 30s dip net samples in pool habitats and benthic scouring methods in cascades. In 2004, qualitative samples were taken with additional quantitative cascade collections made for sampling technique comparisons. In the reference stream riffle habitat, the community was dominated by filtering-gatherers (87% in 2003 and 47.2% in 2004) compared to all other functional groups. Among the impacted streams, riffle functional group composition was variable compared to the reference stream. In reference pool habitats, gathering collectors and scrapers dominated in 2003 and 2004, respectively. Scrapers dominated pool habitats of impacted streams in 2004, with some functional groups missing. Changes in ecosystem attributes followed functional group variability depending on degree of impact. Overall, functional group ratios indicated that channel stability ratio ([filtering-collectors + scrapers]/[shredders + gathering-collectors]) was lowered with increasing impact, suggesting food and/or habitat quality for filtering-collectors was degraded in riffle habitats in 2003 with no trends in 2004. By this protocol all streams were determined to be degraded in 2004 relative to 2003.

4:00 EXTRAFLORAL NECTARIES ON ADZUKI BEANS, PHASEOLIS ANGULARIS, AND THEIR ATTRACTION TO ANTS. MARK E. HEADINGS¹, HEADINGS.1@OSU.EDU, AND LESLIE MORRIS², MORRIS.508@OSU.EDU, ¹THE OHIO STATE UNIVERSITY AGRICULTURAL TECHNICAL INSTITUTE, 1328 DOVER ROAD, WOOSTER OH 44691 AND ²USDA-ARS AT THE OSU AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER.

Certain ant species are attracted to nectar exuding from extrafloral nectaries of selected plants. The objective of this field study was to explore a group of plants; namely, black bean, mung bean, pinto bean, adzuki bean, lentils (white, green, black

and crimson), peanut, and peas (yellow and green) to determine the presence of extrafloral nectaries and insect foragers attracted to them. Adzuki beans and mung beans were the only two observed having extrafloral nectaries. The authors had previously reported seeing such nectaries on mung beans but had not confirmed such being present on adzuki beans. The focus of this investigation is, therefore, on Adzuki beans, *Phaseolis angularis*. This species originates in Japan and China. Distinctly raised extrafloral nectaries were observed on stems of the plant located between flowers developing on opposite sides of the stem. Forty-four photographs of extrafloral nectaries were produced using a Hitachi S – 3500 variable pressure scanning electron microscope. These nectaries each have one to five openings in slightly depressed areas on the outer surface through which nectar exudes. During late summer to early autumn 2004, a commonly observed insect visitor feeding at extrafloral nectaries of adzuki beans grown under field conditions near Wooster, Ohio, was the small honey ant, *Prenolepis imparis*. The ant benefits from this food source; however, it is unclear whether the plant benefits from the presence of this ant.

4:15 COMPARITIVE PROTEOMICS OF PARASITISM IN BLUEGILL. SARAH L. EDMONDS¹, SLLLOYD@UAKRON.EDU, RICHARD L. LONDRVILLE¹, LONDRVILLE@UAKRON.EDU, AND MICHAEL KINTER², KINTERM@CCF.ORG, ¹UNIVERSITY OF AKRON, DEPT. OF BIOLOGY, AKRON, OH 44325-3908 AND ²LERNER RESEARCH INSTITUTE, CLEVELAND CLINIC FOUNDATION, CLEVELAND, OH.

Bluegill, *Lepomis macrochirus*, are commonly infested with a variety of parasites, including the black grub, *Uvulifer ambloplitis*. Researchers have typically concentrated on the effect *U. ambloplitis* and other parasites have on specific bluegill characteristics such as length, weight, body condition, and mortality. Proteomics is a powerful tool that enables one to simultaneously separate thousands of expressed proteins, and can be useful for evaluating a cellular response to an environmental change. Proteomics has increasingly been used to determine the proteomes of disease-causing parasites in humans in an effort to aid in the development of effective treatments. This project employed proteomics to determine the effect of parasitism by *U. ambloplitis* on protein expression in bluegill serum. Three experimental groups were compared: bluegill sunfish without external parasites, bluegill infected with *U. ambloplitis* for a set time period, and chronically infected bluegill from a natural population. Blood was sampled from all fish prior to infection, from experimentally infected bluegill 24-48 hours post-infection, and again from all bluegill at 30 days post-infection, and serum prepared. Albumin was removed from serum samples using a commercial kit, immunoglobins were removed using Protein G-/Protein A, and the remaining protein was extracted using a commercial kit. Proteins were separated by isoelectric point (pH 4-7 gradient) and then by size (15% gel) using two dimensional gel electrophoresis. With care, 2D gels are highly reproducible: pixel volume for any given spot changes only 12-13% among repeat gels on the same sample. A total of 497 bands were detected using 2D analysis software (ImageMaster). Twelve differentially expressed bands (between infected and non-infected) were identified. Differentially expressed bands and several landmark bands were analyzed using mass spectrometry. Infection is correlated with changes in protein expression. Some of these proteins have been identified, i.e. apolipoprotein E, compliment component C3, and we have sequence information for others.

