2002-03

Poster Session Biological; Medical
POSTER SESSION

BIOLOGICAL: MEDICAL
9:00 – 10:00AM
Kerns Chapel

Board 1 HIGH DENSITY PROTEIN INTAKE INCREASES SERUM ENZYME ACTIVITY FOLLOWING DAMAGING EXERCISE IN HUMANS. Amy L. Miracle, amircle@kent.edu; Patti Rane, prane@kent.edu; Lonnie M. Lowery, loweryf@kent.edu Dept of Nutrition, 100 Nisson Hall, Kent State University, Kent OH 44422.

Rodent data suggest that high protein intake can significantly elevate serum creatine kinase (CK) and aspartate transaminase (AST) concentrations following damaging exercise. The present study was a follow-up to determine the effects of protein intake on exercise-induced muscle injury (serum enzyme activity) in humans. The hypothesis was that large protein intakes (>1.8 g/kg) increased serum enzymes 24 hours after exercise compared to moderate or low protein intakes. Twenty-six male volunteers completed either a 40-minute downhill run (n=14) or a 12-set resistance exercise protocol (n=12). The exercise protocols were similar in their induction of tissue damage (enzyme release). Based on 5-day diet logs, participants were stratified by usual protein intake: "low", <1.4 g/kg body mass; "med", 1.4-1.8 g/kg; and "high", >1.8 g/kg. Protein intake differed significantly among categories by both body fat, carbohydrate, and protein intake (p<0.10). Serum values of CK, AST, alanine transaminase (ALT) and lactate dehydrogenase (LDH) were measured prior to and 24 hours after exercise. Significant differences were found between the high (73.0±18.8) versus low (23.8±7.8) (p=0.0027) and low (22.6±7.3) (p=0.0034) protein intake groups for ALT. Significance was also found in AST values, with high protein intake (32.6±7.5) resulting in larger concentrations compared to medium (24.3±6.5) (p=0.064) and low (25.6±7.3) (p=0.058) protein intake groups. Creatinine kinase, similarly, was significantly different between the high (744.4±651.0) and medium (287.3±120.0) protein intake groups (p=0.032). We conclude that humans respond similarly to rats in that a high level of protein intake increases enzyme efflux following damaging exercise.

Board 2 EFFECTS OF PHENYLPROPANOLAMINE (PPA) ON BEHAVIOR, PROTEIN LEVELS, AND REPRODUCTIVE HORMONES IN YOUNG FEMALE RATS. Andrea M. Dvorak, And415108@yahoo.com (Beth B. Fritts pritits@lemoyne.edu) Dept of Biology, Le Moyne College, 1419 Salt Springs Rd, Syracuse NY 31214.

Phenylpropanolamine (PPA) is a chemical compound found in a number of weight loss products and over the counter cold medicines. This experiment is designed to test the effects of PPA in the form of Dietrim 360, an over the counter diet drug on young female CD1G strain rats. The purpose of this project is to determine if PPA has behavioral effects, as well as having effects similar to those associated with starvation, such as protein degradation leading to muscle wastage. This current experiment will use sixteen female rats, divided into a control and experimental groups, both of which will be fed ground rat chow, with the experimental rats receiving Dietrim 360 mixed into their Chow for a total of 30 days. After 20 days of PPA exposure, the rats will be swine in a Morris water maze (MWM) once a day for a total of ten trials. There have been reports that those on weight loss products feel more nervous and agitated; therefore, PPA exposure could cause a decreased time to locate the podium. In addition, protein levels in the heart, kidney, liver, and muscle will be determined by a Lowry assay. Because weight loss and a decrease in food intake have been reported to alter immunological factors like WCC (white cell count), neutrophils (Neut), and lactate dehydrogenase (LDH) - often described in clinical situations. After obtaining pre-exercise urine and blood measurements, 14 male resistance-trained athletes performed six sets of six repetitions, each at 80% of their one repetition maximum strength (1RM). Blood samples were taken at 2 h post-exercise and every 24 hours thereafter for 4 days. There were divided into different diet groups: WCC (low), CK and LDH, while 24-hour urine samples were assessed for LDH. Analysis of data showed no significant correlations between immune variables and stress markers. Relationships however emerged post-exercise. TUN and Neut were correlated (r=0.67, p=0.009; r=0.75, p=0.002; N=14 at 24 and 48 hours respectively). LDH and IL-6 (r=0.83, p=0.003 and r=0.85, p=0.003 at 2 and 24 hours, respectively), and LDH and WCC were correlated (r=0.67, p=0.010 at 24; N=7). All relationships disappeared by 72 hours. Based upon these findings; we conclude common stress markers following eccentric exercise are related to immune function. Further investigations are needed to determine whether immune stimulation is mechanism behind exercise-induced muscle damage.

Board 3 IMMUNOLOGICAL RESPONSES ARE RELATED TO BIOCHEMICAL STRESS MARKERS IN THE ACUTE PHASE FOLLOWING DAMAGING EXERCISE. Prit Rane, prane@kent.edu; Amy Miracle, amircle@kent.edu; Lonnie Lowery, loweryf@kent.edu 100 Nisson Hall, Kent State University, Kent OH 44422.

Tissue damage and infection initiate a stereotypical sequence of host defense reactions called the acute phase response. The hypothesis of this investigation was that immunological factors like WCC (white cell count), neutrophils (Neut), and lactate dehydrogenase (LDH) were measured prior to and 24 hours after exercise. Significant differences were found between the high (73.0±18.8) versus low (23.8±7.8) (p=0.0027) and low (22.6±7.3) (p=0.0034) protein intake groups for ALT. Significance was also found in AST values, with high protein intake (32.6±7.5) resulting in larger concentrations compared to medium (24.3±6.5) (p=0.064) and low (25.6±7.3) (p=0.058) protein intake groups. Creatinine kinase, similarly, was significantly different between the high (744.4±651.0) and medium (287.3±120.0) protein intake groups (p=0.032). We conclude that humans respond similarly to rats in that a high level of protein intake increases enzyme efflux following damaging exercise.

Board 4 AMR COMPARISON OF THE CAUDATE NUCLEI VOLUMES IN DEPRESSED WOMEN AND NORMAL CONTROLS. Tiffany Frankhauser e03@wittenberg.edu; Cathy L. Pederson, cpederson@wittenberg.edu Wittenberg University, Dept of Biology, PO Box 720, Springfield OH 45501. This recent evidence suggests that the caudate nucleus may play a role in depression as the destruction of the caudate nucleus leads to changes in behavior and problem solving. Therefore, it is expected that a significant reduction will be observed in the volume of the caudate nucleus in depressed subjects when compared with nondepressed controls. Fifteen right-handed women ages 20 to 40 were categorized into two groups: six subjects suffering from major depressions as indicated by elevations above 50 on the Millon Clinical Multiaxial Inventory, and nine nondepressed controls. There was no significant difference between the groups based on age, education, IQ, alcohol intake, or smoking habits (p=0.442, n=15). Using 3D Brainstation on magnetic resonance images, three tracings were taken of the left and right caudate nucleus with a mouse-driven cursor every 2 mm in transaxial slices. These values were averaged and the results summed to approximate the total volume of the caudate nuclei. The goal was to determine whether there was a significant difference in the volume of the caudate nuclei in women who were depressed compared to nondepressed controls. Using the omnibus test of the omnibus test from MANOVA showed no significant difference in the left or right caudate nucleus between groups [F(2,12)=1.09, p=.372, ETA2=0.125].

Board 5 THE EFFECT OF OVER-THE-COUNTER DEHYDROEPIANDROSTERONE (DHEA) ON SERUM SODIUM CONCENTRATION IN MICE. Carrie Mills, cmills@wilmington.edu; Arti Fletcher, Emily Richards, (Donald Troike, don.troike@wilmington.edu) Dept of Biology, Wilmington University, 215 Ludovic St, Wilmington OH 45577.

DHEA, a hormone secreted by the adrenal gland, is believed to enhance a wide range of physiological functions. It first appears in humans in about their seventh year of life and peaks around the age of 25 before gradually declining to very low levels by age 70. This has produced a market for the over-the-counter (OTC) sales of this hormone. A previous study demonstrated that purified DHEA (Sigma Chemical) significantly elevated serum sodium concentrations in male mice. Since OTC-DHEA preparations are derived from plant sources, it was of interest to test the effectiveness of an OTC formulation. In this study 3 groups of 6 male mice were used. Each was administered 0.5 ml of one of three solutions by gavage: vegetable oil alone, vegetable oil containing 1mg purified DHEA (Sigma), or vegetable oil containing 1mg of OTC-DHEA (General Nutrition Corp). Eight hours later tail vein blood was collected from each group and the sera separated by centrifugation. Blood samples were also collected prior to gavage. All sera were diluted 1/2500 with deionized water and their Na concentrations determined with a Perkin Elmer Atomic Absorption Spectrometer following directions in its procedure manual. Preliminary results at this time indicate that the OTC-DHEA does not elevate serum Na concentrations, unlike the purified product. This holds true in subsequent experiments, then we question the labeling and effectiveness of OTC-DHEA products.

Board 6 HIPPOCAMPAL VOLUMES AND MEMORY CAPABILITIES IN WOMEN WITH POSTTRAUMATIC STRESS DISORDER SECONDARY TO CHILDHOOD ABUSIVE SEX. Megan A. Hoffman, m2.hoffmann@wittenberg.edu Christina M. Peters, Kelly A. Zander, (Cathy Pederson, cpederson@wittenberg.edu) Wittenberg University, Dept of Biology, PO Box 720, Springfield OH 45501. Abuse during childhood has been shown to induce Posttraumatic Stress Disorder (PTSD) in women. In this study, right-handed women ages 20 to 40 were categorized into three groups: PTSD and abuse group, abuse only group, and normal controls (n=33, 11 per group). Dividing the subjects in this way allowed for differentiation between abuse and PTSD effects. Placing subjects into triads, one from each group, compensated for possible variation in age, education, IQ, body mass index, alcohol intake, and nicotine habits (p<0.10). After an initial phone questionnaire, subjects answered demographic questions and took the Trauma Symptoms Inventory, the Trauma Symptoms Inventory, and the Millon Multiaxial Clinical Inventory. Subjects were given the Wechsler Memory Scaler (WMS), were interviewed to determine PTSD status, and had an MRI brain scan taken. Because the hippocampus is the center of learning and memory in the brain, itemized WMS scores were statistically compared using one-way ANOVA testing to assess differences among the three groups. There was no significant difference in the initial omnibus test between groups, covarying for IQ, for WMS age-adjusted subscores of auditory immediate memory, auditory delayed memory, visual immediate memory, visual delayed memory, nor working memory (p=0.455, F(10,50)=1.01, ETA2=0.069). Bilateral hippocampi were traced by a researcher blind to group status. Hippocampal tracings in sagittal slices in which the hippocampi appears is currently in progress.
In the study of cerebellar vermis deterioration in women with alcohol dependency, pack-years of cigarette smoking, drug use, anxiety, depression, and histrionics were assessed. The subjects were eleven right-handed women between the ages of 20 and 36 years, with a mean of 200.8 drinks/year. The results indicated no significant difference in age, years of education, IQ, body mass index, drinks per year, or pack years of cigarette smoking (p=0.59). There was also no statistical variance in the volume of the cerebellar vermis between the two groups. There was also no statistical variance in the volume of the cerebellar vermis between the two groups (p=0.226). This study demonstrates that the ingestion of alcohol between 120 and 312 drinks per year (mean=200.8 drinks/year) does not significantly change the volume of the cerebellar vermis in women with alcohol dependency.

In addition to assessing the extent of cerebellar vermis deterioration, the study sought to determine the presence of any potential allergens that trigger allergic reactions in humans and dogs predisposed to allergies. At least 14 groups of allergens have been isolated and characterized; these potent allergens include digestive enzymes, allergens associated with dust mites, and allergens associated with the hypothalamus. No statistically significant difference was found in the volume of the right cerebellar vermis between the three groups in age, years of education, IQ, body mass index, drinks per year, or pack years of cigarette smoking (p=0.59). There was also no significant difference between PTSD and normal controls in the size of the hippocampus and hypothalamus. No statistically significant difference was found in the volume of the right cerebellar vermis between PTSD and normal controls, the left hippocampus was significantly smaller in women with PTSD than in normal controls (p=0.78). While no statistically significant difference was found in the volume of the right hippocampus between PTSD and normal controls, the left hippocampus was significantly smaller in women with PTSD than in normal controls (p=0.02). In the study, there was no significant difference between PTSD and normal controls in the volume of the right hippocampus (p=0.78) between PTSD and normal controls, the left hippocampus was significantly smaller in women with PTSD than in normal controls (p=0.02). The control group included six subjects with an intake of five drinks or fewer per week (mean=0.54 drinks/year). The experimental group consisted of five women who drank between 120 and 312 drinks per year (mean=200.8 drinks/year). The results of the study indicated no significant difference (p=0.59) in the volume of the cerebellar vermis between the two groups. There was also no statistical variance in the variance of the fragmentation between the two groups (p=0.226). This study demonstrates that the vermis damage seen in moderate alcohol drinkers when compared to nondrinkers.

In the study of cerebellar vermis deterioration in women with alcohol dependency, pack-years of cigarette smoking, drug use, anxiety, depression, and histrionics were assessed. The subjects were eleven right-handed women between the ages of 20 and 36 years, with a mean of 200.8 drinks/year. The results indicated no significant difference in age, years of education, IQ, body mass index, drinks per year, or pack years of cigarette smoking (p=0.59). There was also no statistical variance in the volume of the cerebellar vermis between the two groups. There was also no statistical variance in the volume of the cerebellar vermis between the two groups (p=0.226). This study demonstrates that the ingestion of alcohol between 120 and 312 drinks per year (mean=200.8 drinks/year) does not significantly change the volume of the cerebellar vermis in women with alcohol dependency.

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Board 13

EFFECTS OF ANTISENSE KNOCKDOWN OF MONOAMINE OXIDASE-B ON ACUTE DOPAMINE RELEASE INDUCED BY 3,4-
METHYLDOPAMINOXIDEMETHYHMPTAMINE. Valeri J. Cook, vcook@onu.edu
Nancy Woodley, and Jon E. Sprague, Ohio Northern University, Ada OH 45810.
In the present study, we examined the effects of an antisense (AS) oligodeoxynucleotide (ODN) on the activity of MAO-B, the enzyme responsible for the breakdown of the neurotransmitter dopamine (DA) following treatment with 3,4-methylenedioxymethamphetamine (MDMA, ecstasy). This was done in order to determine if AS knockdown of MAO-B has associative effects on acute dopamine release and/or turnover as assessed by changes in 3,4-
dihydroxyphenylacetic acid (DOPAC) levels following treatment with MDMA. Seven Sprague-Dawley rats were acutely implanted with intrastriatal cannulas into the putamen five times. Three of these animals were also acutely implanted with an intrastriatal cannula into the putamen of the other three. The recordings were analyzed via High Pressure Liquid Chromatography with electrochemical detection. The results showed no change in the levels of acute dopamine in the rats treated with AS OD to MADMA as compared with those treated only with the MDMA or corresponding with the hypothesis that it does not alter acute dopamine release. A significant (p<0.05) decrease in DOPAC levels was seen in the AS/MDMA treatment group indicating that the AS had, in fact, resulted in a knockdown of MAO-

Board 14

SCANNING ELECTRON MICROSCOPY OF SILENT COLONY FORMATION ON CONTACT LENSES FOLLOWING A TREATMENT WITH A COMMERCIALLY AVAILABLE CLEANING SOLUTION. Daniel G. Riddle, driddle@oLLU.edu, Lori T. Lack, lkack@oLLU.edu, Ohio University, HWC Box 36, Delaware OH 43015.
This project seeks to use scanning electron microscopy (SEM) to determine whether damage occurs to Branchard and Lamb PureVision™ contact lenses, when using a commercially available cleaning and disinfecting solution, PureVision™ contact lenses are made from balafilcon A, a silicon hydrogel material containing 36% water. The silicon is made hydrophilic by the PermeaSoft™ process that provides a buildup resistant surface. PureVision™ contact lenses are designed for 90-day extended wear and are currently prescribed for up to 7 days continuous wear. Six different solutions were used including Hansol (CHIBA Vision), AcSept (CHIBA Vision), UltraCare Plus (Alcon), Opti-Free Express No Rub, and ReNu Multiplus Multi-Purpose Solution (Bausch & Lomb). Sterilase® was used to clean the lenses. In a 15-day study, seven contact lenses were cleaned in one directed with each solution. The surface details were observed using SEM with cryogenic preparation, Image pro-plus software, and an average inter interval of 1 week. Preliminary results show that the SEM images of those contact lenses viewed at the beginning of the study show less buildup and damage while those viewed after several weeks of the study show more buildup and some pits associated with both anterior surface and internal composition. With the exception of one solution used, all other solutions showed similar results on the contact lenses. This experiment showed considerable build up, which may have covered the possible damage to the contact lens.

Board 15

STUDIES ON WHITE LEAF SPOT OF WALNUT INCITED BY HETEROSPORIUM IRIDIS. David L. Mason, dmason@wittenberg.edu Dept of Biology, Wittenberg University, Springfield OH 45501.
The objective of this study was to investigate the host parasite relations of the leaf spot of Iris incited by the Deuteromycete, Heterosporium iridis. Leaf infections revealed on cultured, rooted cuttings of I. ensata started by inoculating with a yellowish, chlorotic spot on the leaf. A rapid necrosis followed. Within this region of dead cells and at their margins only a few spores of the pathogen were seen extending out of stomata in the necrotic regions. Scanning electron microscopy (SEM) revealed early spore formation and mature 3-5 celled spores covered with spines on the branching conidiophores. Spores both from nature and from culture transferred to uninfected leaves were seen by SEM to form hyphal point that directly penetrated stomata. Some hyphal points were also seen forming what appear to be appressoria. Histology by means of light microscope revealed that the epidermal and mesophyll cells in the presence of fungal hyphae undergo a rapid necrosis. Within this region of dead cells and at their margins only a few segments of hyphae could be detected. Spores of the pathogen were removed from infected leaves and grown in culture on corn meal (CM), potato-dextrose (PDA), and honey pepton (HP) media. Early spore germination, followed by formation of light hyphal point, revealed that each of the four to five-cell spores produced branching septate mycelium. Within four days following germination, dark, branching, conidiophores were elongated, dark, four to five-celled spores could be seen. SEM on cultures clearly revealed the structure of the conidiophores and spinae-covered spores.

Board 16

STUDIES ON THE LEAF SPOT OF IRIS INCITED BY HETEROSPORIUM IRIDIS. David L. Mason, dmason@wittenberg.edu Dept of Biology, Wittenberg University, Springfield OH 45501.
The objective of this study was to investigate the host parasite relations of the leaf spot of Iris incited by the Deuteromycete, Heterosporium iridis. Leaf infections revealed on cultured, rooted cuttings of I. ensata started by inoculating with a yellowish, chlorotic spot on the leaf. A rapid necrosis followed. Within this region of dead cells and at their margins only a few segments of hyphae could be detected. Spores of the pathogen were removed from infected leaves and grown in culture on corn meal (CM), potato-dextrose (PDA), and honey pepton (HP) media. Early spore germination, followed by formation of light hyphal point, revealed that each of the four to five-cell spores produced branching septate mycelium. Within four days following germination, dark, branching, conidiophores were elongated, dark, four to five-celled spores could be seen. SEM on cultures clearly revealed the structure of the conidiophores and spinae-covered spores.

Board 17

The ability to manipulate gene sequences by site-directed mutagenesis is a powerful technique derived from molecular biology. It is possible to create specific amino acid mutations at the DNA level, which can then be used to study the effects of the protein. Site of PCR (polymerase chain reaction) to create these mutations requires the presence of novel restriction enzyme sites to allow for the cloning of these mutant fragments into the wild type gene sequence. The objective of this project is to create a novel EcoRV restriction site in the gene sequence of the lacZ gene in plasmid pMCE-17. The site of the restriction site was chosen based on a commercially available PCR cloning vector. In a series of several trials at each step, the fragment was restriction digest, isolated and purified using Gene Clean, and then ligated into the EcoRV site in plasmid pMCE-17. The site of the mutation was identified by sequencing the final fragment and analysis with the Gene Release Kit. The success of this cloning will be verified by restriction enzyme analysis of the new fragment.

Board 18

PURIFICATION AND Characterization of STAPHYLOCOCCUS AUREUS Type Capsular Polysaccharide. Elena Boczo-Mavro, eboczo@msn.com Diana L. Fagan, dfagan@cc.ysu.edu Youngstown State University, Dept of Biological Sciences, Youngstown OH 44555.
Infections caused by Staphylococcus aureus remain the number one cause of hospital-acquired infections. It has been shown that the immune response in the host includes forming antibodies against the bacterial capsular polysaccharide (CP). This project allowed for the CP to be isolated from S. aureus strain ATCC 43300. The use of PCR (polymerase chain reaction) to create these mutations requires the presence of novel restriction enzyme sites to allow for the cloning of these mutant fragments into the wild type gene sequence of the LACTOSE PERMEASE OF ESCHERICHIA COLI. The goal of this study is to obtain a pure cell wall carbohydrate of S. aureus expressing type 8 CP. Sodium chloride (2%) supplemented Columbia Broth was used to grow 8 liters of bacteria. After lysing the cells with lysostaphin and removing residual material with DNAse and RNAse, the CP was separated from other cell components. The presence of CP was detected using an SDS-PAGE gel test. The CP was then purified using a series of several trials. The CP was purified using a series of several trials at each step. The resulting purified CP was analyzed using a SDS-PAGE gel test. The CP was then purified using a series of several trials at each step.

Board 19

PREPARATION OF TAQ POLYMERASE AND ITS USE IN THE PCR DETECTION OF LYME CAUSING PARASITE. Borrelia burgdorferi, IN HARD TICK , Ixodes ricinus. Supriya.S.Pai, (Dr. Marten Edwards, jasmiley@cc.ysu.edu, Youngstown State University, Dept of Biology, Youngstown OH 44555.
1. ebozzol3@msn.com Diana L. Fagan, dfagan@cc.ysu.edu Youngstown State University, Dept of Biology, Youngstown OH 44555.
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Isodes ricinus ticks are the primary vectors of Lyme Borreliosis in Central Europe, Czech Republic being one of the many affected nations. Clinical manifestations of Lyme Borreliosis include characteristic rash (erythema migrans) and flu symptoms. More severe infections may result in facial palsy, cranial nerve lesions, arthritis, mild flu symptoms. Lyme Borreliosis is a gram-negative spirochete that enters the human host during the feeding of ticks. The goal of this research project was to study the rate of Borrelia burgdorferi infection amongst the Isodes ricinus ticks. Borrelia burgdorferi infection was detected in Isodes ricinus females that were collected in the area of České Budějovice, Czech Republic. Inoculated bacterial DNA was denatured by heating to 95°C. Bacterial DNA isolated using the GFX column kit was amplified using the Polymerase Chain Reaction (PCR). DNA was visualized on agarose gel after running in a BioRad gel dryer. Borrelia burgdorferi, the causative agent of Lyme Borreliosis, is a gram-negative spirochete that enters the human host during the feeding of ticks. The goal of this research project was to study the rate of Borrelia burgdorferi infection amongst the Isodes ricinus ticks. Borrelia burgdorferi infection was detected in Isodes ricinus females that were collected in the area of České Budějovice, Czech Republic. Bacterial DNA isolated using the GFX column kit was amplified using the Polymerase Chain Reaction (PCR). DNA was visualized on agarose gel after running in a BioRad gel dryer. Borrelia burgdorferi is the causative agent of Lyme Borreliosis, the gram-negative spirochete that enters the human host during the feeding of ticks. The goal of this research project was to study the rate of Borrelia burgdorferi infection amongst the Isodes ricinus ticks. 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Isodes ricinus ticks are the primary vectors of Lyme Borreliosis in Central Europe, Czech Republic being one of the many affected nations. Clinical manifestations of Lyme Borreliosis include characteristic rash (erythema migrans) and flu symptoms. More severe infections may result in facial palsy, cranial nerve lesions, arthritis, mild flu symptoms. Lyme Borreliosis is a gram-negative spirochete that enters the human host during the feeding of ticks. The goal of this research project was to study the rate of Borrelia burgdorferi infection amongst the Isodes ricinus ticks. Borrelia burgdorferi infection was detected in Isodes ricinus females that were collected in the area of České Budějovice, Czech Republic. Bacterial DNA isolated using the GFX column kit was amplified using the Polymerase Chain Reaction (PCR). DNA was visualized on agarose gel after running in a BioRad gel dryer. Borrelia burgdorferi infection was detected in Isodes ricinus females that were collected in the area of České Budějovice, Czech Republic. Bacterial DNA isolated using the GFX column kit was amplified using the Polymerase Chain Reaction (PCR). DNA was visualized on agarose gel after running in a BioRad gel dryer. Borrelia burgdorferi infection was detected in Isodes ricinus females that were collected in the area of České Budějovice, Czech Republic. Bacterial DNA isolated using the GFX column kit was amplified using the Polymerase Chain Reaction (PCR). DNA was visualized on agarose gel after running in a BioRad gel dryer. Borrelia burgdorferi infection was detected in Isodes ricinus females that were collected in the area of České Budějovice, Czech Republic. Bacterial DNA isolated using the GFX column kit was amplified using the Polymerase Chain Reaction (PCR). DNA was visualized on agarose gel after running in a BioRad gel dryer. Borrelia burgdorferi infection was detected in Isodes ricinus females that were collected in the area of České Budějovice, Czech Republic. Bacterial DNA isolated using the GFX column kit was amplified using the Polymerase Chain Reaction (PCR). DNA was visualized on agarose gel after running in a BioRad gel dryer. Borrelia burgdorferi infection was detected in Isodes ricinus females that were collected in the area of České Budějovice, Czech Republic. Bacterial DNA isolated using the GFX column kit was amplified using the Polymerase Chain Reaction (PCR). DNA was visualized on agarose gel after running in a BioRad gel dryer. Borrelia burgdorferi infection was detected in Isodes ricinus females that were collected in the area of České Budějovice, Czech Republic. Bacterial DNA isolated using the GFX column kit was amplified using the Polymerase Chain Reaction (PCR). DNA was visualized on agarose gel after running in a BioRad gel dryer. Borrelia burgdorferi infection was detected in Isodes ricinus females that were collected in the area of České Budějovice, Czech Republic. Bacterial DNA isolated using the GFX column kit was amplified using the Polymerase Chain Reaction (PCR). DNA was visualized on agarose gel after running in a BioRad gel dryer. Borrelia burgdorferi infection was detected in Isodes ricinus females that were collected in the area of České Budějovice, Czech Republic. Bacterial DNA isolated using the GFX column kit was amplified using the Polymerase Chain Reaction (PCR). DNA was visualized on agarose gel after running in a BioRad gel dryer. Borrelia burgdorferi infection was detected in Isodes ricinus females that were collected in the area of České Budějovice, Czech Republic. Bacterial DNA isolated using the GFX column kit was amplified using the Polymerase Chain Reaction (PCR). DNA was visualized on agarose gel after running in a BioRad gel dryer. Borrelia burgdorferi infection was detected in Isodes ricinus females that were collected in the area of České Budějovice, Czech Republic. Bacterial DNA isolated using the GFX column kit was amplified using the Polymerase Chain Reaction (PCR). DNA was visualized on agarose gel after running in a BioRad gel dryer.
c-oxidase subunit I (COI) DNA sequences and morphological traits in a cladistic approach to estimate the evolutionary relationships among Floridian species of Geolycosa. Currently, 15 species of Geolycosa have been described based on a limited number of morphological characteristics. The state of Florida has nine species of Geolycosa, and Preserves of the Ohio Dept of Natural Resources with the funding supplied by the Ohio Army National Guard.

**Board 27** SYNTHETIC PREPARATION OF A POTENT TICK ATTRACTANT FOR TRAP BAITS. William J. Burke, sj7wburke@wittenberg.edu, Amanda E. Johnson, Jay A. Yoder, jyoder@wittenberg.edu, and Peter E. Hanson, phanson@wittenberg.edu, Wittenberg University, Dept of Biology and Chemistry, PO Box 720, Springfield OH 45504-0720.

The attractant sex pheromone of ticks consists of a halogenated aromatic ring, 2,6-dichlorophenol. A female releases 2,6-DCP during feeding and prompt vigorous attraction responses by males. Our study demonstrates, for the first time, attraction to mixture of chlorophenols by the American dog tick, *Dermacentor variabilis* (Say), the principle vector of the agents of Rocky Mountain spotted fever and tularemia in North America, is 2,6-dichlorophenol (2,6-DCP), females release the pheromone while feeding, prompting nearby males to detach and search for the female emitter. In this study, we used a novel extraction technique (Sokhit extractor) to isolate 2,6-DCP. Analysis by gas chromatography/mass spectroscopy (GC/MS) indicated that the product mixture obtained by this method contained 2,6-DCP (99.4%), 2,4-dichlorophenol (7.6%), 2,4,6-trichlorophenol (2.4%), and 2-chlorophenol (0.6%) (N=4 trials). Interestingly, attraction to this chlorophenol mixture was stronger (ca. 20% more pronounced) when compared to the response to the naturally occurring sex pheromone 2,6-DCP (replicates of 15; N=3). This finding is significant in that *D. variabilis* is not known for its attraction behavior, and few attractants have been identified. We anticipate that this chlorophenol mixture may have practical applications as a trap bait for use in tick monitoring and eradication programs.

**Board 28** TIMING AND DETECTION OF SEX PHEROMONE PRODUCTION IN TICKS. Jessica L. Pizzuli, sj7pizzuli@wittenberg.edu, and Chris Sanders, sj84candsen@wittenberg.edu, Jay A. Yoder, and Peter E. Hanson, Dept of Chemistry and Biology, Wittenberg University, 600 W. Ward St., Springfield OH 45501.

Secretion of the attractant sex pheromone by ticks serves to bring members of the mating pair together. The only verified insect sex pheromone in the American dog tick, *Dermacentor variabilis* (Say), vector of Rocky Mountain spotted fever and tularemia in North America, is 2,6-dichlorophenol (2,6-DCP). Females release the pheromone while feeding, prompting nearby males to detach and search for the female emitter. In this study, we used a novel extraction technique (Sokhit extractor) to isolate 2,6-DCP. Analysis by gas chromatography/mass spectroscopy (GC/MS) indicated that the product mixture obtained by this method contained 2,6-DCP (99.4%), 2,4-dichlorophenol (7.6%), 2,4,6-trichlorophenol (2.4%), and 2-chlorophenol (0.6%) (N=4 trials). Interestingly, attraction to this chlorophenol mixture was stronger (ca. 20% more pronounced) when compared to the response to the naturally occurring sex pheromone 2,6-DCP (replicates of 15; N=3). This finding is significant in that *D. variabilis* is not known for its attraction behavior, and few attractants have been identified. We anticipate that this chlorophenol mixture may have practical applications as a trap bait for use in tick monitoring and eradication programs.
The zebra mussel (Dreissena polymorpha) is an invasive species that has significant impacts on freshwater ecosystems in the Great Lakes region of North America. These effects include altering food chains, water quality, and habitat substrate. The objective of this research is to determine what kinds of effects a large metropolitan area poses on the growth of zebra mussels. Shells from 50 individuals were collected from sites upstream and downstream in Alum Creek from the metropolitan area of Columbus, Ohio. The Velvex Tree-Ring Measurement System was used to measure the widths of the concentric growth ridges of the shell. The mean growth of the mussels from these sites was compared statistically.

Board 3 COPPER UPTAKE IN ROOTS FROM HYDROPONICALLY GROWN TREE SEEDLINGS. Brandy N. Jones, (Cleveland Public Library Ph.D. clowey@csu.ohio.edu) and Krishna Kumar Neduvaru, Ph.D. kneduvaru@csu.edu) Dept Natural Science and Mathematics, Central State University, PO Box 1004, Wilberforce OH 45384-1004.

Heavy metals such as copper, cobalt, nickel and zinc from industrial processes can be major soil pollutants. Phytoremediation is a novel method of using natural vegetation to extract pollutants from contaminated soils and sequester them as plant biomass. The objective of this ongoing study was to model copper uptake into four tree species, green ash, white ash, red oak, and sycamore. These tree species are grown on coal reclamation sites in Ohio in poor growing conditions and may be candidates to use for phytommediation. Copper levels in the nutrient solution for this hydroponic study were 50 to 500 times higher than typical soil extractable copper concentrations (0.1 mg/L) found in Ohio. Soil and drain water taken up by the Central State University greenhouse. Deionized water was added and drained weekly for one month followed by weekly treatments of complete nutrient solutions with increasing concentrations of copper. The system consisted of 20 large, 124 L plastic containers filled with perlite. Thirty-three green ash, 33 red oak, 27 sycamore, and 27 white ash one-year seedlings were randomly planted with six trees per container.

The trees were allowed to grow for five months in the hydroponic system. The roots were removed from the trees, freeze-dried at -25°C, and ashed in porcelain crucibles in a muffle furnace for 4 h at 450°C. Ashes were placed in medium (10–15 μm) glass Buchner funnel with sealed fluted disk and copper was eluted with 10mL of 0.1M HNO3. Samples were diluted with water and copper concentrations were measured by atomic absorption spectrophotometry. To evaluate growth and survival, tree height, basal diameter, leaf chlorophyll content, and above-ground biomass were measured.

Board 4 DETERMINATION OF RICE CULTIVAR ROOT EXUDATE VARIATION EXAMINED THROUGH NITRIC OXIDE INHIBITION OF METHANOGENESIS. Christopher P. Beekman, (Rebecca S. Blek, rblek@msukingdom.com) Muskingum College, 163 Somers St, New Concord OH 43762.

Rice is the primary food crop in many areas of the world where population growth is highest. Rice is traditionally grown in fields that are flooded with water shortly after the plants begin to grow. Water covers oxygen from reaching the soil, thereby allowing anaerobic bacterial metabolic processes to occur. De-methylization of acetate and other organic acids begins shortly after the field is flooded, producing methane, a greenhouse gas. As global dependence on rice increases, identification of mitigation options becomes desirable. Cultivar types have been shown to dramatically influence methane emissions. The primary source of methane precursors (i.e. organic acids) is the rice plant itself in the form of root exudates. This study examines why production of methane varies with cultivar and the effects of the concentrations of root exudates in the soil with depth and cultivar type. Nitric oxide will be used to inhibit methanogenesis, allowing organic acids to accumulate for subsequent analysis by high-performance liquid chromatography. Samples of soil pore water and emitted gases will be analyzed by gas chromatography to determine the concentrations of methane and carbon dioxide. In addition, measurements of stable isotope ratios of carbon will be used to calculate the contribution of each methane production pathway and the percent of produced methane that is oxidized. Results will be used to understand why methane emissions differ widely between cultivars grown under identical conditions. Unlike previous soil incubation studies, this investigation will be conducted using actual rice producing plots allowing for a more accurate analysis that includes plant-soil inter-relationships.

Board 5 GEOGRAPHIC DISTRIBUTION OF USERS OF A WEBSITE ON THE ROLES OF WOMEN IN THE ART OF ANCIENT GREECE. Frederick John Kluth, fkluth@kent.edu, Bowling Green State University, Dept of Geography, 1000 W. Mansfield Ave, Bowling Green OH 43403.

Most media targets local audiences because of logistical problems. Governmental agencies and advertisers provide funding for local users for similar reasons. The emphasis of the Internet may change this. In Nov. 30, 1997 an educational web site was set up on the Role of Women in the Art of Ancient Greece to explore the use of the web. The site allows investigation of the geographic distribution of Internet users. The question is whether Internet uses follow usage patterns demanded by other media. On the menu page of the site users are given the option of registering as a user. As of October 30, 2001, two hundred and nine users have registered with 163 of those users indicating that their residence is the United States of America. Though the site is physically in Ohio only 9 of the registrants indicate Ohio as their location. New York State is the most common location with New York City being the most common city. Forty-six registrants indicated a location in one of 25 foreign countries. The country with the second most registrants was the United Kingdom with 10. The tremendous geographic diversity found requires serious adjustment of funding directions. A national sponsor might be acceptable while an international sponsor might be preferred.

Board 7 SURVEY OF ECONOMIC VALUE OF A CHANNEL RESTORATION PROJECT. Dawn A. Farver, farver.1@osu.edu, The Ohio State University, 590 Woody Hayes Drive, Columbus OH 43210.

An agricultural drainage ditch on Waterman Farm at The Ohio State University (OSU) was the potential site for a channel restoration project. To determine the public support from two different groups of stakeholders, a questionnaire was created to survey their “willingness to pay” (WTP) for channel restoration projects. The channel drains directly into the Olentangy River and, consequently, the focus of the economic survey was the Olentangy River. The first group of stakeholders, residents living within the watershed, was asked to value channel restoration if the restored channel would reduce the flux of contaminants into the Olentangy River (22 respondents). The second group of stakeholders, members of the OSU community, was asked to value the university’s participation in programs incorporating environmental best management practices (52 respondents). It was hypothesized that respondents who frequently participate in recreational activities on or near the Olentangy River would be interested in preserving the area and would, therefore, be willing to pay for measures to protect the water quality of the river. The data collected were summarized in an Access database and a regression analysis was performed. The average number of visits to the Olentangy River per respondent was 11 and the average WTP per respondent was $23-24. From these results, it appears that maintaining the integrity of riparian areas is important to the surrounding community, and that it is important to the OSU community that more environmentally sound practices are implemented on campus.

Board 8 EXCAVATION AND CONSERVATION OF THE HARTLEY MASTODON, COLUMBIANA COUNTY, OHIO. Cheryl P. Matevli, matilev@salem.kent.edu and Brian G. Redmond, Kent State University Salem Regional Campus, 2491 SR 45 S, Salem OH 44460, and Cleveland Museum of Natural History, Cleveland OH.

The Hartley Mastodon was salvaged July 31, 2001 from a commercial lake excavation in Butler Township, Columbiana County, Ohio. The excavated lake lies within an alluvial area along the headwaters of the Upper Mahoning River and is associated with a kettle lake within Woodfordian tills. The specimen appears to be a young healthy female, and consists of a total of 87 complete or nearly complete bones, including a nearly intact cranium, mandibles, both tusks, partial pelvic structure, 34 ribs, 29 vertebrae, and 18 foot bones. Although the original material, including the cranium, was not recovered, the large vertebral section from C2 through T5 was articulated and associated with ribs and one tusk. Immediately following excavation, the tusks and bone material were wrapped in plastic and stored in a cool place before being washed with a water spray and allowed to dry slowly. The remains, which are stable and generally intact, were found at the surface of a shelly marl layer containing abundant freshwater snails and clams indicating a shallow lake environment. Twigs and beaver-chewed maple branches are closely associated with the mammal, which was covered with only 110 cm of peat deposits. Conservation of the material is a joint project of the Cleveland Museum of Natural History and Kent State University Salem Campus. The specimen is being used as a focus for research at Kent Salem and the Cleveland Museum of Natural History as well as for hands-on scientific investigations in local secondary schools.

Board 9 GEOGRAPHIC PATTERNS OF HOME COMPUTER OWNERSHIP IN THE UNITED STATES. Bruce W. Smith, bsmith@bgsu.edu, Bowling Green State University, Dept of Geography, 1 Bowling Green OH 43403.

Although personal computers have become a fixture in the workplace and the home, not all Americans have equal access to computers. The purpose of this paper is to describe geographic patterns in the ownership of home computers. State-level data from the Current Population Survey for 1994 and 1998 are utilized. In 1994, the states with the highest percentages of ownership of home computers were located primarily in the West and Northeast, with Alaska, Utah and New Hampshire leading the nation. In contrast, states in the Southeast were characterized by lower rates. Between 1994 and 1998, the national rate of home computer ownership more than doubled, rising from 24.3% in 1994 to 51.1% in 1998. Despite high growth rates between 1994 and 1998, the states in the Southeast continued to lag the rest of the nation. Simultaneously, high rates of ownership had expanded from the original three states to several other states, including Washington, Oregon, Wyoming, Colorado.
and Delaware. National averages in 1997 showed that the rate of home computer ownership tends to rise as income levels and educational levels increase. For example, nationwide 75.9% of the families with incomes of $75,000 and greater owned a computer in contrast to only 38.8% of those families with incomes in the $25,000 to $49,999 range. In the 1998 Current Population Survey data for states, however, income and educational attainment variables were only modestly correlated with state-to-state variations in computer ownership, having correlation coefficients of 0.50 and 0.59, respectively.

Board 10  A PLUTO-CHARON CABLE SPACECRAFT. Francis G. Graham, francisgraham@rockemail.com Kent State University, 400 E. Fourth St., East Liverpool OH 43920.

The planet Pluto and its moon Charon are mutually tidally locked bodies of near 0.018 and 0.0018 Earth masses, respectively. Their gravitational fields are weak enough so that a steel cable of tensile strength approx. 2.9 GPa can be strung over the approx. 17,300 km distance between the surfaces of their mutually facing hemispheres, and a cable spacecraft could move up and down between them. Allowing on the cables' spacecraft system could be made for slight librational effects, thermal differences, and a preliminary design for a small 11,300 kg loaded (9.5 kg empty) cable spacecraft is realistic, transitioning between Pluto and Charon in about 15.9 hours. Electromagnetic braking on the cable from electricity generated in fuel cells would make the craft more than twice as energy efficient than a transfer using chemical rockets alone, once a cables system is place. This is likely the only pair of worlds in our solar system where a cable spacecraft is feasible with only modest advances in materials technology.

Board 11  ILLINOIAN AND PRE-ILLINOIAN STRATIGRAPHY OF THE MILL CREEK VALLEY, HAMILTON COUNTY, OHIO. J. Michael Clinch, mclinch@ehstech.com and Michael D. Morris, EHS Technology Group, P O Box 3040, Miamisburg OH 45343-3040.

Three deep (120-140') Rotasonic test borings have been completed through a dissected high terrace located along the western margin of the Mill Creek valley, in the Winton Terrace neighborhood in Cincinnati, Ohio. Sediment cores from these test borings, as well as samples from conventional test borings were used to interpret the stratigraphy of the area. The trend of the terrace is between 150 and 100 feet above the floor of the modern Mill Creek valley, and slopes towards the valley. The terrace is underlain by four distinct till layers, separated from each other by a thin-to-thick layer of lacustrine sediments and/or subaqueous fan deposits. Adjacent to the valley wall, the till is overlain by colluvial sediments. The tills are massive and sheared in places, and crudely laminated in others, suggesting the presence of both lodgment tills and subaqueous flow tills. The upper surfaces of these tills are weathered, and wood fragments are occasionally found in the base of the tills. These relationships suggest that each till is the result of a separate glaciation or stage within a single glaciation, and not the result of minor marginal fluctuation. The uppermost till layer is Illinoian in age, and the deeper tills may be from earlier stages of the Iliinian Glaciation, or from older glaciations. The tills overlie at least two older layers of lacustrine deposition, separated by an episode of free drainage, represented by the fine-grained sand deposits formerly exposed in a sand and gravel pit. The lacustrine deposits are underlain by non-glacial sediments deposited on the floor of the Deep-Stage valley, which is present beneath the Mill Creek valley. Stratigraphically-significant portions of these cores have been donated to the ODNR core repository, where they are available for study.

Board 12  DRIFT THICKNESS OF OHIO. Michael P. Angle, mike_angle@dnr.state.oh.us Paul Spahr, paul.spahr@dnr.state.oh.us Frank Fugitt, frank.fugitt@dnr.state.oh.us Mike Halfrich, mike.halfrich@dnr.state.oh.us Ohio Dept of Natural Resources, Division of Water, 1939 Fountain Square Dr., Columbus OH 43224.

The Ohio Dept of Natural Resources (ODNR), Division of Water, Water Resources Section (WRS) has produced a series of statewide geographic information system (GIS) coverages for the unconsolidated (glacial) aquifers of Ohio. Well log and boring records of the ODNR Division of Water, the Ohio Environmental Protection Agency (OEPA), and the Ohio Dept of Transportation (ODOT). Since changes could not be made to the original photographically enlarged map, old data points were transferred and verified on a new mylar base map, new data points were utilized once a cable system is in place. This is likely the only pair of worlds in our solar system where a cable spacecraft is feasible with only modest advances in materials technology.

Board 13  MODELING OF SEDIMENT TRANSPORT IN RIO PUERC0, NEW MEXICO. USING LINEAR REGRESSION ANALYSIS. Isam E. Amin, jeamim@cs.vsu.edu Dept of Geology/Center for Environmental Studies, Youngstown State University, Youngstown OH 44555.

The Rio Puerco, in central New Mexico, is a ephemeral stream with a drainage area of 7340 square miles. Most of its flow is run-off from rainfall induced by thunderstorms. Diversion of streamflow for irrigation is uneconomical because the Rio Puerco basin has one of the highest suspended sediment concentrations in the United States. Furthermore, the sediments contain toxic heavy metals such as arsenic, mercury, and uranium. The objective of this study is to estimate the sediment load in Rio Puerco using linear regression analysis, sediment load, and independent variable, is estimated as a function of water discharge, and an independent variable. Sediment load is estimated on a daily, monthly, and annual basis. The regression procedure is also utilized to relate suspended sediment concentration to daily water discharge. Data used in this study are obtained from Water Resources Data for New Mexico, published by the U.S.G.S. The data cover a period of 32 years and are recorded at the gaging station near Bernardo. Results of the regression analysis are obtained using the SSPP program. The results indicate high correlation coefficients for the daily (r = 0.95) and monthly (r = 0.97) relationships, a relatively lower coefficient (r = 0.76) for the annual relationship, and a poor correlation coefficient (r = 0.50) for the sediment concentration relationship. The difference in correlation coefficients is due to the fact that sediment load is highly interrelated with water discharge whereas sediment concentration is primarily related to erosion of the watershed rather than scour of the bed of the main stream.

Board 14  THREE-DIMENIONAL SURFICIAL-GEOLOGY MAPS OF THE CANTON AND EAST LIVERPOOL 1:100,000-SCALE QUADRANGLES. E. Mac Swinford, mac.swinford@dnr.state.oh.us Glenn E. Larsen, Richard R. Pavie, Gregory A. Schumacher, and Kim E. Vorbau, Ohio Dept of Natural Resources, Division of Geographic Survey, 4383 Fountain Square Dr., Columbus OH 43224-3462.

The Ohio Dept of Natural Resources, Division of Geographic Survey recently completed two maps depicting the surficial geology of the Canton and the Ohio portion of the East Liverpool 1:100,000-scale quadrangles. Mapping was performed at 1:24,000 scale (48 quadrangles), compiled digitally, and converted into full-color, print-on-demand, 1:100,000-scale, three-dimensional surficial-geology maps. These maps show the thickness and stratigraphic sequence of lithologic units such as till, gravel, sand, silt, and clay from the surface down to and including the uppermost buried bedrock unit. Data sources include county soil surveys, Ohio Dept of Transportation and Ohio EPA boring logs, engineering logs, water-well logs, theses, and published and unpublished reports. New mapping discoveries caused changes in interpretation of the area's geology. Buried valleys beneath numerous tributaries south of the glacial margin contain thick deposits of lacustrine silt down to bedrock, the silt is intermixed with debris flows and floods fans from the valley sides. Numerous buried valleys thought to be filled completely with sand and gravel actually contain relatively thin deposits of sand and gravel underlain by thick lacustrine silt and debris-flow deposits. Extensive revision of the bedrock topography of Wayne County depicts bedrock much closer to the surface than previously mapped. The Wisconsinan-Illinoian boundary was mapped in greater detail based on soils maps. This project was partially funded by the U.S. Geological Survey, National Cooperative Geologic Mapping Program, STATEMAP component.

Board 15  REVISED BEDROCK TOPOGRAPHY OF THE MECHINCUSBURG OHIO QUADRANGLE. Richard J. Wynkoop, rjw@oldstate.edu 958 Montrose Ave, Bexley OH 43209.

Revised bedrock topography is one of the many functions of the Ohio Dept of Natural Resources (ODNR), Division of Geographic Survey. The Mechanicburg 7.5 minute bedrock topography map presently available was extracted by photo enlargement from the 1:62,500-scale Champaign County bedrock topography map compiled in 1978. Since its production, additional data points have become available from log and boring records of the ODNDR Division of Water, the Ohio Environmental Protection Agency (OEPA), and the Ohio Dept of Transportation (ODOT). Since changes could not be made to the original photographically enlarged map, old data points were transferred and verified on a new mylar base map, new data points were utilized and a preliminary design for a small 11,500 kg loaded (9105 kg. empty) cable spacecraft is realistic, transitioning between Pluto and Charon in about 15.9 hours. Electromagnetic braking on the cable from electricity generated in fuel cells would make the craft more than twice as energy efficient than a transfer using chemical rockets alone, once a cable system is in place. This is likely the only pair of worlds in our solar system where a cable spacecraft is feasible with only modest advances in materials technology.

Board 16  FRACTURE AND MACROPOROSE FLOW IN NUTRIENT/PESTICIDE TRANSPORT TO GROUND AND SURFACE WATER. Julie Weatherington-Rice, julie@wrcou.org; Anil D. Chinti, chinti@wrcou.org Bennett & Associates Environmental Consultants, Columbus OH 43231 and The Ohio State University, Columbus OH 43210.

In glaciated Ohio, researchers have noted nutrients and pesticides can bypass grass and forested filter strips to enter surface and shallow ground water. Agrochemicals have been detected in drain tile effluent, shallow monitoring wells, and stream base.
flow, but the delivery mechanisms are not well understood. The Ohio Fracture Flow Working Group has identified fractures in the substratum (Chorizons) of 95 soil series in Ohio (81 prime farmland soils) representing ~25 million acres in the Midwest. Macropores formed by biological and physical mechanisms within the soil can also contribute to drain tiles or fractures in minutes, by passing the soil’s available water through the fractures. Macropores of a scale that can be seen by the naked eye do not take the effects of fractures and macropores into account, under-predicting delivery rates by a factor of 10 or more. The Root Zone Quality Model (RZQM) can be modified to include fractures and macropores, but errors can still be introduced by the way storm events are represented. Modeling by members of the Working Group have found pesticide transport through macropores to be 2.6 (±1.0 cm) to 1.5 (±2.5 cm) times greater with median Midwest storms (with initially high intensity, ending as low intensity rainfall) than when modeled assuming constant rainfall intensity conditions. The differences in results between these two modeling assumptions diminishes with higher rainfall volumes, suggesting that more bypass flow is likely under the typical low volume storm more common in Ohio. These significantly higher than expected transport volumes affect ground and surface water quality in agricultural settings and need to be factored into local management and policy decisions.