4:30 NEST SITE SELECTION IN FEMALE PAINTED TURTLES (CHRYSEMYS PICTA MARGINATA), MELANIE L. GERTZ, MGERTZ@WOOSTER.EDU; RICHARD M. LEHTINEN, RLEHTINEN@WOOSTER.EDU; BOX C – 1732 1189 BEALL AVE, WOOSTER, OH 44691.

Proper nest site selection in oviparous animals is critical for reproductive success. This study was undertaken to determine the nesting preferences of female central painted turtles (*Chrysemys picta marginata*). Twenty five nest sites were found at two adjoining ponds in Geauga Co., Ohio from May 24th, 2004 to August 15th, 2004. Measurements of the following environmental variables were taken at each nest site: distance to the nearest pond, percentage of overhead vegetation cover, soil compaction, soil pH, soil moisture and soil temperature at three depths. Identical measurements also were taken at twenty five randomly selected locations at the same site. Of these eight variables, only two were found to be significantly different between random and nest sites. pH was significantly higher at nest sites (mean = 6.80, ± 0.25) than at random sites (mean = 6.54, ± 0.29; Wilcoxon test p = 0.0021). Moisture was significantly lower at nest sites (mean = 26.6 ± 20.1 %) compared to random sites (mean = 48.3 ± 17.5 %; t-test p < 0.0001). These two analyses suggest that female painted turtles assess soil pH and moisture to determine nest location and these two factors may be important to embryonic development and overall hatching success for this species.

4:45 VISUAL OBSERVATION AS A METHOD FOR EXAMINING POPULATION CONDITIONS IN *BRACHYRAMPHUS MARMORATUS* BASED ON FORAGING BEHAVIOR AND BIRD ABUNDANCE IN SOUTHEAST ALASKA. KIRA E. PONTIUS, PONTIUS.16@OSU.EDU, (MATTHEW KIRCHHOFF, ALASKA DEPT OF FISH & GAME, DAVID A. CULVER), THE OHIO STATE UNIVERSITY, DEPT OF EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY, COLUMBUS, OH 43210.

The marbled murrelet (*Brachyramphus marmoratus*) is a seabird found along the Pacific coast and is considered threatened in Washington, Oregon, California and British Columbia. Murrelets are alcids that live and forage at sea yet uniquely nest in adjacent old-growth forests. Our objective was to test the effectiveness of direct visual observation as a means of assessing 1) bird abundance, and movement to and from nest sites; and 2) the murrelets' foraging behaviors and success. If effective, this method would be widely available to researchers and more cost-efficient than transect or radio telemetry surveys. Data were collected south of Juneau, Alaska during July 2004. We used 5718 boat-based direct visual observations of birds arriving in or leaving Snettisham Inlet to examine temporal fluctuations in bird movement. Foraging behavior observations were made from land over 4 days with all behaviors recorded and time-stamped to the second (2874 individual observations on 218 birds). Quantification of foraging behavior and its success was based on measures of catch per dive. Data for assessing relative inshore-offshore movement of murrelets foraging in the inlet are still under analysis. Preliminary results from foraging studies show a higher percent of time is spent diving for food by birds in the Alaskan population (70%) than that reported in the literature for the threatened central California population (62%), suggesting higher forage availability at this site in southeastern Alaska. The California study was based on observations from a single radio-tagged bird. Better, simpler methods for assessing time/energy expenditure on nest-to foraging-site movement and on actual foraging bouts will help us to determine the relative importance of the availability/quality of nesting and forage habitat to marbled murrelet population stability.

Microbiology, Cell Biology & Genetics

9:00 AM Saturday April 2nd 2005

Olscamp Hall Room 119

Lysa Styfurak - Presiding

9:00 WHAT CONCENTRATION AND DOSAGE IS NEEDED TO TREAT A *PSEUDOMONAS AERUGINOSA* BIOFILM INFECTION. MEGAN P. WATSON, M-WATSON@ONU.EDU, (ROD ANDERSON) OHIO NORTHERN UNIVERSITY, 423B UNIVERSITY AVE, ADA, OH 45810.

Biofilm research may help physicians to treat serious *Pseudomonas* infections, commonly a result of urinary catheterization, by finding the needed length of exposure and concentration of commonly used antibiotics to successfully penetrating the bacterial colonization. A biofilm is a mass of cells connected to one another by an extra cellular matrix. The regular treatment of planktonic bacteria, such as *Pseudomonas aeruginosa* frequently does not work for a patient that has a biofilm infection. A normal dose of an antibiotic does not penetrate the biofilm's multiple layers, but if the antibiotic dose was lengthened or the concentration increased, the drug would possibly be able to kill all the cells growing within. Gentamicin, Ampicillin, Piperacillin, Imipenem, and Meropenem all successfully treat UTI when the bacteria is planktonic, however if the cells have colonized in a biofilm the antibiotic is not effective in the normal dose. Biofilm's that are subjected to the antibiotic for the longest period of time are expected to show the most infection eradication. In this experiment, a *Pseudomonas* biofilm, after 48 hours of growth, will be treated with each of five drugs. Every 12 hours, from the initial administration of the antibiotic, the liquid in each well will be removed. This liquid will contain the antibiotic, nutrient broth, and any planktonic bacteria cells. The remaining biofilm will undergo rinsing, staining with crystal violet, and absorption measurements via a spectrometer to determine the number of surviving biofilm cells. Survival will be measured every 12 hours for three days. If after the last measurements are taken on the third day, biofilm growth is still present, the procedure will be repeated with a higher concentration of each antibiotic.