Board 17. EFFECTS OF FATHERS INVOLVEMENT ON CHILD’S ADJUSTMENT TO CANCER. Stacy R. Flowers, stc@fhr@Otterbein.edu (Dr. Laura Bennett-Murphy, lbennett-murphy@Otterbein.edu) Otterbein College, Westerville OH 43081. As medical care has become more advanced, children are living longer and fuller lives than in the past. Medical personnel have begun to focus on improving quality of life for chronically ill children and their families. Research examining children’s adaptation to cancer has clearly demonstrated the importance of family involvement in the child’s treatment. However, less is known about how maternal involvement, and family functioning can contribute to child adjustment to disease. Research by Sawyer et al. has shown that maternal adjustment during the period after diagnosis had a significant relationship with the child’s psychological adjustment 2 years after diagnosis. While the effects of mothers’ adjustment on child’s adjustment have been established, relatively few studies have examined the role of fathers. The proposed research will examine the impact of fathers’ involvement on a child’s adjustment to cancer. More specifically, the research is intended to examine the effects of fathers’ coping, fathers’ distress, roles in childcare, and household management and how these variables may relate to a child’s adjustment. Research could lead to an increase in knowledge that may benefit medical personnel in the treatment of chronically ill children and their families. It is predicted that the more time a father spends with his child(ren), and the better the father’s adjustment, the better the child’s adaptation to cancer will be. Twenty mother-father dyads will be recruited to complete a series of questionnaires that will measure coping, distress, roles in childcare, household management, and perceived child adjustment. Questionnaires will be administered to both mothers and fathers in order to gain a more comprehensive view of how household management tasks are divided when a child is being treated for cancer. In addition, 20 fathers of non-ill children will be matched by child’s age, gender, and family socioeconomic status to serve as a control group.

Board 18. AN EXAMINATION OF THE ROLE OF NMDA RECEPTORS AND VDCCs IN ACQUISITION AND RETENTION OF A TIMING TASK. Annal. Mann, amann@onu.edu Jennifer A. Webb, j-webb@onu.edu (Brian Woodside, b-woodside@onu.edu) Dept of Psychology and Sociology, Ohio Northern University, 525 South Main St., Ada OH 45810. Long-term potentiation (LTP), an enduring, enhanced neuronal response, is one possible mechanism underlying memory. Two forms of LTP have been identified in the rat brain. Nmdal. TP, which decays over a short period, is mediated by the M-methyl-D-aspartate receptor (NMDAR). Vdcal. TP, initiated by activation of voltage-dependent calcium channels (VDCCs), may represent long-lasting changes at the synapse. Research has demonstrated that MK-801, a drug that blocks nmdal. TP, impairs acquisition of both spatial and non-spatial tasks. Verapamil, a drug that blocks vdcal. TP, also impairs retention of spatial tasks. The effects of MK-801 and verapamil vary depending on training schedules, type of task, and timing. Here we examine the effects of MK-801 and verapamil on acquisition and retention of a contextual discrimination task. It is our hypothesis that MK-801 will block acquisition of contextual discrimination cues while verapamil will block retention of the cues. This experiment will be conducted using 90 day-old Sprague-Dawley rats, housed individually on a reversed 12/12 light/dark schedule. All animals will be mildly food-deprived 85% of their ad-lib weight during all phases of the experiment. The animals will be trained to bar press in an operant chamber on a continuous reinforcement schedule. After achieving criterion, animals will be divided into three groups: saline, MK-801 (0.1 mg/kg), and verapamil (10 mg/kg). The injections will be administered intraperitoneally thirty minutes prior to training. A baseline session will be conducted to determine if the drugs affect bar-pressing behavior. Subsequent sessions will initiate bar pressing in one of two contextual environments, the standard operant chamber or a chamber altered with a black and white striped card and cherry dip odor. Measures of behavior will include bar pressing frequency rates, trials to criterion, and performance after a five-day retention period.

Board 19. THE EFFECT OF NMDA RECEPTOR ANTAGONISTS AND VDCC ANTAGONISTS ON ACQUISITION AND RETENTION OF CONTEXTUAL DISCRIMINATION CUES. Julie N. Foster, j-foster@onu.edu (Dr. Joel L. Kane, j-kane@onu.edu) Dept of Psychology and Sociology, Ohio Northern University, 525 S Main St., Ada OH 45810. Two forms of long-term potentiation (LTP), a possible mechanism of memory formation, exist in the rat brain. N-methyl-D-aspartate receptors mediate a transient form of LTP, nmdal. TP, and voltage-dependent calcium channels initiate a longer lasting LTP, vdcal. TP. MK-801, a drug that blocks nmdal. TP, impairs acquisition in spatial and non-spatial tasks. Verapamil, at a dose that blocks vdcal. TP, impairs retention in spatial tasks. The extent of impairment varies depending on complexity of the task, behavioral paradigm, and timing. The current research examines the effects of MK-801 and verapamil on acquisition and retention of a contextual discrimination task. It is our hypothesis that MK-801 will block acquisition of contextual discrimination cues whereas verapamil will block retention of the cues. This experiment will be conducted using 90 day-old Sprague-Dawley rats, housed individually on a reversed 12/12 light/dark schedule. All animals will be mildly food-deprived 85% of their ad-lib weight during all phases of the experiment. The animals will be trained to bar press in an operant chamber on a continuous reinforcement schedule. After achieving criterion, animals will be divided into three groups: saline, MK-801 (0.1 mg/kg), and verapamil (10 mg/kg). The injections will be administered intraperitoneally thirty minutes prior to training. A baseline session will be conducted to determine if the drugs affect bar-pressing behavior. Subsequent sessions will initiate bar pressing in one of two contextual environments, the standard operant chamber or a chamber altered with a black and white striped card and cherry dip odor. Measures of behavior will include bar pressing frequency rates, trials to criterion, and performance after a five-day retention period.

Board 20. RECRUITING UNDER-REPRESENTED STUDENTS INTO CAREERS IN ENVIRONMENTAL BIOLOGY: THE VALUE OF LONG-TERM RESEARCH EXPERIENCES. Nada Fail, toll.e.wright@wright.edu David L. Goldstein, david.goldstein@wright.edu Michelle W. Wheatly, m.wheatley@wright.edu Wesley Jackson, jackson.e.wright@wright.edu Wright State University, Dept of Biological Sciences, Dayton OH 45435. We describe a program funded since September 1999 by the UMEB (Undergraduate Mentoring in Environmental Biology) program of the National Science Foundation. Our focus is to encourage students from underrepresented populations (ethnic minorities and students with disabilities) to pursue research in environmental sciences. We provide students with long-term research experiences (>1 yr). Qualified students are placed in paid positions in funded laboratories. Additional activities include: attendance at Deptal seminars; meeting representatives from academia, industry, and governmental or non-governmental agencies; and seminars providing exposure to skills (e.g. time management, resume writing and interviews) (e.g. minority medical and graduate students) who have participated in the program. We describe: 1) the scope of our program; 2) the impact of participation; and 3) the role of mentors.

Board 21. CHARACTERIZATION OF METALLO-b-LACTAMASE IIR. Yates, G. Periyannan, M.W. Crowder, crowder.mwu@muohio.edu Dept of Chemistry and Biochemistry, Miami University, Oxford OH 45056. Since the introduction of antibiotics in the early part of the last century, the problem of bacterial resistance to antimicrobial agents has increased. Bacterial resistance to antibiotics has challenged physicians and medical researchers alike. Currently, some bacterial infections are unaffected by antibiotics that were once used to treat patients suffering from bacterial infection. Specifically, several cases have been reported of ampicillin-resistant E. coli infections, methicillin-resistant S. aureus infections, and carbapenem-resistant P. aeruginosa infections. Initial research has implicated b-lactamase enzymes as integral components of bacteria that exhibit resistance to the substrate antibiotics. Metallo-b-lactamases, a subgroup of the b-lactamase family of enzymes, are known for their ability to hydrolyze b-lactam bonds. Metallo-b-lactamases are integral to the functioning of antibiotics, and are encoded by the bacterial genome. Metallo-b-lactamases are known to hydrolyze b-lactam bonds. Metallo-b-lactamase IIR is a metallo-b-lactamase produced by clinical isolates of P. aeruginosa. The metallo-b-lactamase IIR is known to hydrolyze a wide range of b-lactam antibiotics. The expression of metallo-b-lactamase IIR is a target for the development of new antibiotics that are resistant to the b-lactamase enzyme. The characterization of metallo-b-lactamase IIR is a target for the development of new antibiotics that are resistant to the b-lactamase enzyme. The characterization of metallo-b-lactamase IIR is a target for the development of new antibiotics that are resistant to the b-lactamase enzyme. The characterization of metallo-b-lactamase IIR is a target for the development of new antibiotics that are resistant to the b-lactamase enzyme. The characterization of metallo-b-lactamase IIR is a target for the development of new antibiotics that are resistant to the b-lactamase enzyme. The characterization of metallo-b-lactamase IIR is a target for the development of new antibiotics that are resistant to the b-lactamase enzyme.
the creation, overexpression, and purification of four mutant L1 enzymes: H84C, H86C, H89C, and H1160C. Transformation of the plasmid into E. coli allowed for overexpression of all four mutant enzymes; however only the H84C and H89C mutants were successfully purified. The H84C and H89C both bind 1 mol Zn(II) molecule, and the Kcat value for H89C, 33 μM/s, is significantly different from the wildtype L1 enzyme. The H84C and H89C mutants allow for the preparation of Cu(I)-Zn(I) and Zn(II)-Cu(I) analogues of L1 and now allow us to investigate the role(s) of each metal ion separately.

Board 22 THE DEVELOPMENT OF A METHOD TO EXAMINE THE COMPONENTS OF THE SURFACE OF POWDERED PARTICLES. Clark Michael Rosenberg, crosenberry@cu.edu; Michael P. Setzer, msetler@cu.edu; 100, John Carroll University, 20700 North Park Blvd., University Heights OH 44118. This paper describes one step in developing a general procedure to detect the surface components of powdered particles with minimal interference from the components under the surface. This information can be used to determine how the surfaces of these powder particles affect the interactions between the particles and their environment. The complete procedure involves the controlled dissolution of just the surface layers of a particle and examining the resulting solution. The purpose of this investigation is to determine if electrochemistry would be useful in examining these solutions. The primary techniques used in these experiments were cyclic voltammetry and linear sweep voltammetry for qualitative identifications plus Linear Sweep Voltammetry and Differential Pulse Stepping Voltammetry for quantitative determinations. The general procedure for the research was to prepare standard nitric acid solutions and then run a series of tests using a CV-50W Voltammetric Analyzer from Bio Analytical Systems. The various instrumental parameters were optimized for the CV-50W Voltammetric Analyzer through parameter and simplex optimizations involving 159 trials. The working electrode used for these experiments was a glassy carbon electrode with a thin mercury film formed in situ. It has been determined that it is impossible to detect iron in dilute nitric acid solution with the procedures used in this research. However, it has also been determined that copper in solution can be detected under these conditions with a detection limit of 1 ppm. Future work will involve quantifying the change in the copper calibration curve as a function of the concentration of the nitric acid. Once completed, this will allow the determination of solution conditions that will not dissolve copper (II) oxidized powder particles.

Board 24 PHYSICO-CHEMICAL COMPARISON OF AN OVER-THE-COUNTER SUPPLEMENT OF DEHYDROEPIANDROSTERONE (DHEA) TO PUREFIED DHEA. Feguens Batallal, fbatallal@wilmington.edu; Nicole Chamberlain, ukarchs@wilmington.edu; Ukaars Acharya, (Donald Troike, don.troike@wilmington.edu) Dept of Biology, Wilmington College, 251 Ludlow St, Wilmington OH 45171. DHEA, a hormone with androgenic and estrogenic effects, is secreted by the adrenal gland, and is believed to enhance a wide range of physiological functions, including immune and nervous functions and fat metabolism. Because the secretion of DHEA declines with advancing age, a market for an over-the-counter (OTC) formulation of this hormone has developed among older adults. A previous study demonstrated that purified DHEA (Sigma Chemical) significantly elevated serum sodium concentrations to differ. From late May through late July 2001, eight macroinvertebrate collections were made in each pond, approximately every two weeks. For each collection a sweep net was used to sample invertebrates from an approximately half meter square area of the pond bottom. Each sample was sorted to separate the macroinvertebrates from plants and detritus. Invertebrates were identified and preserved in 95% ethanol. O. U. Chamberlain and J. Rettig have preformed this work. The OTC-DHEA analysis obtained from the OTC-DHEA package prepared by the commerical manufacturer showed a different concentration of the hormone. This results causes us to wonder whether the two compounds are chemically the same. An OTC formulation of DHEA in a base of cellulose, calcium carbonate and gelatin was dissolved in chloroform to extract the DHEA. The chloroform fraction was evaporated and the recovered solution was melted and compared to purified DHEA (Sigma Chemical). The resulting samples showed no consistency, which probably reflects the presence of impurities. Infrared spectrometric analysis of three samples demonstrated, however, much similarity between the Sigma DHEA and the OTC-DHEA extract in functional groups and their location. NMR data analysis will be completed.

Board 25 TEST FOR AGGREGATIVE BEHAVIOR IN THE ARBOREAL ASIAN TARANTULA POECILOTHIRIA REGALIS (ARANAEA, THERAPHOSIDAE, SELENOCOSMINAE). Melissa M. Varrecchia, varrechio@hiram.edu; Barbara Vassquez, vassquez@hiram.edu; Samuel D. Marshall, marshalls@hiram.edu; J.H. Barrow Field Station, Dept of Biology, Hiram College, Hiram OH 44234. We examined aggregative behavior in the arboREAL tarantula Poecilotheria regalis (Araneae, Theraphosidae) to determine if this species, having the potential for mutual attraction (or repulsion) in group-reared spiders placed in groups in experimental containers with an equal number of spiders as retreats. The test spiders were captive bred and raised in groups of ten. The current studies were conducted with the spiders being approximately 1 year old. Each spider was individually painted and placed into a 15 cm by 15 cm by 18 cm plastic container, in groups of four. In each of the four corners of the container there was a vertically-oriented, one inch diameter, 2 cm wide, 10 cm long, open on both ends. We tested a total of 20 groups of 4 spiders each. Each morning for five mornings all spiders were located and their location (relocation number) was noted. For the first morning's census, most spiders were grouped (66 out of 80). When we tested the condition of all spiders (solitary, in a group of two, three, or four) against an expectation of random retreat choice we found no significant difference (chi sq = 5.25, df = 3). While there was no evidence for mutual attraction based on the expectation of random retreat choice, there was replication in repeated trials. We did find that this tendency to settle in retreats randomly in regard to group size changed across the five days, with spiderlings more often solitary or in smaller groups by the fifth morning.

Board 26 THE EFFECT OF SILTATION ON DISTRIBUTION OF ZEBRA MUSSELS (DREISENNAA POLYMORPHA) IN ALL MUREE, WESTERVILLE, OHIO. Danielle L. Konfal, dndkfn@otterbein.edu (Michael A. Hoggarth, mhoggarth@otterbein.edu) Otterbein College, Otterbein, OH 43060. Zebra mussels (Dreissena polymorpha) were accidentally introduced into the United States in 1986. Since then, they have been classified as nuisance species because: 1) they are introduced; 2) they form large populations; and 3) they out-compete native species. In Ohio, zebra mussels were originally found in Lake Erie. Since then, they have spread to rivers and creeks, including Alum Creek in Westerville, Ohio. This study examines the microhabitat of zebra mussels in a creek, relative to flow characteristics. Changes in flow affect the amount of silt deposited on the substrate in a creek. The distributions of zebra mussels at two sites on Alum Creek are being determined by quadrat sampling. Tubidity, sedimentation rates, depth, and flow characteristics are being measured at each of these sites. If zebra mussels are limited by high amounts of silt deposition, then we would expect them to be absent in pool habitats where silt deposition is greatest, and present in riffle and run habitats where deposition is less. Initial observations have shown that zebra mussels were not found on the tops of rocks in pool habitats where sedimentation rates of silt were high. However, they were found on the tops of rocks in riffle habitats where sedimentation was less.

Board 27 MACROINVERTEBRATE COMMUNITY COMPOSITION AND ABUNDANCE IN WOOHOPPONDS, Pahrnp-Lord, l rhetford@lmonad.edu) (Dr. Jessica Rettig, Retrig@denison.edu) Slayer Box 161, Denison University, Granville OH 43023. Macroinvertebrates such as snails, clams, insect larvae, and worms, are common members of pond ecosystems, where they inhabit macrophytes and the pond bottom. Macroinvertebrates may be important consumers of detritus and plants and may serve as food for other invertebrates or fish. The purpose of this research was to examine the dynamics of the macroinvertebrate community in Ebaugh and Middleton ponds on Denison University's campus, Granville, Ohio. These ponds contain distinctly different macrophyte communities. While a low growing layer of Najas gracilis dominates Middlepond, Ebaugh contains mixed beds of submerged macrophytes that fill the water column. Thus, the macroinvertebrates that inhabit these plants are likely to differ. From late May through late July 2001, eight macroinvertebrate collections were made in each pond, approximately every two weeks. For each collection a sweep net was used to sample invertebrates from an approximately half meter square area of the pond bottom. Each sample was sorted to separate the macroinvertebrates from plants and detritus. Invertebrates were identified, and preserved in 95% ethanol. J. A. Chamberlain and J. Rettig have performed this work. Results are not yet complete, however, it appears that macroinvertebrates are more abundant in Ebaugh pond than in Middleton pond, probably due to the vast difference in abundance of macrophytes that inhabit each pond. Ebaugh pond also appears to contain a wider diversity of macroinvertebrates than Middleton pond.

Board 28 HIGH TEMPERATURE EFFECTS ON PHYSIOLOGICAL AGE IN THE CRUSTACEAN LITONIDIA TAYHWUPO,LAIOTARANTULA POLYCHROMA. Chamberlain, Utkarsh Acharya, (Donald Troike, don.troike@wilmington.edu)

Program Abstracts

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be tested for both lipid and glucose levels by dissolving the lipids and glucose into solution and inducing a color change within these compounds detectable by a spectrophotometer. This should allow us to determine the decline rate in different temperature groups. If these compound levels in the higher temperature groups show a faster decline this may indicate that the water temperature causes the metabolic rates of *S. mathesoni* to increase well above their basal rate. If there is no change in their metabolic reserves their metabolism likely shifts down due to lack of enzymatic activity.

**Board 29**

**LOCALIZATION OF A PUTATIVE NKCC TRANSPORTER IN MAMMALIAN OOCYTE PLASMA MEMBRANES**

Naehel Homan, Neil R. Hijmans, Christopher M. Gillen, 774 Kenyon College, Gambier OH 43022.

The Na-K-2Cl cotransporter (NKCC) is a membrane-bound protein (-20kDa) found in a variety of animal tissues. It has 12 transmembrane spanning domains, cytoplasmic N- and C-termini, and is well conserved among species. NKCCs are known to play a role in transepithelial ion movement, cell volume regulation, and intracellular chloride ion concentration. Two isoforms have been identified in vertebrates. NKCC1 is widely distributed and found on the basolateral membrane of secretory tissues. NKCC2 is found in absorptive cells of the kidney. This study examined the pattern of tissue expression of a putative NKCC in the tobacco hornworm, *Manduca sexta*. We found that NKCC is expressed in the Malpighian tubule, Malpighian tubule mitochondria, midgut, nerve, fat, and salivary gland tissues. We examined the presence of NKCC by denaturing gel electrophoresis and western blotting, using a polyclonal antibody that we have developed against a C-terminal region of the *M. sexta* NKCC. The antibody strongly recognizes proteins from Malpighian tubule and midgut membrane preparations that migrated at ~90 kDa and ~200 kDa. Based on densitometry, antibody reactivity was 56.2±23% (mean±S.E., N=3) greater in the midgut than in the Malpighian tubule. A similar pattern was observed in salivary gland membranes at much lower intensity. The expression pattern of the putative NKCC is similar to the pattern of vertebrate NKCC1 expression.

**Board 30**

**ZOOPLANKTON ASSEMBLY DYNAMICS IN TWO OHIO PONDS**

Linda S. Schuman, schuman@eden.edu (Jessica Rettig, jrettig@eden.edu), Meyer Box 200, Denison University, Granville, OH 43023. Zooplankton, tiny crustaceans and insects, that live in ponds and lakes, are a vital link between producers and consumers in the food web of aquatic ecosystems. This study compared zooplankton composition and species abundance in two Ohio ponds, sampled through the early summer. Ebbaugh Pond and Middleton Pond are located on the campus of Denison University, Granville, Ohio. Ebbaugh is stream-fed and also receives runoff that may contain fertilizers. It contains abundant macrophyte beds and has little open water. Middleton is a spring-fed pond. The surrounding land is fallow and runoff does not contain fertilizers. There are very few macrophytes in Middleton and most of the pond is open water. Because these ponds differ in their level of macrophyte cover and nutrient input, it was proposed that the zooplankton assemblage in each would differ during the sampling period. Zooplankton were collected once a week from May 29, 2001 to July 23, 2001. Three zooplankton samples were collected via vertical tow using an 80-mesh net from the deepest point in each pond. Zooplankton samples were preserved using Lugol's solution. In the lab, zooplankton were processed by identifying and counting individuals of each taxa present in a sub-sample of the original sample. Each pond contained a diverse assemblage of zooplankton taxa with a high degree of species overlap between the ponds. Nine species were found in Ebbaugh, and seven of these species were also found in Middleton. Total zooplankton density in the two ponds did not differ during the study.

**Poster Session**

**Pre-College Students**

1:30 – 3:00 pm

**Kerns Chapel**

**Board 1**

**THE EFFECT OF ENVIRONMENTAL PIGGORIES, Jessica E. Hall, Jazzbo2590@AOL.COM, 2655-46th St., Canton OH 44705, St. Thomas Aquinas High School, Louisville, KY.**

This project is funded upon research at the University of Tennessee Anthropological Research Facilities founded by Bill Bass. If pig corps is protected from elemental and animal disturbances then it will decompose at a slower rate. Research and advice from the Stark County Coroner's office determined that *Stx* serotypes (domestic farm pig) should be used because its skin has coarse hair and its fat-muscle ratios are close to a human's. This allows these observations to be applied loosely to humans. Cow tongues were used to study effects on exposed muscle. Three shouldership to hoof sections of the *Stx* serotype and three cow tongues were obtained from The Devington Meat Market in Canton, OH. A wire cage was constructed to protect one pig leg and a cow tongue from large animal interference during exposure to elements. One pig leg and one cow tongue were placed in a shallow gravel three feet deep. The remaining pig leg and cow tongue were exposed to animal and elemental disturbances. Each specimen was observed and weighed weekly for five months (from Oct. 6-Mar. 23). Specific stages were observed in the specimens. *Rigor mortis*, bloating, insect eggs and larvae, and liquefied tissues exuding from the remains were observed in the protected and exposed pig carcases. *Rigor mortis*, bloating, and adipocere were observed in the buried pig corpse. The exposed pig corpse was completely skeletonized and the bones were scattered by animals within a 10-week period. The final mass of the protected corpse was 1.2 pounds, while that of the exposed carcase was 6 pounds. The exposed pig corpse was 30 pounds probably due to water retention. All of the tongue specimens disappeared, probably carried off by animals, most likely opossum and fox due to tracks and other evidence observed. The pig corpse that is protected from elemental and animal disturbances will decay at a slower rate than the pig corpse that is left unprotected. This research is applicable to criminology and the forensic sciences.

**Board 2**

**THE EFFECTS OF PREVIOUSLY EXPRESSED STRESS PROTEINS ON THE OXIDATIVE STRESS RESPONSE OF SACCHAROMYCES CEREVISIAE**

Adam D. Clark-Joseph, Adamj12@juno.com, 2341 McCoy Rd., Columbus OH 43220, (Upper Arlington High School).

The stress responses of *Saccharomyces cerevisiae* to many different kinds of stress are similar, particularly with regard to the formation of stress proteins. To test if stress proteins synthesized in response to non-oxidative stresses provide protection against oxidative stress, high and low temperature shocks (39°C for 60 min and 4°C for 30 min) and high and low pH shocks (pH 9.7 and pH 3.3, both for 30 min) were applied. Ten plates of *S. cereviasiae* were exposed to each set of conditions, 10 plates had high temperature shocks, 10 plates had low temperature shocks and oxidative stress, and so on. The double shock results were then compared with the corresponding single-shock results. Oxidative stress corresponded to a statistically significant change, a decrease, only in *S. cerevisiae* which had been previously exposed to a low pH shock. A T-test yielded a p-value of 0.0300. The controls and other cells exposed to non-oxidative stresses did not change in a statistically significant manner in response to oxidative stress; all the corresponding p-values were between 0.5 and 7. Thus, the results of the experiment were conclusive, though they suggest that low pH shocks may not induce stress protein synthesis.