9:15 STUDY OF BACTERIAL AGENTS CAUSING ARSENATE TO ARSENIC REDUCTION IN SWINE LITTERS. RACHEL M. KANTOSKY, R-KANTOSKY@ONU.EDU, (RODNEY

P. ANDERSON, R-ANDERSON@ONU.EDU), OHIO NORTHERN UNIVERSITY, 309 S. JOHNSON ST., ADA, OH 45810.

The purpose of this project is to investigate whether rural swine farms are significant sources of arsenic in the environment. This project screened for possible bacterial agents from swine that caused the breakdown of roxarsone in the litter. Roxarsone is an organoarsenate compound used in animal feed to promote rapid growth and control intestinal parasites. A sample of swine feces was incubated in aerobic and anaerobic environments for two days in M9 broth with an organo-arsenate as the sole carbon source. Bacterial growth was observed from the sample, and enrichment of the bacteria was done by serial subcultures. Purification by streak plating resulted in two different types of bacteria (yellow and white colonies), observed in both aerobic and anaerobic environments, on nutrient agar plates. Upon incubation in an arsenate containing medium without a carbon source, the yellow bacteria grew under anaerobic conditions, suggesting a chemoautotrophic species which utilized arsenate as an electron donor. The white colonies grew only in an arsenate-rich aerobic environment. The white bacterial species a gram negative, catalase positive, oxidase positive, bacillus that does not reduce nitrate. The yellow species is a gram positive, catalase positive, oxidase positive, bacillus that does not reduce nitrate. Additional results are pending from tests to determine the final oxidation state of the arsenic species in the culture and identification of the bacteria.

9:30 ANTIBIOTIC RESISTANCE AT SANDY RIDGE RESERVATION OF THE LORAIN COUNTY METROPARKS. LYSA M. STYFURAK KUKUI2@YAHOO.COM, KATIE D. HOGAN KDHOGAN@YAHOO.COM, MELISSA POPE MISSYP41@MSN.COM, ADAM C. MILLER AMILLER2@LORAINCC.EDU, (HARRY W. KESTLER HKESTLER@LORAINCC.EDU) 11226 LAWNSDALE DR., PARMA HTS. OHIO 44130.

Sandy Ridge Reservation is a 310-acre wetland and wildlife preserve in Lorain County, Ohio. Historically a wetland, Sandy Ridge was drained and used for farming for many years, and then converted back to a wetland in 1990. This was a unique opportunity to study a wetland as it is developing. This study was designed to establish a base of aquatic microbial diversity data as well as analyze trends that may develop from year to year. In 2003, the initial year of research, 12 isolates were cultured and metabolically tested to determine that each isolate was distinct. Antibiotic resistance tests were performed on the 12 isolates employing gentamicin, streptomycin, clindamycin, vancomycin, penicillin and bacitracin. The 2003 antibiotic data showed a high percentage of resistance. Of the 12 isolates tested, 9 showed resistance to at least 50% of the antibiotics used. Given the percentage of antibiotic resistance, the annual collection of data for 2004 was revised to include new focus on tracking antibiotic resistance of isolates. Of the 33 isolates cultured in 2004, 15 exhibited resistance to at least 50% of the same antibiotics used in 2003.

9:45 IN VITRO ANTIMICROBIAL ACTIVITY AND BIOFILM INHIBITION OF *OENOTHERA CAESPITOSA* AND *CORYDALIS AUREA* EXTRACTS. TRICIA M. GREENWALD, T-GREENWALD@ONU.EDU, (RODNEY ANDERSON), OHIO NORTHERN UNIVERSITY, 525 S. MAIN ST, ADA OH 45810.

The purpose of this research was to determine if plant extracts used in traditional Navajo medicine could be beneficial in fighting microorganisms. Throughout history peoples worldwide have turned to plants for medicinal purposes. This research project investigated whether two plants, *Oenothera eapitosa* and *Corydalis aurea*, had antimicrobial activity and could limit biofilm formation. The thirty-five total extracts (twenty from *Corydalis* and fifteen from *Oenothera*) were tested against four strains of bacteria, *Staphylococcus aureus*, *Escherichia coli*, *Bacillus subtilis*, and *Pseudomonas aeruginosa* by performing a disk-diffusion assay to evaluate levels of growth inhibition. The disk-diffusion assay was run two times and an average level of inhibition was recorded. Following the disk-diffusion assay, those extracts that showed antimicrobial activity were tested to see if they showed signs of inhibiting biofilm formation. Biofilm formation was detected by measuring absorbance levels following staining and decolorization using a spectrometer. A total of five trials were performed for each extract and the control, 95% ethyl acetate. It is hypothesized that some of the extracts would have antimicrobial activity, and those that showed activity in an assay would have some inhibiting affect on biofilm formation. Four different extracts from the *Corydalis* genus inhibited *E. coli* for an average of 9.5mm. Three different extracts from *Oenothera* only inhibited *E. coli* for an average of 9.66mm. Two extracts *Corydalis* also inhibited *S. aureus* (average inhibition 10.5mm) while one extract from *Oenothera* inhibited 10.0mm. *P. aeruginosa* was inhibited by five extracts from *Corydalis* (average inhibition 9.0mm) and by one extract from *Oenothera* at 10.0mm. Lastly, seven extracts from *Corydalis* inhibited *B. subtilis* (average 9.14mm) and two extracts