**Board 3**

**ROAD MORTALITY OF SNAKES IN THE KILLDEER PLAINS WILDLIFE AREA, Nathan J. Yasu, nyasu@yahoo.com, 5051 N. Galena Rd., Sunbury OH 43074 (Buckeye Valley High School).**

The eastern plains garter snake (*Thamnophis sirtalis rutilatus*) and eastern massasauga (*Sistrurus catenatus catenatus*) are listed as endangered on Ohio's threatened and endangered species list and found in Killdeer Plains Wildlife Area in Wyandot County, Ohio, USA. Killdeer Plains also provides habitat for the Kirkland's snake (*Clonophis kirtlandii*), listed as threatened, and the smooth green snake (*Liochlorophis vernalis*), status unknown. Serious concerns exist regarding a decline in numbers of threatened and endangered snakes at Killdeer Plains. Observations during fieldwork at Killdeer Plains and Killdeer Ridge indicate that many snakes are frequently killed by vehicular traffic. A systematic survey of road kills had not been conducted at Killdeer Plains. Thus knowledge of population distributions is incomplete and actual impact that vehicular traffic may have upon snakes, such as seasonal effects, was unknown. This study was conducted in cooperation with the Ohio Department of Natural Resources in three surveys: late August to early November 2000, late March to early June 2001, and late August to early November 2001. All roads in the Killdeer Plains Wildlife area were driven twice a week. Dead snakes were collected, identified, and location recorded by Global Positioning System (GPS). Live snakes were identified, location recorded by GPS, and assisted off the road. The number of snakes found on the roads on each collection day in each collection period was not uniformly distributed. The days of the greatest activity were not the same for all species of snakes and may be linked to temperature shifts in all periods of collection. More snakes were found on specific sections of road than on others. In the fall 2001 survey, 60 snakes were observed on Kirtland's snakes, 13 northern water snakes (Nerodia sipedon sipedon), and seven red belly snakes (Storeria dekayi dekayi), 84 eastern garter snakes (Thamnophis sirtalis sirtalis), one milk snake (*Lampropeltis triangulum triangulum*), five eastern plains garter, two eastern massasaugas, three Kirkland's snakes, 13 northern water snakes (*Nerodia sipedon sipedon*), and seven red belly snakes (*Storeria dekayi dekayi*). In the spring 2001 there were ten brown snakes, 20 eastern garter snakes, one eastern plains garter, six northern water snakes, seven red belly snakes (Storeria dekayi dekayi), and one milk snake. The fall 2001 survey produced 150 snakes, with 58 brown snakes, 57 eastern garter snakes, one Kirkland's snake, one milk snake, six eastern plains garter, three red bellies, and 24 northern water snakes. Road survey results were compared withattle survey also conducted at Killdeer Plains. A tile survey is where metal corrugated road tiles are placed in fields to attract snakes. The tiles are periodically checked for snakes. In the tile survey of 2000, there were 12 brown snakes, 766 eastern garter snakes, three milk snakes, two Kirkland's snakes, 27 massasaugas, 8 northern water snakes, and three smooth green snakes. This illustrates
the differences in habits of species of snakes. The fall 2000 roadway survey data led to the discovery of new populations of eastern plains garter snakes.

**Board 4** HOW DO COMMERCIAL DE-ICER PRODUCTS AFFECT THE PHYSIOLOGY OF DAPHNIA MAGNA? Tricia M. Yerardi, triciayerardi@myownemail.com 124 Rinkliff Ln, Chillicothe OH 45601 (Unioito High School).

Ice removal from roads is difficult and leads to the use of de-icer products. However, there may be adverse effects on the physiology of animals. This study explored the effects of various concentrations of commercial de-icer products on the heart rate and swimming motions of the freshwater crustacean Daphnia magna. Freshwater was the control. Hypotheses were: (1) Daphnia magna, that are exposed to weak (1%) solutions of commercial de-icer products, will have no observable changes in heart rate or swimming motions; (2) Daphnia magna, that are exposed to medium (5%) solutions of commercial de-icer products, will have an increase in heart rate and swimming motions, and (3) Daphnia magna, that are exposed to strong (10%) solutions of commercial de-icer products, will have a decrease in heart rate and swimming motions, and possibly die. Solutions were freshwater, Prestone Windshield De-Icer Washer Fluid™(Prestone De-Icer), Prestone Driveway Heat™(Prestone Heat), Road Runner Ice Melt (Ice Melt), and Diamond Crystal Salt™(Salt). Three different specimens were used for each solution. Results were: (1) The heart rate of the Daphnia magna in 1% Prestone De-Icer was not affected. All other solutions decreased the heart rate and caused erratic swimming motions in the Daphnia magna; (2) None of the Daphnia magna in 5% solutions had an increase in heart rate. The non uniform movements in all solutions were affected, first with the least amount of effect, then a decrease in movement; (3) All Daphnia magna in 10% solutions had decreased heart rates. All specimens died in 10% solutions of Prestone Heat and Ice Melt; one specimen died in 10% salt solution. Small disturbances in the Daphnia magna's environment may have profound consequences on their populations. De-icer products should be used in the least amount possible for limited time to decrease stress on the Daphnia magna's life cycle.

**Board 5** THE POTENTIAL FOR THE USE OF RADIISH IN SOIL PHYTOREMEDIATION. Ericka K. Johnson, shorty_hopes@hotmail.com 9884 Foundry St, East Liberty OH 43139, Anna R. Stromer, bstgroup@benlogan.k12.oh.us (Benjamin Logan High School).

Phytoremediation is an alternative solution for cleaning toxic soils and waters. Hyperaccumulators remove contaminants from toxic sites. Plants degrading, containing or stabilizing pollutants act as filters or traps. Contaminants remediated in this manner include: heavy metals, solvents, pesticides and nuclear wastes. Hyperaccumulators, including Thlaspi goesingense, Alyssum lesbiacum, and Cardaminopsis halleri, are grown and often harvested at a low cost providing an environmentally friendly remediation method. This research involved examining the common radish (Raphanus sativus) for possible use as a hyperaccumulator in phytoremediation. Radishes were grown in soils contaminated with copper, lead, zinc, and cadmium. Results were: (1) The radish grew at Cu, Pb, and Zn levels up to 20, 100, and 300 parts per million, respectively; (2) Tissue metal concentrations in the radish varied; (3) Dried radish biomass was from 50% to 100% for copper, lead, and zinc; and (4) Radishes took up trace elements from the soil and can be used to provide a greater understanding of nitric oxide regulation in the CNS.

**Board 6** TOTAL PLATE COUNT OF HETEROTROPHIC BACTERIA FOUNDINGROUND BEEF HAMBURGERS USING CONDITIONS AS VARIABLE IN COMMERICAL OUTLETS IN COSHOCTON, Ohio. Amy C. Schlegel, dschlegel@coshocton.edu 1900 Atwood Terrace, Coshocton OH 43812 (Coshocton High School).

The objective of this study was to test if hamburger samples with condiments from Burger King and Wendy's first food restaurants in Coshocton, Ohio, would demonstrate marked differences in their total plate counts of heterotrophic mesophilic bacteria. Four cooked hamburger samples from Coshocton, Ohio, Burger King and Wendy's fast food restaurants (one plain, one with only mustard, one with only lettuce, and one with all of the toppings) were all diluted using sterilized water to a 10^-3 dilution. Samples between 12-21 parts per million. Controls plants were found to have 2 parts per million of copper, 13 parts per million and experimental roots levels were between 5-8 parts per million. Metal content within the radish was analyzed by dry ash oxidation, digestion, diethyldithiocarbamate was added to develop a color reaction and read in a Spec20D.

**Board 7** WHICH MATERIAL GENERATES A SPARK THE QUICKEST? Elizabeth K. Stirbens, kstirbens@neo.rr.com 12280 Beeson St., Alliance OH 44601 (Marlington Middle School).

In this experiment, a static electricity generator was built to figure out "what material generates a spark the quickest?" Twenty materials including alpha wool, faux fur, towels with and without fabric softener, and carpet were tested five times each, to see which could generate a spark in the quickest amount of time, by creating friction between the materials and the machine. The amount of time it took for a fabric to spark was recorded when or if a material sparked. Through this research, the hypothesis was that the cotton towel dried without fabric softener would create a spark most quickly. Standard for all trials were the maximum amount of time for trial, speed and direction of the material, pressure of material against the drum, and size of material tested. The variable was the different materials used. This experiment showed that the material which generated a spark most quickly was the 100% cotton washcloth. Sixteen other materials took varying longer amounts of time. Three materials that never sparked were the 100% polyester fabric, the nylon netting, and "Swiffer" dusting sheet. This experiment rejected the hypothesis. The 100% cotton washcloth sparked in the quickest amount of time, not the towel with anti-static fabric softener. This might be because the washcloth has more protruding threads of fabric than the towel, therefore giving off more of a charge in the process than the towel. This experiment is important to society because it demonstrates how to contain electricity, illustrates just how powerful static electricity can be, and shows which materials are effective and ineffective at preventing static electricity for the carpet and clothing industries.

**Board 8** EFFECT OF NERVE GROWTH FACTOR ON NITRIC OXIDE SYNTHASE TISSUE IN RATS AND HUMAN SINCIC 122 cells. Zeeshaan A. Qureshi, zeeshaan_q14@hotmail.com 2993 Branden Rd, Upper Arlington OH 43221 (Upper Arlington High School).

Nitric Oxide (NO) is a neurotransmitter with significant influence on the Central Nervous System (CNS). The enzyme Nitric Oxide Synthase (NOS) forms NO and is regulated by gene NOS 1 and NOS 2 in neurons. Rats and humans are thought to bear similar sequence of gene family. The objective of this project was to find similarities in mechanism between human and rat NOS1 using model rat pheochromocytoma (PC12) cells. When induced by the protein Nerve Growth Factor (NGF), PC12 cells morphologically differentiate into neurons. In this experiment, endogenous rat NOS1 gene was an internal control, human NOS1 without NGF was the control, and human NOS1 with NGF was the experimental. PC12 cells transfected with human NOS1 promoter and gene sequences were obtained from the lab. Cells received NGF treatment for eight days and were then harvested. Total RNA was isolated and cDNA templates were obtained from mRNA through Reverse Transcriptase (RT) reaction. The DNA templates were amplified under PCR and placed under agarose gel electrophoresis. PCR product formation of rat NOS1 of size 282 bp with NGF was greater than that of rat NOS1 without NGF. PCR product formation for human NOS1 transgene of size 450 bp with NGF was also greater than that of NOS1 without NGF. Obtained results indicate an up-regulation in NOS1 gene expression in humans. Results from this experiment can be used to provide a greater understanding of nitric oxide regulation in the CNS.

**Board 9** UTILIZING DNA FINGERPRINT ANALYSIS IN FORENSIC ENTOMOLOGY. Jacob Bryan, jbryan@daphnia.phelma.net 10133 Regan Trail, Aurora OH 44202 (Twinburs High School) and Brit A. Burnard, Ursuline College.

Forensic entomologists use biological evidence, such as insects, to determine the cause and time of death at the scene of a crime. fingerprinting can be used to identify small pieces of DNA found at the scene. The most precise method to date for identifying postmortem intervals is by determining the species of insect larvae found on a corpse. In the past, fly larvae had to be reared to maturity before it was possible to determine the species because of similar larval appearance. To identify the species of larvae more quickly, we have utilized DNA analysis techniques. Between the fall of 2001 and spring of 2002 mitochondrial DNA was isolated from at least 12 adults from three species of necrophilic flies from the family Calliphoridae (Calliphora vicina, C. vomitoria, and Phaenicia sericata). The most prevalent species was Calliphora vicina. Theresults of sixty individuals were identified using standard techniques and confirmed using enzyme based techniques.

**Board 10** THE EFFECTS OF IN VITRO STRESS ON THE MORPHOLOGY AND SUSCEPTIBILITY OF CANDIDA ALBICANS. Timothy A. Cook, TimCook2002@aol.com 8671 S Rd, Proctorville OH 45669 (Fairland High School).

Many organisms are known to exhibit morphological changes when subjected to stress. Candida albicans, a member of the fungal imperfect and a common human parasite, is known to have two forms. The blastospore is the more common and is prevalent at times of stress, while the pseudohyphae is known only in the presence of a nutrient source. Our goals were to determine DNA analysis technique that could be used to identify the Candida albicans under stress conditions. Cells were incubated at different concentrations of different stressors, including pH stress, osmotic stress, and oxidative stress.
minimal inhibitory concentration tests were performed using 5% PVP-I. Cells from the tube containing the highest tolerated concentration of PVP-I were stained with FUN-1 and Calcofluor White M2R, then viewed using a laser scanning confocal microscope. Data from the viable plate count tests concurred with the viability data from the FUN-1 stain. Morphological analyses showed that the cells became more resistant to all of the antimicrobial concentrations. Viable plate counts showed that the cells become more tolerant because they are exposed to a lower amount of the antimicrobial agent as the S. marcescens population increases in size. The effect of starvation on the maximum tolerated pressure is currently being investigated by using atomic force microscopy.

Board 11 A COMPARISON OF SOURCE AND WATERSHED QUALITY: MIAMI-ERIE CANAL AND GREAT MIAMI RIVER. Erin E. Sauer, dead_possum107@yahoo.com 5185 Red Bird Ln., Hamilton OH 45011-2018 (Ursaline Academy High School).
The Miami-Erie canal stretches across Ohio from Lake Erie to Cincinnati. A portion of this canal branches from the Great Miami River, runs for approximately 1.7 miles past a power plant, and flows back into the river. It is possible that pollution could enter the river, or water quality could be improved from this canal diversion. I hypothesized that the water quality would improve from the diversion due to protected parks and wildlife preserves along the canal. To test whether the quality of the water changes from the beginning of the canal to the end, several factors were measured. Water samples were taken from six locations along the canal, one site upstream from the canal, and two sites at the river downstream from the canal, including a site just downstream from where the canal enters the river. Habitat, invasive species, depth measurements, air and water temperatures, dissolved oxygen, conductivity, turbidity, flow rate, zooplankton and phytoplankton were measured at each site. The tests were repeated at each site three times on different dates. The data was then compared statistically using ANOVA with an alpha value of 0.05 and Tukey's method of multiple comparisons to find potential variation between sites. Although there was no significant variation among sites for stream quality, there did seem to be a rising trend where the river downstream had higher quality compared to the canal. The results reject my hypothesis that the water would be higher quality in the canal than the river.

Board 12 DEVELOPING A MICROSENSOR ARRAY FOR THE MONITORING OF GLUCOSE AND KETONE LEVELS IN DIABETICS. Kristin Butler, 821 Nela View Rd. Cleveland Heights OH 44112 (Hatthaway Brown School).
This research focused on the development of an array of micro sensors to aid diabetics in controlling their blood sugar levels. The glucose sensor would aid in monitoring blood glucose and ketone levels. The first phase of the project involves the fabrication and testing of a cost-effective, accurate glucose sensor, followed by a ketone sensor in the second phase, and concluded by an insulin infusion system in the third phase. The glucose sensor was fabricated using thick film printing technology. The sensor was designed using AutoCAD and was printed onto an alumina substrate by the silk-screening method. The sensor contained three electrodes: an anode, a cathode, and a reference electrode. Both anode and cathode were platinum, and the reference electrode was silver-silver chloride. Glucose oxidase was immobilized onto the surface of the sensor using protein cross-linking with glutaraldehyde. This enzyme catalyzes the sensor measures glucose by detecting the amount of hydrogen peroxide produced in the following reaction: Glucose Oxidase C6H12O6 + O2 → C6H12O6 COO+ + H2O. Testing of the sensor has been conducted at five concentrations: 50mg/dl, 100mg/dl, 150mg/dl, 200mg/dl, and 250mg/dl. The collected data was analyzed on a trendline, and correlation coefficients for sensors tested at both three point and a five point standard curve were calculated. The second phase of this project involves further fabrication and testing of a ketone sensor. Glucose oxidase was then tested against UV light to find out how UV light affects S. marcescens. To find out the answer to the question, "Will it be mutated, making it susceptible to antibiotics, or will it be killed?" To do this experiment, the bacteria was exposed to UV light at different intervals of time. The intervals were 0 hr, 2.5 min, 5 min, 7.5 min, 10 min, 12 min, 15 min, 30 min, 1 hr, 2 hr, 4 hr, 6 hr, and 8 hr. The UV light used was part of a handheld UV light with an integrated photometer to measure the amount of UV light. The different intervals were the changing variable. Then the plates were incubated overnight to enhance the bacterial growth. The next day, the surviving bacterial colonies were incubated into the MCl (Minimal Inhibition Concentration) trays. Those were then incubated overnight. The next day, the results were read using a magnifying mirror reader. This experiment was done twice to ensure the results. It was thought that the UV light would basically kill the S. marcescens and make the surviving colonies more susceptible to antibiotics. This was expected from the background research done on how UV light affects DNA. The UV light did kill most of the S. marcescens but not all. It was concluded that more research needs to be done to the UV light. This is most likely a mutation because of the pigment change and changes in susceptibility seen in the S. marcescens after their exposure to UV light. It turned them aecem color from their original red pigment. This supports Darwin’s theory of survival of the fittest. The colonies that survived became more resistant, therefore, would have a longer survival rate.

Board 13 TO RISE OR NOT TO RISE: YEAST IS THE ANSWER. Natalia D. Haflkowycz, Ukiahfood@aol.com 4450 Perry Circle, Seven Hills OH 44131 (Incarnate Word Academy).
The purpose of this project was to find out whether or not varying the amount of ingredients in a particular recipe for a loaf of babka (Ukrainian bread) will affect the rise, taste and appearance of the ultimate finished product. This experiment involved baking sixteen different loaves of bread including a control bread and variables including: 3x salt, no salt, hot milk (135°F), cold milk (35°F), 2x yeast, 50% yeast, no sugar, 2x sugar, addition of 1 tsp baking powder, addition of 3 tsp baking powder, distilled water, tap water, incubated yeast, frozen yeast, expired yeast, 50% more flour, and baking at 325°F. Each loaf was baked for 55 minutes in an oven preheated to 350°F. I largest hole size in the bread, yeast fermentation time, growth of yeast (bread) in the oven, and color of the bread were measured and recorded for each variable. The baked bread was taste-tested by five observers. Every ingredient affected the final baked product in a different way or another. The greatest rise occurred when no salt and expired yeast were used, and the least rise occurred when tap water and 325°F temperature were used. The best tasting bread was the control, and the worst tasting were when triple salt and cold milk were used. The darkest breads were produced when triple salt and cold milk were used, and the lightest breads when 50% yeast, 325°F temperature and baking powder were used. Fermentation time was shortest when hot milk was used, and longest when cold milk was used.

Board 15 IS THAT HAMBURGER YOU'RE EATING E. COLI FREE? Peter A. Hafkowycz, Rajaffe04@aol.com 4450 Perry Circle, Seven Hills OH 44131 (Incarnate Word Academy).

The purpose of this project was to find out if harmful E. coli (Type 0157:H7) can be found in local hamburger meat and to see if leaving meat in the refrigerator or on the counter will cause more bacteria to grow, and to see at what temperature it is safe to assume that the meat is safe from the growth of E. coli and other bacteria. The hypotheses included E. coli (Type 0157:H7) would be found in local hamburger, the meat that is left the longest will have the most E. coli and bacteria, and the meat that is thoroughly cooked will have the least amount of bacteria. Meat was cultured on triplicate soy agar and MacConkey agar plates, which were incubated. There were three different tests for the three different sources of hamburger meat (i.e. Tops, Giant Eagle, and Thayer's Meats in Cleveland Ohio in December 2000): refrigerator test, counter test, and cooking test. 22 MacConkey plates were tested for the presence of E. coli using special API strips that were incubated. No E. coli (Type 0157:H7) was found in local hamburger meat. Hamburger meat left out the longest on the counter or in the refrigerator had the most bacteria. And it is safe to assume that the meat is E. coli free at about 120 degrees Fahrenheit (i.e. cooked to medium).
modern materials literature, polysilicon was selected as the material to be used for the membrane. This research investigates the permeability and transport properties of polysilicon in order to evaluate its use as an artificial membrane. The testing device used is an "ussing chamber" in which the membrane is placed and tested for permeability and other properties. Prior successfull results using carbon dioxide as the transport medium were obtained: at pressures ranging from 0.42 psi to 0.66 psi, the flow rate of carbon dioxide was reported to exponentially increase directly with pressure and to range from 0.60 ml/min at 0.42 psi to 9.50 ml/min at 0.66 psi. Current testing is investigating liquid flow across the membrane. The results obtained thus far indicate that polysilicon is a viable potential candidate to be used in a BioMEMS artificial membrane.

Board 19 EFFECT OF STICK TWIST ON THE VELOCITY OF A HOCKEY SLAP SHOT. William C. Muscot, Rider3516@aol.com 3516 Darlington NW, Canton OH 44708 (GlenOak High School).

A hockey slap shot consists of a long, fast swing and hitting the playing surface behind the puck, which makes the stick flex and lean-flex into the puck, which gives the puck additional velocity. This study was conducted to see if the addition of twist to the stick bend can increase the velocity of the hockey slap shot. It was believed that the combination of bending and twisting of the stick would increase puck velocity. In order to achieve twist in the stick, the toe of the blade on the stick must strike the ground first. This result is a simultaneous bending and twisting of the stick. Using a gravity-powered machine to consistently shoot the slap shots, there were several different configurations of wedge and angles used in conjunction with the stick bend including seven puck positions and six stick paths. Tests with only the stick bend varied puck position, stick path, stick weight, and stick flexibility. The over one hundred tests with stick bend and twist varied six puck positions and six stick paths. Adding the stick twist caused an increase in puck velocity of 19% (42 KPH to 50 KPH) compared to a swing without the twist. Maximum puck velocity occurred when the puck was placed 175 mm behind the axis of rotation, and the stick hit the ground 335 mm behind the axis of rotation. This is 225 mm further than when no attempt is made to utilize stick twist. Field tests with out the machine showed that the author’s maximum puck velocity went up 15% from 60 KPH to 69 KPH when the swing was changed to maximize stick twist. It was concluded that stick twist can increase the puck velocity if the swing is modified to have the toe of the blade hit the ground first, and the ground must be hit further behind the axis of rotation than would be done otherwise.

Board 20 WINTER HYDROLOGY OF CLOUGH CREEK: DO THE AQUEOUS SOURCE DIFFER? A COMPARISON OF CREEK WATER, RUNOFF, ICE, AND SNOW. Jill E. Neagle, jillneagle@fuse.net 6711 Linder Lane, Cincinnati OH 45244 (Turpin High School).

Do the winter aqueous sources of a creek have similar water quality characteristics to each other? The initial hypothesis stated that creek water, runoff, ice, and snow from Clough Creek, Hamilton County, Ohio showed similar water quality results. Eight measurable water characteristics were taken from two sites on the Clough Creek three different times, each a week apart in January of 2001. Test kits were used to test the collected water for pH, hardness, carbon dioxide, nitrates-nitrogen, dissolved oxygen, chlorine, and acidity. These tests are considered standard water quality measurements. The results from the three samples taken were averaged together into Site A and Site B results. The results were graphed by specific characteristics tested at each site. The graphs indicated significant measurable differences from the same test. For example, the pH of the creek water was 7.7 while the snow was only 6.5. The hardness of the runoff was 22 gpg while the hardness of the ice was 8 gpg. There was also a difference between Site A and Site B in nitrate concentration as Site A was .22 ppm while in Site B it was only .05 ppm. Each source tested came from a different place. The ice had a low hardness concentration because the minerals or hardness are found in the rocks and on the bottom of the creek and the ice sample taken was at the top of the water away from hardness sources. In Site A, there was more runoff causing the nitrate concentration to be higher. These results supported the conclusion that the winter sources of Clough Creek do differ from one another consequently not supporting the original hypothesis.

Board 21 THE EFFECT OF SIDE DOMINANCE ON THE VISUOSpatial FUNCTION OF THE BRAIN. Tadah D. Manoian, manoian@columbus.rr.com 2240 Sedgwick Dr., Columbus OH 43220 (Upper Arlington High School).

The purpose of this research project was to determine whether right brain functions were more developed in left-handed people, more specifically, whether there was a correlation between handedness and visuo-spatialness. Visuo-spatialness is a right brain function, and is described as how someone interprets their environment, and one’s ability to see the “bigger picture.” This ability describes how someone perceives their surroundings and how well they can focus on more than one object at a time. The visuo-spatial ability of 31 high school students was judged by their performance on four tasks, after determining the side-dominance of each student. The tasks included a pencil and paper maze, constructing a surgeon’s skit, creating a star, and a memory test (subjects were shown 8 objects for 15 seconds and were then asked to recite the objects). Findings from this study suggest that side-dominance has no affect on visuo-spatial tasks. When the statistical analysis (which involved using a T-Test and a Chi Squared Test with the data) was completed with the data, the researcher found that any correlation between handedness and visuo-spatialness was too small to be considered significant (0.79, 0.54, 0.23, 0.036), and was due only to chance. This discovery is important because it supports the theory that left-handed people are not stronger in performing right-brain dominated functions. This research project also provides reason that left-handed persons are not right-brained.

Board 22 THE PERFECT WAVE. Andrew J. Loza, aloza@columbus.rr.com 6337 Montane Dr., Dublin OH 43016 (Kearr Middle School).

People often wonder why ocean waves break on shore and why some waves are more spectacular than others. The goal of this project was to identify factors affecting wave height. A 4-foot wave tank was built to simulate production of ocean waves. The wave tank was made using Plexiglas and an erector set. A paper grid was attached to the side of the tank to aid in the measurement of wave height (amplitude). A plastic paddle, moved manually at a constant speed, was used to generate the waves. The wave motion was recorded using a video camera and the tape played back at slow speed to facilitate the measurement of wave height. The resulting wave-height data were analyzed using a spreadsheet. An average of ten waves was used to generate each data point. Four variables were examined: distance traveled by the paddle, frequency of wave generation, distance from the paddle that the measurement was made and the presence/absence of a barrier simulating the slope of a beach. The distance that the paddle was moved appeared to have the largest effect on the amplitude of the waves. On average, a 51% increase in amplitude was observed when the distance the paddle was moved increased from one to five inches. The paddle position in front of the tank led to significant wave reflection and constructive/destructive interference. In all eight tests waves lost amplitude as they traveled away from the paddle. The presence of a barrier (shore) caused the waves to break reducing their amplitude. The results of these experiments could be applied to the problem of beach erosion caused by very large waves. Future projects would test structures capable of preventing large waves from hitting the shore. Since interference and resistance on the bottom of a wave play a large role in the wave height, one could find a way to cancel out or decrease the energy waves have and thus reduce erosion.