from *Oenothera* inhibited for an average of 10.5mm. The bacterium that had the most inhibition was *B. subtilis* while the bacterium that was least affected by the extracts was *S. aureus*. Inhibition of biofilm formation was not statistically significant for either *E. coli* or *P. aeruginosa* when tested as one-sided, 95%, against the ethyl acetate control. The average p-value was .640 for *E. coli*, and the average p-value for *P. aeruginosa* was .711. A *Corydalis* extract did have a p-value of .060 which showed a possible level of biofilm inhibition if there was a 90% alpha level. These initial results show that some of the extracts had antimicrobial activity, whereas all of those with activity did not show any level of inhibiting biofilm formation.

10:00 CYTOCHROME C PEROXIDASE: CHARACTERIZATION OF A MITOCHONDRIAL ANTIOXIDANT ENZYME IN HYMENOLEPIS DIMINUTA (CESTODA). JAHMAL B. GREEN GREENJB@BGNET.BGSU.EDU AND CARMEN F. FIORAVANTI CFIORAV@BGNET.BGSU.EDU, DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

The rat intestinal parasite, *Hymenolepis diminuta*, is essentially anaerobic and forms succinate as the major end product of glucose catabolism. Succinate accumulation is the product of the mitochondrial, electron-transport coupled, ATP-generating, fumarate reductase. *H. diminuta*, however, assimilates oxygen when available, thereby resulting in a mitochondrial, flavin-mediated production of H₂O₂. Thus, with sporadic oxygen exposure, a reactive oxygen species accumulates in the parasite. A dilemma is apparent inasmuch as the cestode lacks catalase and glutathione peroxidase activities. This dilemma was resolved with the finding of a mitochondrial soluble (MtS) cytochrome c peroxidase (CCP). Using the MtS fraction as the enzyme source, *H. diminuta* CCP was characterized with respect to pH optimum, substrate-dependent activity maintenance, Km and Vmax, and was partially purified. CCP activity was optimal at pH 7.0 and activity was maintained with the addition of 0.024mM cytochrome c to the preparation. The apparent Km for reduced cytochrome c and H₂O₂ were 0.03 ± SE 0.004 and 0.07 ± 0.008 mM [n=3], respectively and the apparent Vmax was 2.7mmol/min/mg ± 0.67 [n=3]. Employing DEAE-Sepharose and hydroxyapatite column chromatographies, a more purified preparation of CCP was obtained. This 10-fold purified preparation displayed a monomeric M_r of 38kDa and also required supplementation with 0.024mM cytochrome c for activity maintenance. Characterization of CCP may aid in the development of specific helminth chemotherapy, particularly since this system is in the parasite, but not its mammalian host. Supported in Part by NIH AI-15597 (C.F.).

10:15 INSULIN-INDEPENDENT TYROSINE PHOSPHORYLATION OF INSULIN RECEPTOR: A MECHANISM FOR DEVELOPMENT OF INSULIN RESISTANCE RAVINDRA KOLHE, RBKOLHE@BGNET.BGSU.EDU, NARA GAVINI, NGAVINI@BGNET.BGSU.EDU AND LAKSHMI PULAKAT, PULAKAT@BGNET.BGSU.EDU, 217 LIFE SCIENCES BLDG DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

Patients suffering from hypertension often develop non-insulin dependent diabetes mellitus (NIDDM), a serious pathological condition caused by insulin resistance. Though these patients have normal insulin receptor (IR) and high levels of insulin in the blood, they fail to have IR-mediated signaling essential for glucose uptake and glucose availability. However, mechanisms leading to this insulin resistance in patients suffering from hypertension are unclear. In MCF-7 human breast cancer cell line, by immunoprecipitation and immunoblotting, we report the angiotensin II (Ang II) receptor AT1, which is implicated in hypertension, associates with insulin receptor IR and intracellular kinase Jak2 in response to Ang II binding. This association results in Tyrosine phosphorylation of IR in the absence of Insulin. By using radiolabel ¹²⁵I-Insulin binding assay's we show that Ang II also inhibits ¹²⁵I-Insulin binding to IR in MCF-7 cell line. We have seen this inhibition of ¹²⁵I-Insulin binding to IR at concentrations similar to those seen in patients suffering from hypertension. By immunoprecipitation we showed that Ang II mediated IR phosphorylation and their associated phosphoprotein differs from insulin-induced phosphoproteins and its associating proteins, implying that AT1 can modify IR and alter its signaling. Therefore, insulin-independent, Ang II induced tyrosine phosphorylation of IR can prevent IR from binding insulin, thus contributing to insulin resistance.

Microbiology, Cell Biology & Genetics

3:00 PM Saturday April 2nd 2005

Olscamp Hall Room 119

Rudy Wojtecki - Presiding

3:00 ORIGIN AND EVOLUTION OF CHROMOSOME II IN AGROBACTERIUM AND ITS RELATIVES. BRADLEY W. GOODNER (GOODNERBW@HIRAM.EDU), LINDSEY M. WILSON, NICOLE E. PRIDE, AND TRUCIAN OSTHEIMER. DEPARTMENT OF BIOLOGY, HIRAM COLLEGE, HIRAM, OH 44234.

Previous genetic and physical maps of the *Agrobacterium* strain C58 genome suggested a novel origin for the linear chromosome II and the complete genome sequence further supports a plasmid origin for chromosome II with several intragenomic DNA transfers from the ancestral chromosome I. *Agrobacterium* strains fall into 3 biovars, with biovars 1 and 3 more closely related, and the biovars are embedded within a larger clade that includes *Rhizobium* strains. We used pulsed-field gel electrophoresis (PFGE) and both real and virtual PCR to determine how the evolution of chromosome II relates to the overall evolution of this clade. PFGE and PCR results showed that only biovar 1 *Agrobacterium* strains and a few closely related *Rhizobium* strains contain a linear chromosome II. However, the circular chromosome II of biovar 3 *Agrobacterium* strains and allied *Rhizobium* strains share many conserved gene orders with the biovar 1-type linear chromosome II. For these experiments, we used synteny analysis to predict intragenomic DNA transfers, designed PCR primers to test for new gene orders, and used these PCR primers on a wide range of *Agrobacterium* and *Rhizobium* strains. To further complement this work, we also have done virtual PCR on the unfinished genomic sequences from biovar 2 and biovar 3 *Agrobacterium* strains. The virtual data confirms the common ancestry of chromosome II within the biovar 1/biovar 3 subclade and the late origin of its linearity within the biovar 1 lineage.

3:15 NEOCENTROMERES AND NUCLEOTIDE CONTENT ON HUMAN CHROMOSOME 11 PAUL F. SOUTH URSULINE COLLEGE 2550 LANDER RD, PEPPER PIKE, OH 44124.

When eukaryotic chromosomes undergo cell division genetic information stored in DNA condenses into chromosomes. Each of these DNA protein complexes has repetitive sequence at the centromere. The repetitive sequence constituting human centromeres is called alpha-satellite DNA. During cell division a protein complex, the kinetochore, becomes apposed to the alpha-satellite DNA, enabling microtubules to segregate the chromosomes. Alpha-satellite DNA is high in AT nucleotide content with long repeats (2000-4000 base pairs) in humans. Sometimes when cell division is abnormal, pieces of chromosomes are formed and new centromeres (neocentromeres) form on regions lacking the normal centromeric DNA. This research examined such isolated regions containing a neocentromere using fluorescent *in-situ* hybridization (FISH) and compared the neocentromeric sequence to that found in chromosome 11 via the human genome project. Preliminary data shows that although the neocentromere region is not alpha satellite DNA, it does have the high AT nucleotide content which is a characteristic of alpha satellite DNA. Further understanding of neocentromeres may help to better understand normal centromere formation and function.

3:30 ESTIMATE OF THE DELETERIOUS GENOMIC MUTATION RATE IN DROSOPHILA MELANOGASTER Y1 GONG¹ GONGYI@BGNET.BGSU.EDU R. C. WOODRUFF¹ RWOODRU@BGNET.BGSU.EDU JAMES N. THOMPSON JR.² JTHOMPSON@OU.EDU 1001 EAST WOOSTER STREET, DEPARTMENT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH, 43403 ¹DEPARTMENT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH ²DEPARTMENT OF ZOOLOGY, UNIVERSITY OF OKLAHOMA, NORMAN, OK.

Mutation rate is an important parameter in genetics, evolution, conservation biology and human health. Most spontaneous mutations with any effect on the phenotype are deleterious. The objective of the current study is to estimate the deleterious genomic mutation rate in *Drosophila melanogaster*. We used a marked crossover-suppressing chromosome (Binscy) to detect mutations that accumulate on the X chromosome over time. We measured the decrement of mean viability (DM) of male flies carrying the Binscy chromosome and the increment of variance between replicates (DV) for three runs. A total of 108, 225 and 225 lines were initiated in three runs, and 81, 141 and 71 lines completed each run. Applying Bateman and Mukai's formula, $u = (DM)^2/DV$, we estimated

the polygenetic mutation rate (u) for slightly deleterious mutations on the X chromosome. Three runs of the experiment have been performed. On average, the mutation rate on the X chromosome was 0.044 per generation. Since an X chromosome contains about 10% of genes in the genome, the deleterious genomic mutation rate in *Drosophila melanogaster* is estimated to be 0.44 per generation.