POSTER SESSION BIOLOGICAL 3:00 - 4:00 PM KERNS CHAPEL

Board 1 EFFECTS OF STREAM SIZE AND WATER WITHDRAWAL ON NERITINA GRANOSUS (GRAY SPAT DISPERSION AND MIGRATION IN IAO STREAM, MAUI). JASON B. DAVIES, jdavies@hawaii.edu University of Hawaii, Honolulu, HI 96822-2320; TIMOTHY M. FERNANDES, fernantm@notes.udayton.edu Joseph Boreman, GreenBeret52@aol.com Austin Halpin, austin_2009_14@yahoo.com Christopher Mikeltis, bonjour@wesleyan.edu Annie Mountcastle, ElnnaM1@aol.com Mary Rider, prosthetic_monkey@hotmail.com Chelsea Stengef, Chelseas.Jackson@mahall.com Eric Benbow, benbow@asu.edu Moidele D. McIntosh, mdaymc@hotmail.com Albert Burky, burky@udayton.edu University of Dayton, Dayton OH 45469-2320; JASON Farnsworth, FarnsworthJ@hawaii.edu Manteo Dr, Dublin OH 43016 (Karrer Middle School).

An amphibious limpet, Neritina granosus, endemic to Hawaii has a migration pattern hypothesized to be related to water availability and stream flow. Stream diversions prevent upstream migration from ocean to adult freshwater habitats. This capture-recapture study measures dispersion patterns and migration of spat (juveniles) from three sites in Iao Stream watershed. Spat from a popuated stream were tagged and released upstream and downstream of a diversion in Iao Stream, and into an upstream tributary (Kinihapai Stream). This stream system is normally void of naturally occurring N. granosus due to the diversion. Discharges at Iao sites downstream, upstream, and Kinihapai were 0.22±0.01, 2.39±0.17 and 1.96 mV, respectively. Initial dispersion revealed a higher proportion of downstream movement at the Iao downstream site (41%), with little or no downstream movement at the upstream sites (0-5%). There was an effect of site on mean migratory rate with Kinihapai group significantly faster (1.14 mV day-1, 1.14 mV day-1) vs. Iao sites (0.67 mV day-1 and downstream (0.38 mV day-1). We further found a significant effect of time (3, 5, 6 day release) between the Iao sites; however, after taking into account variation due to site, migration rates were only significantly different between day-3 (0.66 mV day-1) and day-5 (0.63 mV day-1) post-release in the downstream group. There was an effect of time in Kinihapai Stream with significantly fastest migration one day post release and declining from 2-4 days as spat dispersed, indicating effects of density on initial migration. Results indicate that reduced stream flow has a significantly negative impact on spat dispersion and migration downstream of diversions.

Board 2 MICROCHEM ETAL ANALYSIS OF THE TAYA RIVER CRAYFISH, CAMBARUSRYPTOGENIS, Wayne D. Roesser, roesser@notes.udayton.edu (Michael A.
potential refuge sites along two tributaries of Silver Creek at the J. H. Barrow Field.

Salamanders are an excellent indicator taxon for ecosystem health because of their sensitivity to water quality. To initiate a long-term population survey we surveyed potential refuge sites along two tributaries of Silver Creek at the J. H. Barrow Field Station in Hiram Township, Portage County. Each tributary was evaluated for salamander population diversity and density using the quadrant method on two different dates (15 & 23 Sept. 2001). A 1 in 1 meter square plot was sampled every 10 meters for 100 meters, heading upstream from Silver Creek. Three 100 meter transects were tested, two of them along the same tributary. Some of the plots contained running water and some were dry at the time of the survey. All movable rocks completely or partially inside the quadrant were lifted to observe salamander presence. Adult and juvenile salamanders of the following species in the following quantities were found: 13 Eurycea bistina, 21 Desmognathus fuscus, 24 Desmognathus ochrophaeus, and 8 Plethodon cinereus.

Board 4  SITE FIDELITY IN WOOD TURTLES (Clemmys insulcata) IN NORTHERN MICHIGAN. Erin Zaycek, s03.zaycek@wittenberg.edu Timothy L. Lewis, Phillip Huber, Wittenberg University Dept of Biology, Springfield OH 45504, 4 United States Dept of Agriculture, Forest Service, Mio Ranger District, Mio, MI 48459. Wood turtles (Clemmys insulcata) grow to a carapace length of 20 cm, weigh 800 g, and live in semi-aquatic environments in the northeastern and northern Midwest area of the United States and adjacent portions of southern Canada. Human impacts, such as habitat destruction and removal of animals for pets, pose significant threats to this species. Fidelity to a specific location, as opposed to habitat type, would put this turtle at risk in areas where such habitat changes are occurring. We used radio telemetry and mark-recapture techniques to determine fidelity to a specific location in the summer of 1998 through 2001 along Michigan’s Au Sable River in the Northern National Forest. The river corridor had a sandy soil substrate containing mostly jack pine (30.0%) and red pine (19.3%), as well as aspen (9.2%), wetland conifers (13.4%), and some other deciduous trees. The river channel itself constitutes just 2.7% of the protected corridor. This forest is managed for recreational and other public use, with the river corridor supporting thousands of canoeists and anglers. Of turtles found, 6 turtles were recaptured in multiple years. All showed overlapping home ranges between years, indicating annual site fidelity (P < 0.01). Because turtles return to or remain in the same locations year to year, it may indicate higher levels of site fidelity. Therefore, it may be important not only to protect habitat types but also specific locations.

Board 5  SURVEY OF AMPHIBIANS AT BIG ISLAND WILDLIFE AREA, MARION COUNTY, OHIO. Thomas P. Archdeacon, tarchdeacon@conu.edu Ohio Northern University, Ada OH 45810. Amphibians in Big Island Wildlife Area (Big Island Township, Marion County, Ohio) were surveyed using screen funnel trapping, search and seize, and vocalization surveys. The survey lasted 25 man-hours from 14 February to 21 May 2001. Three woodland pools and two fields were surveyed. Eight species of frogs (Order Anura) were detected, last known voucher is in parentheses.

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for the township, *Ambystoma tigrinum* (post 1950) and *Ambystoma opacum* (before 1950). The absence of *Ambystoma tigrinum* and other ambystomatid salamanders may be attributed to agricultural practices that have destroyed higher quality habitat needed for breeding.

**Board 10** MUSCLE FUNCTION IN THE DUSKY SALAMANDER (*DESMOGNATHUS FUCUS*): AN ANALYSIS OF METABOLIC ENZYME ACTIVITIES, LDH ISOZYME COMPOSITION, AND RECOVERY FROM EXERCISE. Elizabeth A. Russ, RUSS@ecum.edu (Brandon Sheafor, sheaford@ecum.edu) Mount Union College, Box 1950, 1972 Clark Ave, Alliance OH 44601.

Dusky salamanders (*Desmognathus fucus*), lack lungs and perform all gas exchange across their skin. Because they rely solely on cutaneous respiration, it is likely that their intake of oxygen is compromised and that diffusion of gases is impaired due to the need for skin to serve as an external barrier. It is not clear if dusky salamanders reduce ATP use, modify metabolic pathways, or rely on fermentation pathways in order to compensate for reduced respiratory surface area. For results to convey significance as to the function of lungs and the adjustments made by lungless salamanders, comparisons were made between *Desmognathus fucus* (n=5), and fire-bellied newts, *Cynops pyrrhogaster* (n=5), a lunged salamander species of similar mass. Citrate synthase (CS) was used as an oxidative marker enzyme and lactate dehydrogenase (LDH) as an anaerobic marker enzyme to determine the oxidative and anaerobic capacity of tissues. Analysis of tissue lactate accumulation and removal during exercise was also performed. Preliminary results show that CS activity in Desmognathus heart and liver tissues are twice what is found in Cynops. Desmognathus skeletal muscles, such as neck and tail tissue, demonstrate LDH levels that are seven and five times greater in Cynops, respectively. Desmognathus lactate levels approximated resting levels (+4 mmol/kg) 25-30 minutes after exercise. Lactate removal in this organism may be facilitated by the composition of LDH isozymes within tissues. Relative amounts of LDH isozymes will be quantified by native gel polyacrylamide electrophoresis to gain a clearer understanding of the mechanisms associated with lactate removal.

**Board 11** SOURCE/SINK: THE INFLUENCE OF COMMON SNAPPING TURTLES (*CHELYDRA SERPENTINA*) ON THE POPULATION DENSITY OF JUVENILE EASTERN PAINTED TURTLES (*CHRYSEMYS PICTA PICTA*). Kristen M. Reinhart, kristenj@muskingum.edu; David R. Brown, drbrown@muskingum.edu; and Michael Reinhart, ht367@ohio.edu, New Concord OH 43762 and University of Virginia, Blandy Experimental Farm.

Relatively few studies have defined source/sink habitats based on juvenile survivorship of the species in question. In this study, source/sink habitats for eastern painted turtles were determined by examining the percentage of juveniles in a series of 10 farm ponds. We assumed that ponds with a high percentage of juvenile painted turtles defined as a source habitat, while ponds with small numbers of juveniles acted as a sink. From 13 May through 3 August 2001, we set out to determine the extent to which common snapping turtles influence the numbers of juvenile painted turtles in 10 ponds ranging from 0.5 to 0.64 ha on the Blandy Experimental Farm in Clarke Co., VA. Using sardine baited hoop-net traps, we captured and marked a total of 107 snapping turtles in these 10 ponds. The differences in avian diversity were probably due to the plant variety and richness, and greater spatial heterogeneity in both the prairie and marshy habitats. Both wetlands compare species diversity between the study sites and among the three habitats. The Simpson species diversity index was calculated to compare species diversity between the study sites and among the three habitats. The species diversity index for habitat species diversity indicated that prairie habitat supported the greatest species diversity, followed by marshy area, then open water. This was probably due to the greater area covered by the prairie, and greater richness and heterogeneity in species. The need for skin to serve as an external barrier. It is not clear if dusky salamanders reduce ATP use, modify metabolic pathways, or rely on fermentation pathways in order to compensate for reduced respiratory surface area. For results to convey significance as to the function of lungs and the adjustments made by lungless salamanders, comparisons were made between *Desmognathus fucus* (n=5), and fire-bellied newts, *Cynops pyrrhogaster* (n=5), a lunged salamander species of similar mass. Citrate synthase (CS) was used as an oxidative marker enzyme and lactate dehydrogenase (LDH) as an anaerobic marker enzyme to determine the oxidative and anaerobic capacity of tissues. Analysis of tissue lactate accumulation and removal during exercise was also performed. Preliminary results show that CS activity in Desmognathus heart and liver tissues are twice what is found in Cynops. Desmognathus skeletal muscles, such as neck and tail tissue, demonstrate LDH levels that are seven and five times greater in Cynops, respectively. Desmognathus lactate levels approximated resting levels (+4 mmol/kg) 25-30 minutes after exercise. Lactate removal in this organism may be facilitated by the composition of LDH isozymes within tissues. Relative amounts of LDH isozymes will be quantified by native gel polyacrylamide electrophoresis to gain a clearer understanding of the mechanisms associated with lactate removal.

**Board 12** USE OF GEOGRAPHIC INFORMATION SYSTEMS IN IDENTIFICATION AND ASSESSMENT OF POTENTIAL SPOTTED TURTLE (*CLEMYS GUTFATA*) HABITATS IN OHIO. Joseph Ullmer, Ullmer15@comcast.net; John B. Ritter, jritter@wittenberg.edu; and Timothy L. Lewis, tlewis@wittenberg.edu Wittenberg University, Depts. Geology and Biology, Springfield OH 45501.

Populations of spotted turtles (*Clemmys guttata*) have declined over the last two decades throughout its range in eastern North America, largely due to habitat loss, predation, and over-collection. In Ohio, this species was listed as endangered until the late 1980’s, but its status was downgraded to “Species of Special Interest,” largely due to limited data on population status. Given the significance of habitat loss to this species and the extremely high percentage of wetlands destroyed in Ohio (91% of original wetlands lost), identification of potentially suitable habitat is important for conservation and restoration of wetlands. We are using ArcGIS to classify 500 Ohio habitats based on available data layers, including surficial geology, soils, wetlands, and groundwater potential data, digital elevation models, aerial photography, and various multi-spectral scanner data. For example, satellite images of the dry seasons has provided critical data for the wetland inventory previously identified in the wetlands inventory; groundwater potential data indicates vulnerability to nearby development. Ohio’s Natural Heritage Database includes 50 locations of reported spotted turtle sightings throughout 21 counties in Ohio since 1958. With these data we will predict potential habitats and evaluate these areas with site visits and comparisons to identified, state-protected wetlands.
FACTORS. Important in photosynthesis, they are thought to accumulate in response to abiotic environmental stresses, including intense light or low temperatures. A more complete characterization of these protective responses would have scientific and practical benefits, especially for the lettuce industry, which requires vividly colored products. Using cultivated lettuce (Lactuca sativa var. capitata) as a model system, the primary objective of this study is to determine the independent and interactive effects of temperature and light levels on anthocyanin accumulation. A related objective is to develop a rapid, reliable method for quantifying anthocyanin levels in plant tissue spectrophotometrically. A total of 432 plants from four varieties of L. sativa genetically predisposed to vary in anthocyanin production were exposed to differential light intensity and temperature treatments for 3 weeks in an environmentally controlled greenhouse at OSU/OARDC in Wooster, OH. The fully expanded leaves were removed from each plant at three developmental stages and subsampled. Sub-samples were frozen within 2 hours of removal and stored at -20°C until pigment extraction in HCl-methanol, and subsequent measurement. Anthocyanin levels are expected to be greatest in plants grown under full light and fluctuating temperatures, and lowest in plants grown under reduced light and constant temperature. Absorption spectra from preliminary samples show clear peaks at 420, 540, and 660 nm, accepted as absorption maxima for chlorophyll, anthocyanin, and chlorophyll, respectively. After ANOVA statistical tests to compare anthocyanin levels in tissue from each treatment, graphs will be designed to show these comparisons and the possible effects of light and temperature on anthocyanin accumulation.

Board 17 SEASONAL VARIATION IN EPIPHYTIC MICROFLORA OF POLYSTICHUM ACROSTICHOIDES. Ellen M. Giorand, giordano@osu.edu (Jonathan Scott, scottj@mu.edu) Mount Union College, 1972 Clark Ave., Alliance OH 44601.

Leaf surfaces provide an excellent environment—a source of water, nutrients, and protection—for the growth and reproduction of epiphytic bacteria, filamentous fungi, and yeast. Much research has been conducted on the epiphytic microflora communities associated with various plant species. While most of these studies have focused on crop plants, some work on non-woody plants has been done. For example, bacteria associated with filamentous fungi have been found to be increased by Wilt disease under greenhouse conditions. However, there is very little information available on microorganisms associated with ferns and their possible role in fern development. Hence, this project aims to investigate the epiphytic microflora diversity of Polystichum acrostichoides and to demonstrate that like many other plants, ferns show qualitative and quantitative seasonal variation in diversity of their epiphytic communities. Two naturally growing fern samples will be gathered from the woods of the Mount Union College Nature Center in October and November of 2001 and in January and March of 2002. After removal of casually associated microorganisms by washing in sterile water, their epiphytic microflora will be collected from leaves by brief sonication in sterile water. The sample washings will then be diluted and plated on potato dextrose agar with chloramphenicol (for isolation of filamentous fungi), wort agar with chloramphenicol (for isolation of yeasts), and nutrient agar with cycloheximide (for isolation of bacteria). Bacterial enumeration will be based on colony characteristics, oxidase and catalase reactions, and oxidation and fermentation tests. Yeast and filamentous fungi will be identified using available taxonomic reference sources. Population densities (as colony-forming units per cm²) and diversity indices will be determined for each category of microorganism.
sapid flux with sapwood depth in the dominant tree species, and 2) to compare stand-level sap flux with above-canopy measurements of latent heat exchange (LE). Thermal dissipation probes were used to measure sap flux velocities in five tree species: Acer rubrum (red maple), Larix laricina (paper birch), Pinus strobus (white pine), and Populus grandidentata (bent willow) and Quesera rubra (red oak). 5). Radial sap flux measurements were taken at 1 cm, 2 cm, and 3 cm depths in the xylem of A. rubrum, P. grandidentata, and Q. rubra. This study is on going, with results presented here from January through December 2001. We found all measured tree species responded to environmental conditions with similar trends in sap flux. Stand-level sap flux underestimated ecosystem LE by 21-56%.

Methods: One microcosm was used per treatment. The microcosms were then painted black and covered with a layer of soil to reduce light penetration. The microcosms were then covered with a plastic sheet to reduce water evaporation and placed in a growth chamber at a temperature of 25°C and a photoperiod of 16 h light:8 h dark. The microcosms were then allowed to equilibrate for 1 week before planting. After planting, the microcosms were then allowed to develop for 1 year before being harvested.

Analysis: Plant growth was measured by recording the dry weight of each plant species. Soil moisture was measured using a soil moisture meter. Light penetration was measured using a light meter. Temperature and humidity were measured using a temperature and humidity meter.

Results: The microcosms that were planted with a mixture of species showed the highest growth, followed by the microcosms that were planted with a single species. The microcosms that were unplanted showed the lowest growth. Light penetration was highest in the microcosms that were planted with a mixture of species, followed by the microcosms that were planted with a single species. Soil moisture was highest in the microcosms that were planted with a mixture of species, followed by the microcosms that were planted with a single species.

Discussion: The results of this study suggest that microcosms can be used to test the effects of different treatments on plant growth. The microcosms that were planted with a mixture of species showed the highest growth, which suggests that a diverse plant community is beneficial for plant growth. The microcosms that were unplanted showed the lowest growth, which suggests that a plant community is necessary for plant growth.

Board 23: EFFECT OF FERTILIZER, NURSERY CROPS, AND SEEDLING DENSITY ON COMPOSITION AND PRODUCTIVITY OF WILDFLOWER MEADOWS USING A COMMERCIAL SEED SOURCE. Michelle E. Greiner. greinemj@mu.edu (Dr. Charles McLaughlin, cmlaughlin@mu.edu) Mount Union College, 1972 Clark Avenue, Alliance OH 44601.

The success of using fertilizers to increase plant productivity is variable and depends on the type and amount of fertilizer used. To determine the effectiveness of different fertilization treatments, we conducted a fertilization experiment using a commercial wildflower seed mix. Eight 0.1 ha plots were established of four treatments, with 2 replicates. The treatments were: 1) Control (no fertilization), 2) Treatment 1 (500 kg/ha of 13-13-13 fertilizer), 3) Treatment 2 (1000 kg/ha of 13-13-13 fertilizer), and 4) Treatment 3 (1500 kg/ha of 13-13-13 fertilizer). The plots were fertilized with the respective treatments in late April of 2000 and the plant productivity was measured in late August of 2000. The results of the experiment showed that the Treatments 2 and 3 had the highest plant productivity, while the Control had the lowest. The results of this study suggest that fertilization can be used to increase plant productivity, but the amount and type of fertilizer used should be carefully considered.

Board 24: EFFECTS OF DECIDUOUS FOREST RESTORATION IN SOUTHWESTERN OHIO: SURVIVAL, WOODY RECRUITMENT, AND VEGETATION COMPOSITION FOLLOWING PLANTING DISTURBANCE. Carolyn Keiffer. keifferc@muohio.edu and Catherine Lesly. Miami University, Dept of Botany, Oxford OH 45056.

Successful conversion of pastures to forest is often hindered by the lack of structural complexity, which in turn reduces seed dispersal and woody recruitment. A long-term restoration study was initiated on a former pasture at the Fernald Environmental Board 24 EFFECTS OF DECIDUOUS FOREST RESTORATION IN SOUTHWESTERN OHIO: SURVIVAL, WOODY RECRUITMENT, AND VEGETATION COMPOSITION FOLLOWING PLANTING DISTURBANCE. Carolyn Keiffer. keifferc@muohio.edu and Catherine Lesly. Miami University, Dept of Botany, Oxford OH 45056.

Successional conversion of pastures to forest is often hindered by the lack of structural complexity, which in turn reduces seed dispersal and woody recruitment. A long-term restoration study was initiated on a former pasture at the Fernald Environmental Management Project in southwestern Ohio (Butler County). Our objectives was to establish a seedling density that has the best chance for successional conversion of pastures to forest. Eight 0.1 ha plots were established of four treatments, with 2 replicates of each: Control (no planting), Seedlings (120 individuals of 5 species planted), Mixed (120 seedlings, 100 saplings, of each: Control (no planting), Seedlings (120 individuals of 5 species planted), Mixed (120 seedlings, 100 saplings, of each: Control (no planting), Seedlings (120 individuals of 5 species planted), Mixed (120 seedlings, 100 saplings, of each: Control (no planting), Seedlings (120 individuals of 5 species planted), Mixed (120 seedlings, 100 saplings, of each: Control (no planting), Seedlings (120 individuals of 5 species planted), Mixed (120 seedlings, 100 saplings, of each: Control (no planting), Seedlings (120 individuals of 5 species planted), Mixed (120 seedlings, 100 saplings, of each: Control (no planting), Seedlings (120 individuals of 5 species planted), Mixed (120 seedlings, 100 saplings, of each: Control (no planting), Seedlings (120 individuals of 5 species planted), Mixed (120 seedlings, 100 saplings, of each: Control (no planting), Seedlings (120 individuals of 5 species planted), Mixed (120 seedlings, 100 saplings, of each: Control (no planting), Seedlings (120 individuals of 5 species planted), Mixed (120 seedlings, 100 saplings, of each: Control (no planting), Seedlings (120 individuals of 5 species planted), Mixed (120 seedlings, 100 saplings, of each: Control (no planting), Seedlings (120 individuals of 5 species planted), Mixed (120 seedlings, 100 saplings, of each: Control (no planting), Seedlings (120 individuals of 5 species plated), Mixed (120 seedlings, 100 saplings, of each: Control (no planting), Seedlings (120 individuals of 5 species plated), Mixed (120 seedlings, 100 saplings, of each: Control (no planting), Seedlings (120 individual...
high pressure. There is a strong correlation between capillary and erythrocyte size in vertebrates. Erythrocytes are approximately twenty-five percent larger than the capillaries through which they pass and are deformed in transit, presumably to ensure sufficient gas exchange. This experiment will quantify dimensions of erythrocytes and capillaries in both marine and freshwater teleosts. Comparisons between six freshwater and six marine fishes will determine if osmoregulatory selective pressures have produced significant differences in circulatory resistance. Fish will be anesthetized and a ventricular cannula surgically inserted. Blood will be drawn and the circulatory system flushed with isotonic saline followed by fixation of capillaries with 1.8% buffered glutaraldehyde. Erythrocyte and capillary diameters will be determined microscopically using digital analysis of perfused tissues.

FLORISTICS AND PLANT BIOLOGY
2:00PM Saturday, April 6, 2002
BATTLE HALL 115
BRIAN C. MCCARTHY-PRESIDING

2:20 FLORA AND VEGETATION OF A NEUTROPICAL, SAVANA IN NORTHERN BELIZE, CENTRAL AMERICA. Jessica E. Woo, woog@muohio.edu

Dept. of Biology, Denison University, Granville OH 43023.

B.2.3 EFFECTIVE POPULATION SIZE IN THE CLONAL, SELF-INCOMPATIBLE PLANT, HYMENOXYS HERBACEA. Lesley G. Campbell1, campbell.6523@osu.edu Brian C. Husband1, bhusband@uoguelph.ca 1775 Neil Ave, Dept of Evolution, Ecology and Organismal Biology, Ohio State University, Columbus OH 43210 and 2Dept of Botany, University of Guelph, Guelph ON.

Mating type diversity in populations of self-incompatible plants will decrease when effective size (N) is less than 50, due to the impact of genetic drift on S1 allele frequencies. To evaluate the impact of genetic drift on the clonal, self-incompatible plant Hymenoxys herbacea we estimated effective size (N) in two populations, under field conditions, using a demographic model for clonal plants, and (2) compared allelogenic diversity in population size 13 populations. Effective size was 2831 and 5856 in the two populations respectively and averaged 43% of the census population size. Elasticity analysis revealed that N was most sensitive to changes in the survival and frequency of non-reproductive adults, and variation in sexual recruitment had a much larger impact than sexual reproduction. The percentage of the nine loci that were polymorphic ranged from 11 to 48% (mean = 31%). The gene diversity averaged 0.2035 (SE = 0.08). There was a significant relationship between alloyne diversity and population size (N > 50).

2:45 A PHYLOGENETIC ANALYSIS OF CRYPTIC MOONWORT SPECIES (BOTRYCHIUMS, S.PHYLOGLOSSACEAE) USING RFLP AND tmlF DNA SEQUENCES. Heather M. Hawke, hawke.12@osu.edu (Warren D. Haak, has@denison.edu) May 22, 12:30-1:30, Denison University, Granville OH 43023.

Botrychium sensu strictu (s.s.), a group of ferns commonly called the moonworts, have a worldwide distribution, although the center of species diversity is in the mountains of western North America. Due to their relatively small size and simple morphology, species of Botrychium s.s. have been designated as "cryptic species." Thus, recognition and classification of moonwort species is challenging. The goal of this research is to determine whether these species are being confused, and if so, to establish a more complete phylogeny of Botrychium s.s. species.

3:30 MICROBIOTIC CRUST COMMUNITIES FIX NITROGEN IN A TEMPERATE OAK SAVANNA. Roberta M. Velucchi, velucchi@hotmail.com Kelly Ketcham1, kellybbones@yahoo.com Deborah A. Neher, dneher@uoft02.utoledo.edu Dept. of Earth, Ecological and Environmental Sciences, Mailstop 604, University of Toledo, Toledo OH 43666, Bowling Green State University.

Microbiotic crusts are a biological soil crust composed of lichens, cyanobacteria, green algae, mosses, and fungi. Although crusts are known to be a dominant source of nitrogen in soil and stabilize soil surfaces to resist erosion in arid and xeric habitats, this study is the first to examine ecological function of crust communities in xeric patches of temperate habitats. The study site is located within the Oak Openings Metropark of Northwest Ohio (41°14’38”N, 83°41’8”W). Using an acetylene reduction technique, we demonstrated that nitrogen fixation occurs in these crusts. Based on video imaging analysis of crust surface cover, proportion of moss cover explained more nitrogen fixation (p = 0.0012) than lichen, cyanobacteria or no cover (p = 0.72). Fluorescent microscopy revealed that moss surfaces are covered with cyanobacteria responsible for fixing nitrogen. Looking at the effect of depth, populations of cyanobacteria were greater on moss surface (0-30 mm) than subsurface (31-60 or 61-90 mm) strata of these crusts (p < 0.0001). Based on the assumption that moss tends to occur only in late successional and well-established crusts, this data support our hypothesis that more nitrogen fixation occurs in well-established crusts than in intermediate or non-established crusts. This study identified an important ecological function of microbiotic crust communities to promote conservation of lands with this habitat.

3:15 ATRIPLEX PROSTRATA (CHENOPODIACEAE) SEED DORMANCY AS INFLUENCED BY LONG-TERM COLD STORAGE. Christie T. Carter, christiecarter@ohio.edu Lorenza S. Brown and Irwin A. Ungar, Dept of Environmental and Plant Biology, Porter Hall, Ohio University, Athens OH 45701.

Atiplex prostrata produces two seed morphs. The larger brown seeds germinate readily when produced and the smaller black seeds require a cold stratification treatment to promote germination. While the seed morphs exhibit two different dormancy types, physiological changes in dormancy cycles may be slowed or altered during cold storage. We investigated the effects of long-term cold storage on the dormancy of morphic seeds of A. prostrata to determine whether these stored seed morphs exhibited annual changes in their dormancy cycles. Atiplex prostrata seeds collected in 1998 from an inland saltmarsh in Ritman, Wayne Co., Ohio, were stored dry at 5°C. Beginning in April 2000, 25 large and small seeds each were placed in 50 mm petri dishes with filter paper and 2 ml distilled water. Four replicates of each seed type were exposed to four temperature regimes (5°C, 5°C/25°C, 15°C/25°C and 20°C/35°C, 12°C/night/12-day) at monthly intervals over a one-year period. We found a significant interaction of seed size, temperature and month (p = 0.05) on the germination of the two seed morphs. The germination of seeds to go to different temperature regimes during storage at 5°C varied with the month that seeds were removed from the cold treatment. Large seeds had their highest rate of germination in 20/35°C temperatures whereas small seeds showed the highest rates of germination in 5/25°C temperatures. Our data indicate that both seed types maintain endogenous rhythms of dormancy as indicated by their germination patterns.
EFFECTS OF ORGANIC MULCHING AND FERTILIZING TREATMENTS ON POPULATIONS OF RIVER BIRCH ECTOMYCORRIZAS

Jennifer H. Wagner, wagner.343@osu.edu and Dr. P. Brian Bond, bond@olemiss.edu, The University of Mississippi, Dept. of Plant Pathology, 201 Cotman Hall, University of Oxford 38243.

A relative lack of research on the effects of compost in plant production and establishment is an obstacle to the rational use of this environmentally friendly resource. Mycorrhizas are symbiotic associations between some soil-borne fungi and the root systems of the majority of plants that have been demonstrated to be beneficial to the fitness of the plant host. In general, mycorrhizal colonization has been shown to improve the health status of trees. This study quantified and partially characterized populations of ectomycorrhizal fungi colonizing the roots of River birch (Betula nigra) trees grown in experimental plots under different treatments that included mulching with composted yard waste and shredded wood pallets, and N-P-K fertilization. The various mulching and fertilization treatments, alone and in combination, were expected to elicit changes in ectomycorrhizal populations. The procedure consisted of isolation, quantification, and morphological typing (i.e. mycorrhizal type of the ectomycorrhiza). Treatment appeared to affect the occurrence of morphotypes with a slightly higher diversity being found in the yard waste plots. Fertilization appeared to affect total root mass/length, while mulching significantly increased colonization percentage. Results of this study suggest that use of compost in tree establishment and maintenance may indirectly contribute to overall tree health by increasing natural mycorrhizal infection. Thus, this study indicates that composted soil amendments may be a viable and superior alternative to mineral fertilization.

APOSEMATIC WARNING COLORATION IN VASCULAR PLANTS OF SOUTHEASTERN OHIO

Brian C. McCarthy, mccarthy.ohio.edu and Darin L. Rubino, Dept. of Environmental and Plant Biology, Ohio University, Athens OH 45701.

Aposematic coloration, the use of conspicuous color to advertise unpleasant qualities to potential predators, is well documented in the animal kingdom. However, similar use of warning coloration in plants to advertise physical armaments (spines, thorns, or prickles) has been, until recently, unreported. The hypothesis was that plants using aposematic coloration to advertise physical armaments might be protected from future bouts of herbivory if herbivores associate color or a color pattern with unpleasantness. The goals of this investigation were to document the presence of aposematic coloration in the native and naturalized flora of southeastern Ohio (USA). Additionally, we wanted to gain a rudimentary idea regarding the commonality of aposematic coloration in the native and naturalized flora of southeastern Ohio (USA).

DOES INDUCIBLE ANTIBIOTIC RESISTANCE IN ESCHERICHIA COLI K12 VOLTAGE ACETYLPHOSPHATE PATHWAY? Abhishek Sanaria, saharia@acs.wooster.edu, David M. Hix, Clayston E. Doggett, and Kathryn L. Holmes, School of Natural Resources, Ohio Agricultural Research and Development Center, The Ohio State University, 1600 Madison Avenue, Wooster OH 44691.

Little is known concerning the composition and structure of the ground-flora in Ohio's riparian forests prior to European settlement, yet these forests are a unique part of the flora as one of the last remaining habitats. We initiated a study to examine the vegetation-environment relationships of the riparian area associated with a small intermittent, headwater stream located in Johnson Woods State Nature Preserve, a 206 acre old-growth forest remnant located in north-central Ohio. Using transects arrayed perpendicular to stream flow, we sampled the ground-flora vegetation (herbaceous and woody plants < 1 m tall) and soils of 193 1 m plots. Using TWINSPLAN, we classified the most common ground-flora species (28 out of a total of 75) into eight species groups, each with characteristic patterns of distribution. Ordination analyses of these 28 species indicate that ground-flora vegetation is strongly related to a variety of environmental factors, including distance from the bankfull channel, organic matter content, and fine texture soils. This suggests that ground-flora species are ordered along a complex environment from the stream edge to the uplands. Although we observed no significant differences in species richness between the floodplain and upland landforms sampled, there are differences in functional lifeform guilds. Specifically, graminoids, annual forbs, and perennial forbs dominate the floodplains, while woody seedlings and vines dominate the adjacent uplands. While these old-growth riparian forests are an unrealistic target for many of the highly disturbed riparian systems in northeastern Ohio, the results suggest that the restoration of riparian-ground flora communities should focus on maintaining a diverse array of plant functional guilds in these headwater systems, rather than the traditional single species grass-tree buffers that are currently being restored along many streams in north-central Ohio.

TESTING MECHANISMS RESPONSIBLE FOR THE LATITUDINAL GRADIENT OF SPECIES DIVERSITY

Marina H. Stevens, hasslers@ohio.edu, 316 Pearson Hall, Dept. of Botany, Miami University, Oxford OH 45056, and J. Price, Rutgers University, L. Kirkhoff, Rutgers University, and P. J. Morin, Rutgers University, Rutgers University.

Biodiversity generally increases from the poles to the tropics. Different explanations for this diversity gradient focus on either the maintenance of diversity (ecological mechanisms) or the generation of diversity (evolutionary mechanisms). In a queer twist of fate, ecologists have neglected to replicate the planet in order to perform the necessary experiments. We used laboratory microcosms where "climate" was scaled to the generation time of protists and bacteria to test whether ecological explanations could explain the latitudinal diversity gradient. If ecological mechanisms drive the latitudinal gradient, then short-environmental treatments that mimic latitudinal variation in climate should result in diversity peaking in tropical treatments. We imposed a complex laboratory-climatic gradient on aquatic habitat microcosms containing bacteria, protists, and small metazoans. Our gradient consisted of five treatments: polar, subpolar, temperate, subtropical, and tropical treatments. We scaled seasonal variability to the generation time of protist ciliates, so that 1-3 generations of ciliates would occur in four microcosm seasons, or one microcosm year. These treatments had mean temperatures of 2, 4, 8, 16, and 24 degrees Celsius and seasonal ranges of 0, 2, 6, 8, and 0 Celsius degrees, respectively. These light and temperature combinations mimicked the long-term averages, seasonal variability and diurnal variability of temperature and light along the earth's latitudinal gradient. Ciliate protist diversity peaked in subpolar and temperate treatments, and multiple polynomial regressions found that species richness was most closely related to temperature range. These results are not consistent with ecological mechanisms, but rather, are most consistent with evolutionary explanations for the latitudinal gradient of species diversity.

ALL-TAXON BIODIVERSITY INVENTORY OF DEEP WOODS, HOCKING COUNTY, OHIO.

David J. Horn, horn.1@osu.edu, Cynthia Ricardi, cr68168@oak.cats.osu.edu, Brian J. Armitage, armitage.7@osu.edu, Dept. of Entomology, The Ohio State University, Columbus OH 43210, 21st Century Environmental and Plant Biology, Ohio Agricultural Research and Development Center, The Ohio State University, Columbus OH 43210.

No streams have been restored in the southern Appalachian mountains after 100 years of recovery from the effects of historical mining. Deep Woods is a 114-hectare parcel in Benton Township, Hocking Co., which contains a rich variety of habitats, from early seral stages (mowed lawn, old fields) through mature oak-hickory and beech-hemlock maple forests. A riparian corridor and topographical relief generate microhabitats. In 1998 the Ohio Biological Survey and Ohio Division of Wildlife initiated an All-Taxon Biodiversity Inventory to document...
animal and plant species of Deep Woods, with special attention to species that are rare or of restricted distribution. All major habitats have been sampled systematically, using visual observation (terrestrial vertebrates), electroshocking (fish), pitfall, Malaise and blacklight traps (invertebrates), litter extraction (microarthropods) and vegetation transects. Species determinations are entered into a database that includes precise location and pertinent ecological information (such as plant-insect associations). Species documented to date are: Algae, 151; Lichens, 38; Vascular Plants, 341; Arthropods, 1300; Mollusks, 27; Fish, 22; Amphibians, 18; Reptiles, 20; Birds, 125; Mammals, 33. Surveys of Bryophytes and fungi will be initiated in 2002. Several arthropods (e.g. the craneflies Pedicia vermiculata and Tipula fraterna, the ground beetle Harpalus somnulentus and 11 species of Collemboidea) have not been previously reported from Ohio. Several rare plant species (e.g. round-leaved catchfly) and unusual vertebrates (smooth earth snake, blue grosbeak) have been documented. The study provides a valuable baseline for characterizing the flora and fauna of unglaciated Ohio including nearby parks, state and private forests, and natural areas. The biodiversity of Deep Woods is of particular interest due to strong pressure for economic development in rural southeastern Ohio.

9:45 COMPOSITION, STRUCTURE, AND DIVERSITY OF THE WOODY REGENERATION LAYER OF THREE MIXED-OAK FORESTS IN SOUTHEASTERN OHIO. Matthew A. Albrecht, mc323500@ohio.edu Brian C. McCarthy, mccarthy@ohio.edu Ohio University, Dept of Environmental and Plant Biology, 317 Porter Hall, Athens OH45701.

Developing an advance regeneration layer of mixed hardwood species is important if forest managers are to successfully regenerate mixed-oak forests in the central Appalachian region. The primary objective of this study was to determine if the inclusion of a number of important trees (oak, hickory, white ash) by manipulating the composition, structure, and diversity of the woody regeneration layer can be an effective tool for forest managers in characterizing the composition, structure, and diversity of the woody regeneration layer of three forests in southeastern Ohio (Raccoon Experimental Management Area (REMA), Tar Hollow State Forest, and Zaleski State Forest). Tree seedlings and saplings were surveyed in 300 m² plots distributed across 12 stands within the three forests. Seedlings and saplings were each divided into three size classes based upon height and diameter. Mean density of saplings per ha was significantly greater at REMA (1963.3 ± 97.5), than Tar Hollow (1238.5 ± 45.9) and Zaleski (886.7 ± 66.9). However, the density of seedlings per ha was significantly greater at Zaleski (97825 ± 7143.9) than at REMA (64185.7 ± 4486.0) and Tar Hollow (75650 ± 7077.2), indicating lack of seedling advancement into the sapling layer at Zaleski.

The Shannon-Weiner Diversity Index revealed that REMA had a significantly greater diversity than Tar Hollow and Zaleski at both the seedling and sapling strata. A discriminant analysis (DCA) of sapling stratification showed a distinct separation of Tar Hollow from REMA and Zaleski, suggesting a marked difference in the species composition of the regeneration layer at Tar Hollow compared to REMA and Zaleski. Land use history is the most likely factor driving compositional and structural differences between sites.

10:00 FUEL LOADS IN SOUTHEASTERN OHIO MIXED-OAK STANDS. Cynthia L. Riccardi, riccardi@ohio.edu Brian C. McCarthy, mccarthy@ohio.edu Ohio University, Dept of Environmental and Plant Biology, Ohio University, Athens OH45701.

Researchers have developed fuel models to predict and describe forest fire behavior and intensity. Components of fuel models include characteristics of fuels, vegetation, and environmental conditions. Two primary determinants of fuel models are fuel load and particle size. To elucidate fuel loads in the Central Hardwoods region, ground and environmental covariates in fuel models developed for the Central Hardwoods region. Fine fuel loads are stand and site specific, perhaps due to various factors associated with overstory, understory, and coarse woody debris (CWD, logs ≥ 10 cm diameter) in a mixed-oak forest of southeastern Ohio. Trees, saplings, and CWD were measured and identified in fifty 500 m² plots stratified across slope aspect and slope position. To explore relationships between overstory and understory species composition and topographic gradients, redundancy analysis (RDA) was performed. RDA revealed that trees’ distributions were significantly related (P < 0.001) to the measured environmental and vegetation parameters (slope aspect, percent slope, topographic position, plot age, canopy cover, and maximum tree height). RDA of sapling species’ distributions were also significantly related (P < 0.007) to the measured environmental and vegetation parameters (slope aspect, percent slope, topographic position, plot age, canopy cover, maximum tree height, tree basal area, and tree density). Oak (Quercus sp.) and Acer rubrum trees and saplings reached their highest importance in more wetter plots (steep, upper-slope, and/or southwest-facing plots). Canonical correspondence analysis revealed no significant relationship between CWD species and the measured environmental and vegetation parameters. CWD density was significantly correlated (r = 0.299; P = 0.03) with slope position with higher densities in valley than on ridges. Also, oak CWD was significantly correlated (r = 0.481; P < 0.001) with overstory oak importance. Topographic gradients proved to be of predictive value in describing overstory and understory species composition, but not for CWD species distributions.

10:30 CLASSIFICATION AND CHARACTERIZATION OF FOREST ASSOCIATIONS WITHIN AN OHIO NATURE PRESERVE. Beth E. Krisko1, bethkrisko@hotmail.com Robert S. Whyte2, rswhyte@antioch-college.edu Orel R. Loucks3, louchesk@muohio.edu Antioch College, Glen Helen Ecology Institute 405 Corry St. Yellow Springs OH 45387 and Miami University, Dept of Zoology, Oxford OH45056.

Glen Helen is a 1,000-acre nature preserve and environmental education facility located in Greene County, Ohio. The land, given as a gift to Antioch College in 1929, is currently owned by the college and managed by the Glen Helen Ecology Institute (GHEI). For the nature areas, GHEI seeks to develop a long-term management plan. Critical to this process is an understanding of the full range of forest community diversity. Based on existing vegetation and total woody species composition, forest vegetation was sampled, characterized, and mapped. Transects were established and walked, qualitatively describing composition and structure of vegetation and physical attributes of the landscape. Along each transect, where topography and plant composition were uniform according to field observation, plots (N = 100) were randomly established and measurements taken to obtain values of relative cover for overstory species and density for overstory and understory species. Using Principal Component Analysis (PCA), plots were grouped into 12 dominant types. For individual dominant classes which contained more than four plots, PCA was used to further differentiate associations. Twenty-four distinct association types were found. Each association was named by dominant and differentiating species, and characterized by dominant, differentiating and common species and their corresponding summary statistics, such as average dbh and height. Dominant types were mapped using qualitative description from transects, and interpretation of topographic maps, soil surveys, and historical and current aerial photos. Individual associations were mapped using plot data and qualitative field description.

10:45 EFFECTS OF HERBICIDE (ROUND-UP®) ON ALLIARIA P A T E R O L I A, AN INVASIVE BIENNIAL HERB, AND SUBSEQUENT EFFECTS ON THE NATIVE PLANT COMMUNITY IN HUESTON WOODS STATE NATURE PRESERVE. Adrianne M. Carlson, carlsona@muohio.edu Miami University, Dept of Botany, Oxford OH45056. Alliariapatens (garlic mustard), an invasive biennial herb, has become established in Hueston Woods State Nature Preserve in southwestern Ohio. Due to concerns about its impact on native species, the preserve has begun a multi-year eradication program using dormant season herbicide (Round-up®) treatment. To investigate the effects of Round-up® on A. patens and forest floor plants, we established 50 x 1 m plots in patches of high A. patens density in two of the stands of the preserve (an old and a secondary growth stand) in May 2000. Twenty-five plots in each section were randomly assigned to be sprayed (Nov. 1, 2000), while the rest were not sprayed. All plots were censused for density of A. patens in May, June, Aug., Oct. 2000 and 2001. This census will continue through 2004. In addition, percentage cover of each vascular species and demographic data on representative forest floor vascular species were determined during the 2000 and 2001 growing season. Based on percentage cover data, species richness and diversity were calculated and detrended correspondence analysis (DCA) ordination was done to determine whether or not community changes took place due to A. patens decline. While A. patens density significantly decreased immediately after spraying in both stands (ANOVA: P = 0.0002, P = 0.046), density of the spring 2001 cohort was not affected. Neither richness nor diversity increased more in experimental than in control plots. However, significant overall composition changes following Round-up® treatment took place in the old growth stand (DCA Axis 1 scores: ANOVA: P = 0.021).

The Ohio Journal of Science Vol. 102 (1)
INTRODUCTION AND SPREAD OF THE NON-INDIGENOUS NORTHERN STUDFISH (Fundulus catus) IN THE UPPER LITTLE MIAMI RIVER DRAINAGE. Matthew J. Greene, greene.19@osu.edu and Ted M. Cavender, Museum of Biological Diversity, 1315 Kinnear Road, Columbus OH 43212-1192. During a recent fish distributional survey (1999-2001) of the upper Little Miami River drainage, we were able to map the current distribution of the northern studfish in the little Miami mainstem and its tributaries near Xenia, Greene County, Ohio. The studfish is one of the 48 species found as resident population in the upper Little Miami. Based on collecting done in 1995 by the Ohio Division of Wildlife (District 4), the studfish was first noted near the mouth of Massies Creek at Xenia. In 1997, the studfish was still confined to Massies Creek. By 1998 there was an established population in lower Massies Creek where all growth stages, including young-of-the-year, were collected. At that time the studfish was also in the Little Miami River mainstem just upstream from the mouth of Massies Creek. By the summer of 2000, the studfish had spread about 7 miles upstream in Massies Creek as far as the Cedarville Gorge area, as was also the case in the Massies Creek tributary Old Town Creek. In the Little Miami River the studfish has spread upstream to Conner Branch tributary and to Jacoby Road Bridge (RM 83.1). Downstream it spread past Fairgrounds Road in Xenia (RM 78.2). The studfish now occupies an approximately 24 square mile area of the Little Miami drainage in Xenia Township. It prefers small stream habitat where there are abundant gravel beds and backchannels with firm substrate derived from limestone.

HUMAINPACT ON CETACEANS IN THE HAWAIIAN ISLANDS. Lazzetta DeBord, LDeBord@ursuline.edu Brita Ann Banyard, bbanyard@ursuline.edu Biology Dept, Ursuline College, 2550 Lander Road, Pepper Pike OH 44124. In recent years tourism, commercial fisheries, and the military have been encroaching on the habitat of several species of dolphins in and around the Hawaiian Islands. There is little or no data on the population density and distribution; therefore it is hard to determine the effects of these intrusions on the habitats of the dolphins. As Hawaii considers adding night ferries and is considering allowing additional military maneuvers in the area, these studies will assist in the decision as to whether or not these projects should be reconsidered. Dolphin density data were collected through visual sightings within randomly predetermined computerized trisects. Data continues to be collected and evaluated to determine if any changes have occurred in the population distribution and density estimations of dolphins and if there exists any correlation between those changes and an increasing human presence.

ZOOLOGY I

9:00 AM SATURDAY, APRIL 6, 2002

BATTLE HALL 103

JACK KOVACH-PRESIDING

9:00 INVASIVE ROUND Goby IMPACTS ON BENTHIC MACROINVERTEBRATES IN LAKE ERIE, J. Michelle Pino, Pino@wcmich.edu, 2252 E. State St, Fremont OH 43420 and Jeffrey G. Miner, jminer@bgsu.edu Dept of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.

Two invasive species in the Great Lakes have had substantial impact on the Lake Erie ecosystem. Zebra mussels (Dreissena polymorpha) occupy large percentages of available hard substrate and have been shown to alter phytoplankton and zooplankton communities via their collective filtration capacity. Feces and pseudofeces from this activity, as well as increased light penetration, have altered habitat for other benthic macroinvertebrates, generally increasing abundance and diversity. Round gobies (Neogobius melanostomus) are specialized predators of zebra mussels and it has been predicted that at high densities, they will consume high numbers of zebra mussels, thus altering ecosystem processes. We conducted a manipulative enclosure experiment in Lake Erie (August 1997), exposing zebra mussel-dominated benthic communities to direct and indirect effects of round gobies at three densities (0.4, 5.1, and 11.4 goby/m2) and cageless controls. After about one month, round gobies had consumed 40-65% of the zebra mussels. In addition, richness of the macroinvertebrate community declined by 25% at the high round goby density (ANOVA, p=0.03). Microtendipes pedicellatus, a chironomid closely associated with zebra mussels, was eliminated at the highest round goby density. Round gobies are proving to be as important an invading species as zebra mussels in the benthic communities of Lake Erie.

ZOOLOGY II

2:00 PM SATURDAY, APRIL 6, 2002

BATTLE HALL 103

NANCY J. SNAILS-PRESIDING

2:00 EFFICACY OF RECORDED ALARM AND ALERT CALLS FOR GOOSE DISPERSAL. Kenneth J. Stope, kjstope@capital.edu Capital University, Dept of Biology, 2199 East Main St., Bexley OH 43209. Giant Canada geese, Branta canadensis maxima, are a nuisance species in urban settings where they use manicured lawns of residences, corporate parks and golf courses. From March to August 2001, six weeks of research were conducted to evaluate the use of playback of recorded alarm calls as a means to disperse several hundred flightless geese and goslings from 10 hectares of grass test growth testplots at local lawns and garden corporation headquarters. Calls were played at a randomized 7-10 minute intervals down to a distance of 50 feet. Results (Dr. Philip Whitford, Capital University, Capital University, Department of Biology, 2199 East Main St., Bexley OH 43209) Modified to play recorded alert and alarm calls series by the author's advisor, Dr. Philip Whitford, during dissertation research on Canada goose vocal communication. On First activation, call playback caused all geese present to vacate a 16+ hectare area. Call playback caused all geese present to vacate a 16+ hectare area of ponds for two weeks after the call units were deactivated. Complete elimination of geese occurred for the first four days. Habitation began after some 120 repetitions of call playback and goslings assumed feeding on the test plots. Call units were shut off for three weeks thereafter of no playback. As a result, geese were observed to give birth to up to 60 viable young before they expired - a clear example of geese eating their escargot and having it.
using multiple categorical states, including AB (abnormal), AG (aggressive), EX (exploration), FD (feeding), LA (inactive), OT (other), PL (play), SO (social), and TE (tension). Over sixty hours of fifteen-minute individual behavior samples have been compiled and analyzed. The group observed at the Columbus Zoo in Columbus, Ohio, the largest captive group of bonobos, comprised a population of several individual species. Nest predation has been cited as a possible explanation for these population declines. Additionally, it has been suggested that the type of land use activity outside of fragments may influence predation on nests. I explored the influence of both land use patterns outside of a fragment, and fragment size, on nest predation of experimental nests. I expected to find that the land use outside of a forest fragment has an influence on nest predation levels. I used four forest fragment sites, 2 sites surrounded predominately by urban development and 2 sites surrounded predominately by agriculture. All fragments were roughly 2.5 ha in size. I also selected two sites in a continuous forest of 200 ha. I sampled the sites with artificial nests for 4 weeks. Predation rates were higher in fragments than in the continuous forest. Predation rates were similar in agricultural and urban fragments and were high in all habitats examined (average of 85% nests predated). Predation rates at all sites increased over the course of the study. Using geographic information systems (GIS), I will examine the relationship between nest predation rates and land use patterns by modeling predation rates as a function of land use.

**2:30** PRIMARY SENSE SWITCHING IN COURTSHIP IN THE BROWN TREE SNAKE (Boiga irregularis). D.E. Geis, dgeis@wosuer.edu The College of Wooster, 55 South senior, Wooster OH 44691.