3:45 CHARACTERIZATION OF BETA CATENIN LEVELS IN CONNECTIVE TISSUE PROGENITOR CELLS DURING OSTEOBLASTIC DIFFERENTIATION.

JANETT A KORB, JANYOURMAN@YAHOO.COM., SANDRA M VILLARRUEL, SMV8@CWURU.EDU., GEORGE F MUSCHLER, MUSCHLG@CCF.ORG., 3236 DELLWOOD RD, CLEVE. HTS. OH 44118.

During bone healing a hematopoietic stem cell population, known as connective tissue progenitor cells (CTPs), migrate to the wound site and undergo cellular differentiation. This process gives rise to mature tissue which becomes bone. Further understanding of the body's natural mechanism of bone repair can facilitate uses in tissue engineering. One such cellular pathway that is active during bone healing which stimulates proliferation of CTPs is the Wnt signaling pathway. When the Wnt signaling pathway is active a protein known as beta-catenin accumulates in the cell. Therefore, the hypothesis is that during successive days of differentiation the levels of beta catenin will decrease. Bone marrow containing connective tissue progenitor cells (CTPs) will be harvested from the iliac crest of eight patient donors using an approved IRB (Internal Research Board) protocol. The bone marrow will be plated at densities ranging from $10 \times 10^6/82.5 \text{ cm}^2$ to $25 \times 10^6/82.5 \text{ cm}^2$ and grown for 6, 9, 12, and 24 days and then harvested. The expression of beta catenin will be measured in both cytosolic and nuclear cellular components using a procedure known as the Western Blot. The Western Blot is a procedure used to determine the presence and relative quantity of a protein either in cytosolic or nuclear extract. Once results are obtained a graphical evaluation will compare the quantity of beta catenin during the successive days of osteoblastic differentiation.

4:00 MOLECULAR SYSTEMATICS OF THE UNIONOIDA (BIVALVIA): UTILITY OF A UNIQUE MITOCHONDRIAL INHERITENCE SYSTEM FOR INFERRING PHYLOGENY.

R. WOJTECKI¹, J. M. WALKER¹, D. WADE¹, E. G. CHAPMAN¹, A. E. BOGAN², W. R. HOEH¹, ¹DEPARTMENT OF BIOLOGICAL SCIENCES, KENT STATE UNIVERSITY, KENT, OH 44242 AND ²NORTH CAROLINA STATE MUSEUM OF NATURAL SCIENCES, RALEIGH, NC .

The freshwater bivalve order Unionoida contains five families that display highly variable reproductive modes. This variability is exemplified by differences in brooding location and larval morphology. The lack of a robust phylogeny for the group has impeded attempts to infer the evolutionary basis of this variability. Additionally, this order possesses a form of mitochondrial DNA (mtDNA) inheritance where, unlike the situation under standard maternal inheritance, both females and males pass on their mitochondrial genomes to offspring. This doubly uniparental system of mtDNA inheritance (DUI) offers two independent genomes for molecular systematic analysis which uniquely allows for replicate, mtDNA-based estimates of evolutionary history. We have evaluated the distribution of DUI in the Unionoida with a PCR-based approach and have sequenced cytochrome c oxidase subunits I and II from male- (when present) and female-transmitted mtDNA genomes. Bayesian- and parsimony-based phylogenetic methods were used on the COII/COI sequences to (1) estimate the phylogenetic relationships among the families and (2) infer the evolutionary transitions in reproductive characteristics for the Unionoida. The presence of DUI was detected in three of the five families. Phylogenetic analyses of the COII/COI sequences indicated (1) a single origin for the univalved larvae present in the Iridinidae and Mycetopodidae, (2) a basal position for the Hyriidae in the estimated unionoid phylogeny, (3) a clear distinction between the male- and female-transmitted genomes, and (4) the following relationships among the families with male-transmitted genomes: ((Unionidae, Margaritiferidae) Hyriidae).

Environmental Engineering

3:00 PM Saturday April 2nd 2005

Olscamp Hall Room 103

Yung Tse Hung - Presiding

3:00 CHARACTERIZATION OF NORMAL DISTRIBUTION RELATED TO TWO SAMPLES BASED ON SECOND CONDITIONAL MOMENTS. DHANUJA

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TINGUYEN@BGNET.BGSU.EDU ARJUN K. GUPTA, GUPTA@BGNET.BGSU.EDU DEPARTMENT OF MATHEMATICS AND STATISTICS, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

In the one-way classification with two treatments, we assume that the data, Y_{ij} , are observed according to the model $Y_{ij} = \xi_i + \varepsilon_{ij}$, $j = 1, \dots, n_i$, $i = 1, 2$, where the error random variables, ε_{ij} , are independently and identically distributed normally with mean 0 and variance σ^2 . Then to test whether a set of observed data, Y_{ij} , are coming from the above regression model, it is required to test the hypothesis that Y_{ij} are from $N(\xi_i, \sigma^2)$, $j = 1, \dots, n_i$, $i = 1, 2$. This is a composite hypothesis. The motivation of characterization given in this paper is to find a transformation in the procedure to construct an exact Empirical Distribution Function (EDF) goodness-of-fit test for testing the above hypothesis. We obtain characterization of normal distribution in two samples based on second conditional moments. Using this characterization together with some transformations, the above composite hypothesis can be changed to a simple hypothesis where it is required to test the transformed data are coming from completely specified student's t distributions. This can be tested using any EDF statistic. Finally this test is generalized for k samples.