Sensory cues important to brown tree snakes (BTS) have been compared in the context of foraging, but not in other settings. In foraging, vision is the primary sense used for searching. Other senses are used when the visual cue is inadequate or absent. In courtship, only pheromonal cues have been examined, so their importance relative to other stimuli is not known. Female BTS pheromonal cues have been demonstrated as releasers and inhibitors of courtship in males, but visual mate searching and/or identification have not yet been considered. To examine this, four male BTS were given a choice between a filter paper treated with the non-volatile attractive female sex pheromone and an actual female. It was hypothesized that the males would choose to approach the female rather than cut the filter paper. The filter paper was placed so that it was the first stimulus that the male encountered, and the choice was recorded as whether the male subsequently courted the filter paper or approached the female for courtship. Each male was given seven trials, each with a different female. Another such trial was conducted for each male, in which the first visual stimulus was replaced by a rope on the floor. In 21 of 28 trials the males' response was to court the live females; they courted the rope in three of four trials. The null hypothesis is therefore rejected. These results might be expected in a taxon that is primarily visually guided. Pheromone detection and trailing are important, but sense modalities may be switched when one cue is dominant to another—for example, a pheromone may be trailed until visual contact with a potential mate is made, when the primary sense is switched from olfaction to vision.

**2:45** A PUZZLING TELEOTROC. Jennifer A. Tieche, jtieche@capital.edu Biological Sciences Dept, Capital University, 2199 E. Main St., Columbus OH 43209.

This photographically well-documented research report describes the development of a functional telotroch (the free-swimming, re-colonizing stage) from a zooid that is broken-off from a sparsomene-bearmg, colonial, contractile, stalked Peritrich prototrozoan. Under duress created by extensive microscopic viewing, zooids would break free from the observed Peritrich specimens and subsequently die. But in one instance, a detached zooid survived and appeared to successfully make the transformation from zooid to telotroch in its detached state. Microphotographs were taken at approximately five-minute intervals and show the transformation of a small, eel-shaped, detached zooid into a telotroch resembling that of a Zoanthumum macrozoooid. The oddity of this transformation is increased by the placement of the ciliary girdle at the scapular end of the zooid, while the oral zone remained wide.

**3:00** COMMUNITY STRUCTURE OF SCLERACTINIAN CORALS AT THE PARAISO NEARESTSHOREFRINGINGREEF CREST, COZUMEL ISLAND, MEXICO. John F. Vitullo, jvitullo@capital.edu Dept of Biology, Capital University, 2199 E. Main St., Columbus OH 43209-2594.

Coral reef community structure and its effectors are not well understood by the marine science community. Research and quantitative analysis was conducted on the nearshore reef environment at Paraiso reef, Cozumel, Mexico, to investigate scleractinian coral relative abundance based on head sizes of 1 mm, 3 mm, and 5 mm. To elucidate any underlying patterns that govern Caribbean species diversity and abundance with respect to head size, it was hypothesized that each coral head size exhibits a different diversity of included coral species. Data collection utilized self-contained underwater breathing apparatus (SCUBA) during five 50-minute dives spanning January 8, 9, and 10, 2001. These dives permitted species identification and collection of percent head coverage data of species on 7 sets of 1 mm, 3 mm, and 5 mm coral head communities. Data analysis compared the relative abundance and diversity of species on varying size coral heads. Our hypothesis was supported via reasonable Cohen's f diversity index between head sizes of 1 mm and 3 mm, 5 mm. Cohen's f provides a standardized measure of difference between two groups with congruent variances. No difference was determinable between 3 mm and 5 mm heads.

**3:15** EFFECTS OF LAND USE ON PREDATION LEVELS OF EXPERIMENTAL NESTS IN FOREST FRAGMENTS OF NORTHEASTERN OHIO.

**3:30** REPTILES IN AN AGRICULTURAL LANDSCAPE: USE OF GIS AND ROAD-SURVEY DATA. Raymond S. Matlack, matlack@wooster.edu Ryan L. Rehmeier, rreymir@ksci.edu College of Wooster, Dept of Biology, 931 College Mall, Wooster OH 44691 and Division of Biology, Kansas State University, Manhattan KS 66506.

Much of the land suitable for cultivation in the Midwest has been converted to row-crop agriculture. However, little is known about the use of agricultural land by reptiles. Using geographic information systems (GIS), we examined use of an agricultural landscape by reptiles by investigating the relationship between locations of reptiles, derived from road surveys, and habitat surrounding a road using geographic information systems (GIS). The landscape was composed of agricultural (44%), woodlands (42%), developed lands (10%), rivers (3%) and tallgrass prairie (1%). Intensive surveys were conducted along a 10-km stretch of road through this agricultural mosaic from May 2000 to June 2001. We observed 67 individuals of 16 species of reptiles during 2370 km of cumulative road surveys. We found a negative relationship between species richness and the proportion of cropland within 25 m of the road (R2 = 0.61, P < 0.05). Richness and total abundance was positively related to the proportion of woods within 25 m of the road (R2 = 0.54, P = 0.01; abundance: R2 = 0.80, P < 0.01). Riparian woodlands and the surrounding waters are important habitats for reptiles in this agricultural landscape. In addition, these habitats likely serve as travel corridors between hibernation sites and summer habitats.

**3:45** LIKELIHOOD OF INTESTINAL PARASITE INFECTIONS IN DOGS YOUNGER THAN TWO YEARS. Trina S. McGowan etal@bioiogy.com (Deit & A. Buniyand, bbunyard@ursuline.edu) Biology Dept, Ursuline College, 2550 Landor Road, Pepper Pike Ohio 44124.

All dogs are plagued with intestinal parasites at some point in their lives. Puppies are especially susceptible due to the multiple modes of transfer they encounter, (transplacental, trans-mammary, and from the environment). The goal of this research was to determine the likelihood of intestinal parasite infection in dogs less than or equal to two years of age. Statistical analyses were run on data collected from 145 fecal samples. Parasite species encountered in the fecal samples included Isospora canis, Toxocara canis, Trichuris vulpis, Taenia sp., Dipylidium caninum and Uncinaria stenocephala. Among the findings of this study were that dogs younger than 3 months were more likely to be infected than older puppies. Also, a dog that had no other dogs in the household was more likely to be infected than those having other dogs nearby.

**Aquatic Biology I**

**9:00AM SATURDAY, APRIL 6, 2002**

**Battelle Hall 126**

**J.G. Kooser-Presiding**

**9:00** DEVELOPMENT OF A BENTHIC MACROINVERTEBRATE INDEX TO ASSESS BIOLOGICAL INTEGRITY IN THE OHIO RIVER. Jerome M. Applegate, applegate@bioue.ohio.edu Paul C. Baumann, baumann@bioue.ohio.edu T. Enrich E. Emery, emery@organo.ohio State University School of Natural Resources, 2021 Coffey Rd., Columbus OH 43210-5000, United States Geological Survey and Ohio River Valley Water Sanitation Commission.

The causes of degradation of aquatic systems are often complex and stem from a variety of human influences. Comprehensive, multimetric biological indices have been developed to facilitate the quantification of this degradation and its effect on aquatic communities. Traditionally, indices have concentrated on small to medium-sized
9:15 ASSESSING THE EFFECTS OF HIGHWAY CULVERTS ON PRIMARY HEADWATER STREAMS: PRE-CONSTRUCTION FINDINGS. James G. Kooser, Jim Kooser@urscorp.com Tracy L. Engle, Tracy.engage@urscorp.com Brad M. Falkenburg, brad_falkenburg@urscorp.com Jeffery W. Bridgland, jeff_bridgland@urscorp.com URS Corporation, 800 W Saint Clair Ave Ste 500, Cleveland OH 44113-1323.

The Ohio Environmental Protection Agency (OEPA) developed the Headwater Habitat Evaluation Index (HHEI) to assess the habitat quality of primary headwater streams. The HHEI differs from the Qualitative Habitat Evaluation Index (QHEI) used to assess larger streams by assessing habitat for salamanders and macroinvertebrates rather than fish. We began a five-year study to determine how well the methods assess habitat quality, and whether the HHEI can detect habitat degradation as a result of highway construction. We studied six streams in Athens and Meigs Counties, five that will be crossed by a new highway; one that will not be crossed.

We identified three sampling zones in each stream, one upstream of each proposed culvert and two downstream (one stream lacked a far downstream zone). Within each sampling zone we established three 10-meter long sampling areas (total number of 10 meter sampling areas = 31). In each sampling area we recorded physical characteristics (bankfull width, flood-prone area, maximum depth, depth of three deepest pools, riffle-run characteristics), sediment size (sand, silt) and substrate (rock, organic matter, clay, etc.). We collected macroinvertebrates using timed searches, and evaluated each stream using the HHEI. During pre-construction sampling we found 514 salamanders representing 4 species, 1,432 macroinvertebrates representing 19 orders, and 86 fish from 3 species. Initial analyses found correlations between the biological data and several habitat variables. The sampling will be repeated in 2006, after highway construction is completed.

9:30 AN ASSESSMENT OF SUBSTRATE EMBEDDEDNESS IN SIX SOUTHEASTERN OHIO PRIMARY HEADWATER STREAMS. Brad M. Falkenburg, brad_falkenburg@urscorp.com James G. Kooser, jeff_bridgland@urscorp.com Tracy L. Engle, tracy_engle@urscorp.com and Jeffrey W. Bridgland, jeff_bridgland@urscorp.com URS Corporation, 800 W Saint Clair Ave Ste 500, Cleveland OH 44113-1323.

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9:45 CORRELATIONS BETWEEN STREAM BIOTA AND STREAM CLASSIFICATION IN SIX SOUTHEASTERN OHIO PRIMARY HEADWATER STREAMS. Jeffrey W. Bridgland, Jeff_Bridgland@urscorp.com James G. Kooser, Jim Kooser@urscorp.com Tracy L. Engle, tracy_engle@urscorp.com and Brad M. Falkenburg, brad_falkenburg@urscorp.com URS CORPORATION, 800 W Saint Clair Ave Ste 500, Cleveland OH 44113-1323.

A Primary Headwater Habitat (PHWH) Stream Evaluation on six headwater streams in Athens and Meigs County, Ohio was conducted with the objective of evaluating the Headwaters Habitat Evaluation Index (HHEI) designed by the Ohio Environmental Protection Agency. Five primary headwater streams with proposed culvert impacts and one un-impacted control stream were studied. Three field metrics (Stream Channel Substrate, Maximum Pool Depth, and Average Bankfull Width) were collected within a 200-foot section (divided into three zones each) to calculate an HHEI score. The stream was then assigned a class (Class I—ephemeral, seasonal dry; Class II—water warm adapted native fauna; Class III—cool water adapted native fauna). Correlations between macroinvertebrate and salamander populations and stream habitat parameters were sought. Class III streams contained on average 146 individual macroinvertebrates from an average of 10 orders and 41 individual salamanders per sampling zone. Class II streams contained on average 30 macroinvertebrates comprising 4 orders and 19 salamanders per sampling zone. Although average number of individuals was directly proportional to Class ranking, it should be noted that a limiting factor is presence of water. All eight Class II zones had water present while only four of eight Class II zones contained water. Preliminary analysis suggests other habitat variables such as bankfull width, flood prone width, and substrate appear to be less directly related to salamander and invertebrate numbers than the presence of water.

10:00 GENETIC DIVERSITY OF PHORMIDIUM RETZII (CYANOBACTERIA) IN A LOW-ORDER WOODLAND STREAM. Dale A. Casamatta, dac73859@ohio.edu and Morgan L. Vis, Dept of Env. and Plant Biology, Ohio University, Athens OH 45701.

This research addresses the genetic diversity of the cosmopolitan cyanobacterium Phormidium retzii in a spatial and temporal scale in a headwater stream. Random amplified polymorphic DNA (RAPD) markers were employed to examine genetic similarity of colonies collected from permanent plots along the stream. Eighteen samples yielded a total of 87 and 90 bands among 29 and 51 samples in 2000 and 2001, respectively. In 2000, distance analysis revealed five major groupings, which were not correlated with sample date or stream location (upstream vs downstream). Eight of the 10 samples from the final collection date did group together, to the exclusion of all others. Principle Coordinate Analysis (PCO) revealed two clusters, one of which included all of the samples from the last collecting date to the exclusion of others. ANOSIM results using RAPD data did not show significant differences in genetic variation among the three sample dates (86 and 14% variance among and within dates). A PCO using 2001 data showed five clusters based primarily on collection date. AMOVA did not show any significant differences in stream locations, but showed significant (p<0.05) differences by date (77% variance among dates). One possible reason for the genetic similarity of Phormidium retzii is that the final collection date was due to the early development of the colony population from the previously geographically isolated populations. The genetic population of Phormidium retzii continued to grow to the point of being widespread in 2001 from the samples collected in the last collecting date, while the populations from the upstream and downstream locations were isolated from each other. The results of this research suggest that Phormidium retzii has the ability to adapt to new environments.
The Hawaiian Islands are located 3700 km from the nearest continental land mass and as such provide an interesting research opportunity to study freshwater organisms intolerant of seawater. The freshwater biota has been only partially studied with little research on the stream macroalgae. The only previous study, which focused solely on stream macroalgae, reported 25 new species to the Hawaiian Islands from 34 stream segments sampled. The purpose of our study was to expand the sampling of streams to better determine macroalgal distributions and species richness. Twenty-three additional stream segments (10 on Oahu, 8 on Kauai and 8 on Maui) were sampled for macroalgae. The physical and chemical parameters of each stream were measured. Stream segments ranged greatly in size from 1.2 m to 40 m in width. Water temperature was relatively uniform (ca. 21°C) but other physical parameters differed from site to site (pH 5.5-8.9, specific conductance 20-2000/μS/cm). Mean species richness per stream segment was 4.2 with two to seven species collected per segment. To date, 21 infrageneric taxa have been identified from the Chlorophyta (8), Cyanobacteria (7), Rhodophyta (5) andCryptophyta (1). The most abundant taxa were Cladophora glomerata, Compsopogon coelogynus and Phormidium reticulatum. All three of these species are cosmopolitan. Seven of the taxa are new records for streams in the Hawaiian Islands. The large percentage (33%) of new taxa suggests that more research such as this study needs to be conducted to fully catalog the Hawaiian stream macroalgal diversity.

10:45  PRELIMINARY REPORT ON SOME FRESHWATER ALGAE OF ECUADOR. Susan Carty, scarty@heidelberg.edu and John D. Hall II, jhall2@heidelberg.edu Dept of Biology, Heidelberg College, Tiffin OH44883. The freshwater flora of Ecuador is poorly known. This report provides preliminary information about the freshwater pyrrophytans in Ecuador. There has been some work on diatoms but other groups remain unstudied. In June 2001 samples were collected as whole water by using a 10/4 ml plankton net from 52 locations in the interior (Amazonian) and Andean regions and examined within hours using a Swift field microscope. Nine additional samples from Ecuador have been provided by Dr. Miriam Kanan. Amazonian sites consisted of oxboow lakes along the Rio Shiripuno, and small ponds and lakes along the road from the river to Coca. Andean sites were principally in the Cajas National Park near Cuenca. Genera in the Scenedesmaceae include Scenedesmus, Coelastrum, genera in the Desmidiaeae include Micrasterias, Desmidium, Cosmarium, Gonatozygus, Bamhusina, Pleurotaenium, Staurostrum, Arthrodesmus, Xanthidium, and Closterium. Pyrrophytans include Gymnodium, Sphaerocodium, Peridinium, and Hemiastrum.

AQUATIC BIOLOGY II
2:00PM SATURDAY, APRIL 6, 2002
BATTLE HALL 126
ROBERT KLIPS-PRESIDING

2:00 IMPACTS OF COLIFORM BACTERIA AND LIMESTONE SEDIMENT ON ORCONECTES INERMIS (DECAPODA: CAMBARIDAE) IN PLESS CAVE, LAWRENCE COUNTY, IN. Matthew C. Hazleton, mohzalton@wittenberg.edu (Horton II, Hall, Klips@wittenberg.edu) Dept of Biology, PO Box 720, Wittenberg University, Springfield OH45501-0720. The impact of coliform bacteria and limestone sediment pollution on the aquatic ecology of Pless Cave (Lawrence County, IN) was explored by examining the relative abundance of blind crayfish, Orconectes inermis inermis. Specific conductance, water hardness, pH, and temperature were measured to detect possible negative effects of the pollutants. Because O. i. inermis is the climax species of Pless Cave’s aquatic ecosystem, it could be used as an accurate indicator of ecological health. Twelve data sets, composed of physicochemical and biological information, will be collected with six having been accumulated to date. This will provide an accurate year-round portrayal of the ecology of Pless Cave. Results to date suggest that neither the limestone sediment nor the coliform bacteria are having major negative impacts on the Pless Cave ecosystem. Two gonad spills in the 1980s severely impacted the Pless Cave community based on comparisons of current data with those of the early 1970’s. No other spill crayfish population data are available to compare with data from this study.

2:15 A NEW METHOD FOR STUDYING NUTRITIONAL LIMITATION OF PERiphyton. Sarah E. Hamsher, sh35108@ohio.edu Dale A. Casamatta, Nanda R. Filsin, Amy S. McClintic, Wayne B. Chastain, Robert G. Verb, and Margaret L. Visi, Dept of Environmental and Plant Biology, Ohio University, Athens OH 45701 and Dept of Biology, Ohio Northern University, Ada OH45810. Acid mine drainage impacts 16,900 km of streams in the Appalachian region, but little is known about the biology of these habitats. Numerous studies have been conducted employing maize pots to assess periphyton nutrient limitation. Recently, research has concluded that this methodology may have inherent flaws due to variable porosity. Therefore, development of new nutrient diffusing substrates is needed. To test a new approach for nutrient diffus ion, petri dishes were filled with agar and the nutrient of choice. A Whatman glass microfiber filter (GF/F) was attached to the top of the dish, which served as the medium through which the nutrients diffused and a uniform surface area for periphyton colonization. Before testing in a stream impacted by acid mine drainage, laboratory studies were conducted to simulate field conditions. Nine containers were filled with 1.0L acidified (pH 3) distilled water, which was circulated via individual stir plates. Diffusing petri dishes with either 0.5Mu nitrate or phosphorus were placed into the containers. Water was saturated with nutrients within a few days and thus was changed every other day for the first few weeks. After one week the nitrate concentration in the experimental study approached ambient local stream water concentrations. However, the phosphorus concentration (0.76 mg/L) remained 10 fold higher (0.076 mg/L) than that found in the streams of interest. This laboratory study suggests that a phosphorus concentration of 0.5 Mu is suitable for long-term field studies but that the nitrate concentration may need to be increased. Seasonal assessment of this approach is currently underway employing in situ experiments.

2:30 A CONSTRUCTED WETLAND TREATMENT SYSTEM DESIGNED FOR ACCOMMODATION OF BOTH HIGH NUTRITION NURSERY PAD EFFLUENT AND AGRICULTURE STORMWATER RUNOFF. Becky F. Lipmann, lipmann.3@osu.edu Environmental Science Graduate Program, Ohio State University, 210 Kottman Hall, 2021 Coffey Rd, Columbus OH43210 (Dr. Virginie Bouchard, bouchard.6@osu.edu) Dr. Martin Quigley quigley.30@osu.edu Dr. Jay Martin, martin.126@osu.edu Dr. Tim Granata, granata.8@osu.edu Dr. Larry Brown, brown.2222@osu.edu Constructed wetlands have been developed for two main reasons: to substitute function for a natural wetland that was lost or removed, or to enable watershed managers to reduce or remove toxic or harmful substances from drainages. Many agricultural constructed wetlands are designed to ameliorate impacts of stressful environmental inputs, such as high nitrogen concentrations, chemical pollution and sediment. Urban “detention ponds” are usually designed to slow runoff and to filter petrochemical pollutants, but not sediments. This study focuses on the potential for treating multiple land-use inputs within a single wetland system. A double basin constructed wetland treatment system (CWTS) has been constructed on the OSU Waterman Farm to test the treatment of a consistently high nutrient influent—a nursery container production pad—while providing sufficient retention of periodic storm water runoff from agricultural drainages. Nutrient and suspended sediment concentrations will be quantified at several points in the CWTS. Random soil samples will be tested periodically for bulk density, percent carbon and methane, carbon dioxide and denitrification potentials. Plant community structure (LAI, biomass, species composition) and sediment dynamics will indicate water treatment performance. Initial results include bulk density range between 1.18-1.98 g/cm3 and LAI range between 0.04-0.44. It is hypothesized that from the inlet to the outlet of each wetland cell, plant density will decrease, species diversity will increase and sediment deposition and pollutants level will decrease. This CWTS was created to explore minimization of costs and land requirements for agricultural wetlands, and to demonstrate a method for zero-discharge farming practice.

2:45 EFFECT OF ENVIRONMENTAL STRESS ON SOIL NEMATODE LIFE HISTORY CHARACTERISTICS; Andrew J. Hosken, ahosken@hotmail.com 15750 Ida Center Rd, Petersburg MI 49270 and Deborah A. Neher, deborah.neher@utoledo.edu Dept of Earth, Ecological and Environmental Sciences, University of Toledo. Nematodes are found in ecosystems ranging from tropical rainforest to arctic tundra. Indices of nematode community structure and composition such as species richness, trophic structure, and successional status are useful in monitoring soil health. Index values decrease in soils contaminated with heavy metals. The goal was to confirm life history traits of Rhabditidae, a group of nematodes generally believed to tolerate heavy metal contamination. Two nematode populations were isolated using a 4th order index, on a scale of 1 to 5, with 1 being most tolerant and 5 most sensitive to environmental stress. Acrobelesoids and Rhaditiss, two genera of Rhabditidae, were extracted from two soil sites, cultivated in petri dishes containing Nematode Growth Medium, and fed Escherichia coli OP50. The nematodes were then subjected to different metals that were mixed into the medium. Their survival and reproduction were measured. Both genera were closely related but respond very differently to stress, and this sensitivity increased with duration of time in culture. Those taken from contaminated soil lost their tolerance to the same soil contaminants; those taken from uncontaminated soil also exhibited lower tolerances to stress. This suggests that current techniques used for ecotoxicological testing of nematodes should consider the possibility of rapid loss of tolerance in culture.

3:00 INDUCED HIGH TEMPERATURE HARDINESS WITH THE COLLEMBOLAN SINELLARIA CURVITAEK. Kimberly D. Shazig, Kimmie10@aol.com Richard L. Stewart Jr, Stephen J. Diakoff. Malone College, Dept of Natural Science, 51525 ST NW, Canton OH44709. SineUraavis, Insecta: Collembola, are abundant, widespread insects. Members of this order display a wide range of temperature tolerance that enables them to survive
anywhere on Earth. Our experimentation has revealed this species’ higher lethal temperature limits. These spruce seedlings were reared continually at approximately 23°C with twelve-hour light-dark cycles and 100% relative humidity. They were transferred from their normal rearing chambers into test tubes and exposed to temperatures ranging from 36°C to 40°C within incubators. Their higher lethal temperature (HIT) was discovered at 39°C at 53%. This may convey increased hardiness above their unexposed HIT. We predict that longer pre-exposure times at lower stressors will provide an increase of survivorship at their unexposed HIT.

3:15 BIODIVERSITY AND ECOLOGY OF MYCOPHAGOUS DIPTERA IN NORTHEAST OHIO. Brita A. Bynard, b huntingbird@ohiou.edu Osteology College, Biology Dept, Duquesne Science Center, Pepper Pike OH 44124.

During their ubiquity in nature, few studies have been conducted worldwide to determine the ecological importance of mycophagous diptera (fungi-feeding flies). For this study, 134 species from 30 families of Basidiomycetous fungi and 19 species from 11 families of Ascomycetous fungi were collected from different sites in Northeastern Ohio (Cuyahoga, Geauga, and Portage Counties). Many fungal species were collected on different dates throughout the growing season (March-November, 2001). Different sites were utilized to understand the community of insects. During the entire flowering period spanning late July through mid-September, 2001, a small low population at Stages Pond State Nature Preserve (Pickaway County, Ohio) was visited during mid-afternoons at 5-day intervals. All arthropods occurring on 10 haphazardly selected flowers were sampled, counted, and identified. Common insects include several detritivores to the plant such as the generalist flower-feeding Japanese beetle (Popillia japonica), a specialist weevil (Conotrachelus flavipes) that feeds on the flowers as adults and on the fruits as larvae, and two bruchid seed beetles (Altica spp.). One of the bruchids, A. hibisci, although apparently rare in Ohio, was much more common than the very similar A. folkersti. Male-biased bruchid sex ratios (2.6:1) were noted early in the season (26 July), possibly as females frequently younged to oviposit there. Beneficial and commensal flower associates are the specialist anthophorid “hibiscus bee” (Ptilotrichus bombiformis) that provisions her nest with nectar of pollen, and a sap beetle (Conotethus obscurus). Seasonal changes in insect species occurrence were noted, as bruchid density (beetles per flower) dropped mid-season in apparent inverse relation to the total number of blossoms. The bruchid A. folkerstli was encountered only during the first two sample dates (26 July and 31 July), while the sap beetle and a pomace fly (Drosophila sp.) were common later.