3:15 TREATMENT OF RIVER WATER BY ULTRA FILTRATION AND REVERSE OSMOSIS. YUNG-TSE HUNG, NANDA KUMAR SADANANDAN NAIR, CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT, HOWARD H. LO, BIOLOGICAL, GEOLOGICAL, AND ENVIRONMENTAL SCIENCES DEPARTMENT, CLEVELAND STATE UNIVERSITY, CLEVELAND, OHIO 44115 EMAIL: YUNG TSE HUNG@YAHOO.COM

The use of ultra filtration and reverse osmosis for treating water has increased significantly during the past two decades. It has been possible due to the advent of membrane fouling prevention techniques and energy recovery methods. This paper investigated the use of ultra filtration and reverse osmosis for removal of pollutants from river water for process water use. The river water sample was filtered prior to ultra filtration treatment. The filtered water consisted of 7.6 pH, 694 $\mu\text{S/cm}$ conductivity, 454 mg/L TS (total solids), 11.5 mg/L COD (chemical oxygen demand), 4.2 mg/L TOC (total organic carbon), 30,000 microorganisms/1000 mL. Cross flow ultra filtration system was used in the study. The capillary inside diameter was 0.8 mm, molecular weight cutoff of 150kDa, membrane cross flow rate of 0.3 m/s. After ultra filtration treatment the permeate had 7.7 pH, 708 $\mu\text{S/cm}$ conductivity, 443 mg/l TS, 8.2 mg/L COD, 3.5 mg/L TOC, and 1 microorganism/100 mL. Results indicate that ultra filtration membrane had a very high removal efficiency of microorganism and low rate of bacterial recolonization. Ultra filtration process can be used as a pretreatment for reverse osmosis to produce water for reuse as process water.

3:30 ACTIVATED SLUDGE AND REVERSE OSMOSIS FOR TREATING MEAT PROCESSING WASTEWATERS FOR REUSE. YUNG-TSE HUNG, AARON

JEFFERY MORFORD, DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT, HOWARD H. LO, BIOLOGICAL, GEOLOGICAL, AND ENVIRONMENTAL SCIENCES DEPARTMENT, CLEVELAND STATE UNIVERSITY, CLEVELAND, OHIO 44115 EMAIL: YUNG TSE HUNG@YAHOO.COM

This paper describes the treatment of meat processing wastewater by sequencing batch reactor (SBR) activated sludge process followed by a reverse osmosis process. Meat processing wastewater contains high concentration of organic pollutants and nutrients and will require proper treatment of meat processing wastewater for protection of environment. Raw wastewater contains 5300 mg/L COD (chemical oxygen demand), 2900 mg/L BOD (biochemical oxygen demand), 557 mg/L total N, 37.8 mg/L total P, and 2 mg/L of NH_3 . The SBR activated sludge process was used as the first stage of treatment followed by a reverse osmosis process as the second stage treatment. The operating parameters included organic loading rate of 0.15 g COD/g MLSS-day, hydraulic detention time of 12 hours, MLSS (mixed liquor suspended solids) of 5000 mg/L. The ratio of mixing time to the sum of mixing time and aeration time was 0.3. After the SBR treatment the effluent had 102 mg/L COD, 10 mg/L BOD, 9.5 mg/L total N, 4.8 mg/L total P and 0.3 mg/L NH_3 . The membrane process was conducted at a pressure of 2.0 MPa and a linear velocity of 2 m/sec. The RO effluent contained 10.8 mg/L COD, 5 mg/L BOD, 0.09 mg/L total P, and 1.3 mg/L total N with corresponding removal efficiency of 89.4%, 50%, 98.1%, and 86.3%. The 2 stage treatment process consisting of SBR and RO treatment processes was able to produce effluent which can be reused in the meat processing plant.

3:45 ANAEROBIC TREATMENT OF ORGANIC MATERIAL IN PRESENCE OF INDUSTRIAL WASTE.

YUNG-TSE HUNG, MAJID ZARRINAFSAR, CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT, HOWARD H. LO, DEPARTMENT OF BIOLOGICAL, GEOLOGICAL, AND ENVIRONMENTAL SCIENCES, CLEVELAND STATE UNIVERSITY, CLEVELAND, OHIO 44115 EMAIL: YUNGTSEHUNG@YAHOO.COM

The objective of paper is to determine the removal efficiency of organic pollutants in industrial wastewaters using anaerobic treatment process. The study was conducted in laboratory and batch, bench scale reactors. Completely stirred continuous and batch reactors were operated at 35 °C, 50 days hydraulic retention times, and fed at 1 g/L-day. Unacclimated methanogens were progressively inhibited by addition of nickel, from 50 to 500 mg/l, in batch reactor, and were inhibited from 80 to 100 mg/l in the continuous reactor. For batch reactor exposed to ammonia, the unacclimated bacteria, was severely affected by concentrations of 2500 to 12,000 ppm of ammonia. In the continuous reactor, methane gas production was inhibited at nickel concentrations of 4000 to 14,000 ppm. At sulfide concentration of 50 ppm in the continuous reactor, inhibition of methane generation was observed. After the sulfide was removed from the system the inhibition effect was not observed. The recovery from sulfide inhibition was not as rapid as that for nickel and ammonia. The inhibition of formaldehyde increased when concentration of formaldehyde increased from 100 to 500 ppm.

4:00 STORM RUNOFF TREATMENT WITH SETTLING.

YUNG-TSE HUNG, JESSICA FERRATO, CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT, CLEVELAND STATE UNIVERSITY, CLEVELAND, OHIO 44115 EMAIL: YUNGTSEHUNG@YAHOO.COM

The purpose of the paper is to determine the efficiency of plate settling device and cellular settling device on the removal of pollutants from storm runoff. Storm water was collected and was treated by the 2 types of settling devices. Storm water before and after treatment was analyzed for various pollutant parameters including heavy metals, TSS (total suspended solids) COD (chemical oxygen demand), and BOD (biochemical oxygen demand). The storm runoff characteristics consisted of 158 mg/l TSS, 99 μ S/cm conductivity, 7.5 pH, 68 mg/L COD, 10 mg/L BOD, 1.2 mg/L hydrocarbon, and 0.56 mg/L total P. The plate settling device removed 53% TSS, 24% Cd, 40% Cu, 44% Pb, and up to 75% COD. The influent TSS was 158 mg/L while the effluent TSS was 73 mg/L. Cellular setting device removed 28% TSS, 26% Cd, 45% Cr, 29% Cu, 28% Pb, and up to 63% COD. The influent TSS was 199 mg/L, while the effluent TSS was 143 mg/L. The settling devices were found to be effective in removing pollutants from storm runoff and can be used for controlling pollution in urban environment.

4:15 OZONATION AND BIOLOGICAL TREATMENT FOR WATER TREATMENT.

YUNG-TSE HUNG, ANTONIO C. ARMAGNO, CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT, CLEVELAND STATE UNIVERSITY, CLEVELAND, OHIO 44115 EMAIL: YUNGTSEHUNG@YAHOO.COM

The use of chlorine in water treatment processes has come under scrutiny recently because of its potential to react with organic compounds and form disinfection by-products (DBP's) and because of its ineffectiveness in inactivating protozoa. This paper describes the use of ozonation followed by biological treatment processes for removing organic pollutant from water supply. Multi-stage ozonation-biological treatment process was studied. Water samples included reservoir water, secondary effluent from municipal wastewater treatment plant and water supply containing humic substances. DOC (dissolved organic compound) removal in the multi-stage ozonation-biological treatment was higher than that in the conventional single-stage ozonation-biological treatment with the same total ozonation time for the reservoir water and humic substances containing water sample. Three- or four-stage ozonation for 5 min followed by biological treatment (total ozonation time 15 or 20 min) showed higher removal of DOC than the single-stage ozonation (60 min) and biological treatment. For multi-stage treatment, ozonation was effective to convert refractory DOC for subsequent biological treatment. Multi-stage ozonation-biological treatment was not effective for treatment of the secondary effluent. Ozonation does not produce water that is biologically stable, but should be combined with GAC or biological processes to minimize organic carbon (AOC) formation potential.

4:30 DEVELOPMENT OF A RECYCLING GARNET SYSTEM FOR WATER JET CUTTING MACHINES IN ADVANCED MACHINERY INDUSTRY.

YUNG-TSE HUNG AND AMARIN KONGTAWELERT, CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT, CLEVELAND STATE UNIVERSITY, CLEVELAND, OHIO 44115 EMAIL: YUNGTSEHUNG@YAHOO.COM

The objectives of this study were to design, build and modify the bench-scale units to best-guess operating conditions for recycling the garnet, to determine the garnet recovery and contaminant carryover efficiencies by using mass balance analyses, to investigate a wide range of recycling process alternatives and the evaluation of feasible processes. Sieve analyses, magnetic separation and water jet flotation were examined in the study. The optimal time for sieve analyses was 3 minutes which gave the most recyclable abrasive in quantity and quality in sieve analyses. In magnetic separation, there were about 2.48% of the ferrous materials that mix in the sample from sieve analyses. Data of water jet flotation was computed from the settling velocity of garnet which tested in the column testing and the water jet stream from the different types of manifold. The ferrous materials recovery ranged from 51.5 to 64.4% using water flotation. The results indicated that inverse relationship between the angle of the manifold and the percent of waste separation and direct relationship between the size and amount of the outlets on the manifold to the percent of waste separation. The prototype development can be designed based on the laboratory work which used the principle of size separation, density separation and magnetic separation.