3:30 GENETIC VARIABILITY AND PHYLOGEOGRAPHIC PATTERNS OF A NONINDIGENOUS SPECIES INVASION: A COMPARISON OF EXOTIC VS NATIVE ZEBRA ANDQUAGGA MUSSEL POPULATIONS. Konstantina Skaltsa, K. Skaltsa@osu.edu Ohio State University, Columbus, Ohio 43210. Clifford D. Taylor. Carol A. Stepień, c.stepień@csuohio.edu Northeast Ohio (Cuyahoga, Geauga, and Portage Counties). Many fungal species were collected on different dates throughout the growing season (March-November, 2001). Different sites were utilized to understand the community of insects. During the entire flowering period spanning late July through mid-September, 2001, a small low population at Stages Pond State Nature Preserve (Pickaway County, Ohio) was visited during mid-afternoons at 5-day intervals. All arthropods occurring on 10 haphazardly selected flowers were sampled, counted, and identified. Common insects include several detritivores to the plant such as the generalist flower-feeding Japanese beetle (Popillia japonica), a specialist weevil (Conotrachelus flavipes) that feeds on the flowers as adults and on the fruits as larvae, and two bruchid seed beetles (Altica spp.). One of the bruchids, A. hibisci, although apparently rare in Ohio, was much more common than the very similar A. folkersti. Male-biased bruchid sex ratios (2.6:1) were noted early in the season (26 July), possibly as females frequently younged to oviposit there. Beneficial and commensal flower associates are the specialist anthophorid “hibiscus bee” (Ptilotrichus bombiformis) that provisions her nest with nectar of pollen, and a sap beetle (Conotethus obscurus). Seasonal changes in insect species occurrence were noted, as bruchid density (beetles per flower) dropped mid-season in apparent inverse relation to the total number of blossoms. The bruchid A. folkerstli was encountered only during the first two sample dates (26 July and 31 July), while the sap beetle and a pomace fly (Drosophila sp.) were common later.

3:45 PHYLOGEOGRAPHY OF BATRACHOSPERMUM HELMINTHOSUM (RHODOPHYTA) IN NORTH AMERICA. Wayne B. Chiasson, achiasson@ohiou.edu Ohio University.

The freshwater red alga, Batrachospermum helminthosum, is distributed primarily in streams of eastern North America. Although it is often an abundant and conspicuous component of the algal flora for many streams, little is known about the genetic relationships among populations throughout its range. The purpose of our study was to elucidate geographic patterns among populations to gain insight into the biogeographic distribution of this species and possible modes of dispersal. Individuals were sampled in 13 stream segments as follows: four locations in Ohio, two locations in Michigan and one location each in Indiana, North Carolina, Tennessee, Louisiana, Rhode Island, Massachusetts and Connecticut. The mitochondrial spacer region (372bp) between the COX2 and COX3 genes was chosen because it is variable among individuals. This region was sequenced for 15-20 individuals from each location. Fourteen haplotypes were identified among the 13 locations with most locations having only one haplotype. Two haplotypes were present in three of the Ohio stream segments, but these populations differed in the frequency of each haplotype. Interestingly, the other Ohio and North Carolina populations had only the first haplotype whereas Connecticut and Rhode Island only showed the second haplotype. The Indiana, Louisiana and Michigan populations each had a unique haplotype. The Tennessee population had three haplotypes, one of which was very similar to the Michigan haplotype. The relationships among these populations are very complex but there may have been a recent dispersal event or gene flow among the Ohio populations and those in Massachusetts, Rhode Island and North Carolina.

4:00 Hibiscus flowers in the northeast U.S. support diverse assemblages of insects. Robert A. Klips, klips.1@osu.edu Ohio State University, Marion, Ohio 43003. George D. Kenney, keneey.1@osu.edu Ohio State University, Marion, Ohio 43003. Donna L.52006. The relationships among populations are very complex but there may have been a recent dispersal event or gene flow among the Ohio populations and those in Massachusetts, Rhode Island and North Carolina.
Salt marsh haying (the removal of above-ground vegetation with a tractor) is a traditional activity on East Coast salt marshes and is still carried out throughout Plum Island Sound, located in northeastern Massachusetts. The removal of approximately 90% of the above-ground biomass of the salt marsh by haying may alter many ecological processes within the salt marsh. One such process is the production of above-ground above-ground algae. There should be a marked increase in above-ground algae following haying. Sediment core samples were taken at three marsh sites, each about 1 to 2 hectares in area. Two sites are regularly hayed (EPH and HAY), and one is an un-hayed reference site (PUH). At PUH and EPH, six 1-m² quadrats were placed randomly in two different vegetation zones, Spartina alterniflora and Spartina patens. Three quadrats in each vegetation zone at each site were cleared of above-ground vegetation using hedging clippers, and three were uncultivated as reference quadrats. A HAY, three 1-m² quadrats were established within each of the above-ground algae areas following haying. Six sediment cores (3 cm in diameter, 1 cm depth) were taken from each quadrat at day 0, day 1, day 14 and day 30 after clipping (or haying). The benthic chlorophyll a was extracted from the core samples using 90% acetone and absorbance readings were measured on a spectrophotometer at two wavelengths, 750 nm and 650 nm. The measurements of benthic chlorophyll a were utilized as an estimation of the algal biomass present. We found that although there was a significant difference in algal biomass between hayed and un-hayed sites (ANOVA, P<0.05), clipping appeared to have no significant affect on algal biomass (ANOVA, P>0.05). We suspect that haying on a large scale, but not small-scale removal of the plant canopy, increases the amount of benthic algae present.

4:45 VANCYMIN RESISTANT ENTEROCOCCI IN STREAMS OF WAYNE COUNTY, OHIO. Lori M. Miskavić, mt79560@jlnku.edu (Dean Fang and Mara L. C. Benson) College of Wooster, Department of Biology, 1189 Beall Ave., Wooster OH 44691-2363. Agricultural antibiotic use, particularly the use of the antibiotic vancomycin in animal husbandry practices, may have an effect on the amount of vancomycin resistant enterococci (VRE) found in streams surrounding these farms. Vancomycin is commonly called the drug of last resort because it is often the only antibiotic to which some pathogens remain sensitive. If VRE from contaminated water were to get inside the interior duct of humans, the bacteria could potentially spread their antibiotic resistance genes to other intestinal bacteria, therefore rendering vancomycin useless. It is hypothesized that the probability of occurrence of VRE will increase with an increase in antibiotic use in animal feed on farms. Water samples were collected from October through December 2001 from 103 randomly selected sites in 31 watersheds in Wayne County, Ohio. Each sample was filtered through a cellulose nitrate membrane and plated on Enterococcus agar. Enterococcus colonies were then plated on Brain Heart Infusion agar supplemented with 6% milk/vancomycin in to select vancomycin resistant enterococci (VRE). Sampling found 72% of the 103 samples showed the presence of VRE. Among those plates there is variation in the amount of VRE present, ranging from 1 to 29 colonies. By the conclusion of my project, I hope to be able to predict the occurrence of VRE by examining land use in the watershed. This model can then be used to create a predictive map of Wayne County that indicates the probability of finding VRE within a stream for the sampling period of fall, 2001, by using geographical information systems.

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9:00 AM SATURDAY, APRIL 6, 2002
BATTLE HALL 144
DANIEL J. KASER-PRESIDING

9:00 NITRIC OXIDE AND ENDOTHELIAL NITRIC OXIDE SYNTHASE MAY PRODUCE A HYPOTENSIVE EFFECT IN A LOW BLOOD PRESSURE LINE OF WISTAR-KYOTO (WKY) RATS. Colin M. Everhart, Daniel Ely, ali@wooster.edu, College of Wooster, Department of Biology, 1189 Beall Ave., Wooster OH 44691-2363. The hypothesis tested was that a greater amount of endothelial nitric oxide synthase (eNOS) protein and nitric oxide (NO) will be produced in the WKY/Low blood pressure (LBP) strain than in both the WKY/Normal blood pressure (NBP) and SHR/Spontaneously Hypertensive Rat (SHR) strains (n=8/group). Blood pressure (BP) was measured by tail-cuff method and recorded at 12 and 20 weeks of age and correlated to NO and eNOS levels. Aorta, hearts, and livers were removed and frozen at -70 °C. The relationship between BP and NO output between SHR and WKY LBP was statistically significant (r=0.01, r²=0.43). This suggests that NO production may produce a hypotensive effect in a LBP line of WKY rats.

9:15 EFFECTS OF A MIXTURE OF TWO SPECIFIC PCBMOLECULUS GENERAL DEVELOPMENT, THYROID STATUS, AND ANNEUROCHEMICAL MEASURE IN 15- day OLD SPRAGUE-DAWLEY RATS. Chelsa S. Combs, combs_chels@yahoo.com Michelle J. Meekows, Katherine Kuenzer, Terri Provest, Christa Bowen, and Lee A. Meserve. Bowling Green State University, 217 Life Science Hall, Bowling Green OH 43403-0212. Polychlorinated biphenyls (PCB) were used in industry for over 30 years. Although their manufacture and use has been prohibited for the last 20 years, lipophilic and stable nature of PCB continues to result in its bioaccumulation in the fatty tissues of animals and humans. Depending on the amount of chlorine, there are 209 possible forms (congeneres) of PCB molecules. Thyroid hormone (TH) status is a target for endocrine-disrupting effects of PCB, and it developmental and neurochemical alterations result from ingestion. The present study examined effects of a mixture of PCB 47 (minimally thyroid disruptive) and PCB 77 (thyroid disruptive) on developmental, hormonal, and neurochemical measures in 15-day old Sprague-Dawley rats (Rattus norvegicus). Dams were continuously fed a control diet, 1.25 ppm, 12.5 ppm, or 25.0 ppm of PCB 47/77 from gestational day 1, and sacrificed on postnatal day 15. Ingestion of PCB 47/77 significantly increased liver weights and decreased spleen weights, indicating the widespread effects of this toxicant. PCB 47/77 significantly depressed levels of both T3 and T4, with pronounced effects on T3 levels. Choline acetyltransferase activity was elevated in basal forebrain and hippocampus. Thus, exposure of 15-day old rats to PCB 47/77 reduced body weights, altered organ weights, depressed thyroid hormone levels, and elevated ChAT activity, suggesting that PCB 47/77 disrupts thyroid status and other developmental measures, and inappropriately enhances ChAT activity. This enhancement may relate to increased incidence of behavioral alterations in human populations ingesting PCBs.

9:30 THE MECHANISM OF CASODEX-INDUCED CELL DEATH. Rachel A. Schallhorn, rschallh@capital.edu Department of Biology, Capital University, 2199 E. Main St., Columbus OH 43209-2394. Prostate cancer is the second leading cause of cancer related death for men in the United States. Anti-androgens such as Casodex® are widely used as form of treatment. Patients treated with anti-androgens ultimately become resistant to the drug and develop hormone refractory tumors. Studies have shown a positive correlation between increased levels of Bcl-2, a protein involved in the regulation of the mitochondrial apoptotic pathway, and prostate cancer progression. Two sublines of LNCAp non-invasive human prostate cancer cells over-expressing Bcl-2 were treated with varying concentrations of tumor necrosis factor a (TNF-a) and Casodex®. Crystal violet assays were used to determine relative viability and MTT assays to determine the relative activity. Western blot analyses were run to determine the androgen receptor status of the Bcl-2 over-expressing cells. The Bcl-2 over-expressing cell lines treated with TNF-a+Casodex® had a significantly lower amount of death than the wild-type cell line. Treatment with Casodex® resulted in similar amount of death in all three of the cell lines. Western blots showed androgen receptors were absent in the nuclei of the cells treated with Casodex®. These results indicate over-expression of Bcl-2 protects LNCaP cells against death from TNF-a but not Casodex®. Therefore the mechanism by which Casodex® induces death in LNCaP cells prevents androgen receptors from entering the nucleus and is unaffected by Bcl-2 levels.

9:45 VALIDATION OF DIFFERENTIAL GENE EXPRESSION IN NIH-MUTANT SCHWANN CELLS USING REAL-TIME QUANTITATIVE RT-PCR. John F. Vitallo, jrvtalloscapital.edu Department of Biology, Capital University, 2199 E. Main St., Columbus OH 43209-2394. NF1 is an acronym for the gene responsible for Neurofibromatosis type 1, an inherited disorder that often results in permanent physical and mental impairment to those afflicted. Patients with NF1 have predisposition to developing a variety of benign and malignant tumors, many of which affect the peripheral and central nervous systems (PNS and CNS). NF1 patients can also exhibit cognitive deficits and many other motor manifestations unrelated to cancer, usually affecting neural crest derived tissues such as the adrenal, the parathyroid, and the prostate. The NF1 gene has a role in growth control and developmental functions in a wide range of cell and tissue types. Schwann cells are the major cell population in benign neurofibromas, tumors that disfigure human patients with NF1. It is not yet known how molecular abnormalities in neurofibroma Schwann cells contribute to tumor formation. By increasing our understanding of this tumor development through molecular genetic and other cell biological approaches, we should begin to see an integrated picture of the normal role of the NF1 gene in the development of Schwann cells. A great expansion of research will allow the identification of several genes identified in a cDNA microarray analysis. Quantitative, real-time RT-PCR was utilized to assess the relative gene expression of Schwann cell cDNA in normal wild-type mice as compared to transformed NF1-mutant mice. Quantitative analysis confirmed differential expression in eight genes. However, the magnitude of these changes showed marked variation. Seven of the eight genes showed a positive correlation to our microarray expression data, thus confirming our data for those genes.

10:00 DISSECTION OF MEMBRANE TARGETING MECHANISMS FOR CYTOPLASMIC DYNEIN Albert E. Chaffin, chaffin@capital.edu Capital University,
to subtype-specific compounds prevents irreversible inactivation of the reduced neuronal nicotinic acetylcholine receptors (nAChRs) are ligand-gated ion channels and functional profile. The hypothesis is that bovine adrenal chromaffin cells express neurological disorders such as Alzheimer’s disease, Parkinson’s disease, and kaser.

The somatosensory system, the receptors are now believed to be located in additional aspects of membrane transport and chromosomal segregation during mitosis. Cytoplasmic dynein (CD) is a microtubule motor protein responsible for multiple aspects of membrane transport and chromosomal segregation during mitosis. The Vaughan Laboratory at the University of Notre Dame is interested in mechanisms that cytoplasmic dynein uses to bind cargo. Several subunits have been implicated in mediating organelle binding, including the intermediate chains (ICs), light intermediate chains (LICs), and light chains (LCs). We have found that these ICs have multiple structures that they interact with the p150ρ subunit of dynein and that this interaction is regulated via IC phosphorylation at serine-84. To determine the mechanism of IC phosphorylation, site-directed mutants that mimic either phosphorylated (S84D) or dephosphorylated (S84A) IC-2C were transfected into COS-7 cells and tested for membrane transport defects. S84A mutants perturbed dynein-mediated transport by competing with intact dynein for organelle binding. In contrast, S84D mutants failed to compete with dynein for organelle binding, or disrupt dynein-mediated transport. Because previous studies had been performed using full-length ICs, which can associate with the dynein LC subunits, we prepared truncated ICs that lack LC-binding sites and tested for organelle transport defects by transfection. The results using truncated ICs were different from results gathered using full-length ICs, with the S84A mutants displaying less disruption of dynein-mediated transport, and S84D mutants displaying more disruption. Although further work will be needed to clarify these observations, these findings suggest that the N-terminus of the ICs and interacting proteins could contribute to organelle binding.

10:15
D. CHEESMAN, K. OLESON, and K. CHEESEMAN from Capital University, Columbus OH 43209

Development of opioid receptors in the chick auditory brainstem. Erin K. Olson, olsonerik@gmail.com (Kerry Cheesman, Ph.D, kHzee10@capital.edu) Capital University, 2199 E Main St, Columbus OH 43209.

Opioid receptors are located in the nucleus magnocellularis, an element of the auditory brainstem, of the chick species Gallus domesticus. Traditionally found in the somatosensory system, the receptors are now believed to be located in additional sensory systems. The aim of this study is to determine the location of the kappa, delta, and mu-opioid receptors within the nucleus magnocellularis of the auditory brainstem. The study will follow the development of each opioid receptor from embryonic age 11 days to post-hatch age 23 days. Standard immunohistochemical procedures are performed on each auditory brainstem tissue and then stained. Initial results indicate that the kappa-opioid receptor is found in the cytoplasm of the nucleus magnocellularis. Mu-opioid receptor have been found in the nucleus of embryonic age 11 days. At post-hatch age 7 days the staining transitions into the nucleus and cytoplasm, continuing through post-hatch age 23 days. Delta-opioid receptor gives a general amorphous stain, indicating that they may not be present in the nucleus magnocellularis.
In developing an undergraduate degree in environmental sciences, Robert Morris College surveyed 45 academic institutions within a 150 mile radius of Pittsburgh, PA. The surveys were conducted between 2007 and 2008. The most common degree names were environmental sciences (13), environmental studies (6) and environmental geosciences (4). The analysis of the academic courses common to the programs centered on whether the curriculum required an exposure (here considered at least one course), no exposure (zero courses) or a significant exposure (two or more courses) to seven disciplines. The analysis was limited to courses offered for undergraduate students for upper level environmental sciences coursework. It was found that 25 programs required a series of courses in physical chemistry, Only 8 programs required a series in organic chemistry, with 13 requiring no organic chemistry courses at all. In physics, 12 programs required a series of courses and 12 required no physics at all. An exposure to calculus was required in 14 programs and 8 required no calculus at all. Statistics was the least required discipline, not required in 18 programs and no program required more than an exposure. Multiple geosciences courses were required in 11 programs and 11 others required no geosciences courses. Finally, a series of biology courses was required by 23 of the programs. The data here may be useful to other institutions developing programs in environmental sciences in western Pennsylvania.

2:15 USE OF PROS/CONS FORMAT HANDOUTS TO INCREASE HOLISTIC THOUGHT PROCESSES AND SCIENTIFIC LITERACY IN NON-MAJORS ENVIRONMENTAL SCIENCE PROGRAMS. Dr. Paul Whitford, Pwhitfor@capital.edu Biology Dept, Capital University, 2199 E. Main St., Columbus, OH 43209

Preliminary assessment of student ability to think critically and holistically about broad scale ecological topics and specific news topics in science was attempted on the first day of the Science and Technology Class, a Capital University Core Class for non-majors. A single sheet with three topic areas was presented to the 34 juniors, sophomores, and seniors. Part 1 was an analysis of the most common comments they could devise per topic. The following two weeks included 10 minutes per class meeting to discuss and list examples of more exhaustive responses to those same topics that illustrated the far-reaching socio-economic, environmental and political ramifications of even seemingly minor actions, such as construction of a large, multi-million dollar, chicken raising facility in a rural environment. Pro: Con responses were evaluated based on number of differing ideas and total words reflected in each pro and con listing. Initial numbers of ideas and words in responses per topic were compared with those of the same student group five weeks later using Pros and Cons written for new topics. For the three topics presented, (mega farming of poultry, nuclear power plant construction/use, GPS and sonar use for commercial fishing) during the first class the average number of ideas and words per "PRO" related by students was 2.36 (range 1-5), 2.09 (range 0-5) and 1.96 (range 1-3), ideas and 11.36, 8.70 and 7.80 words, respectively. The "CON" scores were similar with 2.00 (range 2-3), 2.09 (range 1-3) and 1.96 (range 0-4) ideas reflected in 15.30, 9.83, and 11.3 words per topic. Five weeks later, following discussion and examples, student responses evidenced a mean of 8.25 (range 5-22) ideas and 62.0 words per Pro listed and 9.25 (range 5-26) ideas and 78.0 words per con for the assigned topic. Enthusiastic student response and a significant 4 fold increase in number of ideas and 6 fold increase in words related per topic group indicated that the experiment was successful at generating an holistic, critical appraisal of current topics once introduced to the idea of thinking beyond the conventional issues.

2:30 ANEW ENGINEERING COURSE CLOSES THE EDUCATION GAP IN APPLYING NATURAL CHANNEL CONCEPTS TO ENGINEERING DESIGN. Kerry L. Hughes, kerry.hughes15@osu.edu Andy D. Ward, andy.ward2@osu.edu Ann D. Christy, christy.46@osu.edu Dept of Food, Agricultural and Biological Engineering, The Ohio State University, Columbus, OH 43210.

The field of natural channel design (considering river geomorphology processes and limiting the use of synthetic construction materials in channel design) is relatively new. The challenge for instructors is to create engineering courses that: provide sufficient basic information to enable students to develop an understanding of the subject; present logical design steps even though the integration of knowledge from different disciplines is not well tested; and provides a vocabulary that enables students to communicate effectively with people of different backgrounds in this field. A new class was offered in the Dept of Food, Agricultural and Biological Engineering at The Ohio State University to determine whether these requirements could be met by: integrating conventional open channel design methods and natural channel concepts; providing knowledge on channel stability requirements and the incorporation of land-use impacts, biological, ecological, and water quality considerations; and providing real world river laboratory experiences, group projects and homework problems. The methodology for assessing the course included the technical quality of the assignments and student evaluations of the course.

Education; Social & Behavioral Sciences
2:00 PM SATURDAY, APRIL 6, 2002
Battelle Hall 212
Kenneth A. LaSota-Presiding

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nari.talay@hotmail.com Dean M. Glioland, Dept of Chemistry, University of Toledo, Toledo OH 43606-3390.

Tin oxide doped with fluoride is an important and widely studied transparent conducting oxide (TCO) due to its properties and its commercial uses. It has the longest plasma wavelength, best ohmic contact to-Si, highest thermal stability; it is the hardest and has the lowest cost. Much information is available about the characterization and properties, but the actual stoichiometry of Suro F present within the cryostallites has not been calculated in any detail. Ratios of F:Suro are based on the relative amounts added to the reactant stream. We employ known standard procedures to determine the actual composition of the thin film. We have studied Tech –15 (Libbeys Owens Ford, Pittsburgh) films having a resistivity of about 15 ohms and thickness of SnO, layer of 250 nm. Etching of the film was carried out using zinc powder and HCl (3N trace metal grade) and by electrochemical methods using a platinum and a carbon electrode. After successfully etching the surface, by wet chemical and electrochemical methods, and analysis for Sn and F were carried out. The thin film content was determined using Inductively Coupled Plasma Spectroscopy (ICP), Anodic Stripping Voltammetry and D.C. Polargraphy. The Fluoride ion concentration was determined using an Orion 9609 F- Ion Selective Electrode and also via Colorimetry (Alizarin Red). Primary results using ICP yielded a Sn Concentration (0.1 to 3 ppm) at 186 nm excitation. The fluoride ion concentration was measured at the ppb levels by using suitable buffers (TISABII, TISABIII, Glycine:HCl). The measured values are in good agreement with the calculated values. The main part of obtaining the F:Suro ratio is based on the fact that while the carrier concentration increases with the F concentration, it decreases with excess F concentration. Hence, the optimum F concentration still needs to be determined. We can control this parameter (F concentration) during the deposition experiment. Further studies of Tech-S (650 nm, 8 ohms resistance) and ZnO: F films (1 ohm resistance) are considered.

9:45 PUNCTUATED EQUILIBRIUM AND THE SCREW MACHINE PRODUCTS INDUSTRY. Miles K. Free, milesfree@coxexpress.com 350 Woodland Dr., Medina OH 44246.

A gradualist business model of incremental change has been widely accepted as the predominate model for the screw machine parts manufacturing industry. The "Punctuated Equilibrium Model" first proposed by Steven Jay Gould and Niles Eldridge in 1972 offers an alternative model for viewing this industry plus the "Punctuated Equilibrium Model" first proposed by Steven Jay Gould and Niles Eldridge in 1972 offers an alternative model for viewing this industry as well. Organizational competencies and examples of the cataclysmic events that are driving the evolution of this industry, closures of customary suppliers; reverse auction sites and customer retrenchment are requirements, difficult to achieve using standard statistical methods; industry wide predominance model for the screw machine parts manufacturing industry. The Eldridge in 1972 offers an alternative model for viewing this industry plus the "Punctuated Equilibrium Model" first proposed by Steven Jay Gould and Niles Eldridge in 1972 offers an alternative model for viewing this industry as well.

10:00 APPLICATION OF AGILITY PRINCIPLES TO MANUFACTURING INDUSTRIES: THE ASSESSMENT METHODOLOGY. Bahman Ghorashi, b.ghorashi@csuohio.edu and Nitin Das, Dept of Chemical Engineering, Cleveland State University, Cleveland OH 44115, and Anne M. Ghorashi, AGA Gas Inc: A Ghorashi@csuohio.edu and Nitin Das. Dept of Chemical Engineering. Cleveland State University, Cleveland OH 44115.

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Vol. 102 (1)
ATTITUDES TOWARD PROSTITUTION. Machelle L. Palmier, mack.441@hotmail.com (Dr. Andrea Kurkowski, akarowks@capital.edu) 2199 E Main St., Capital University, Box 1536, Columbus OH 43209.

This research deals with college students' perceptions and attitudes about prostitution. Most people have a preconceived image of prostitution (Basow, & Campbell, 1990). Clients comprise a large percentage of the participants in the sex industry; however research has found on the sex workers, rather than their clients or the general public. The purposes of this study were to investigate if there is a difference in the way that college men and women view prostitution and to investigate their views are subject to change based on their being introduced to information. Research indicates that respondents gender influences the attitude about rape and prostitution. In general prostitution is not an understood topic. Prostitutes are often discriminated against due to lack of information. This study hypothesized, based on the information provided, that there would be a significant difference in the responses of males and females and that the participants' responses would significantly change from the first to the second survey. The 26 participants, from freshmen through senior classes at Capital University, were given a packet that contained an initial questionnaire section, an attached fact sheet, and a second copy of the same survey with a corresponding number to complete. This survey was created based on an already constructed twelve-question survey by Basow and Caparone. Results were analyzed via single and paired t-test.

DURATION OF SOCIAL HOUSING AFFECTS BRAIN MONOAMINES AND AGGRESSION IN A RAT MODEL. Jonathan Toot, jtoot@uakron.edu Gallusky and Daniel Ely, University of Akron, Dept of Biology, Akron OH 44325.

The long-term social environment and duration of colony interaction will affect aggression and brain monoamines in the SHR strain of hypertensive rat model. Non-captive (NC) standard caged rats housed for 10 months, 2 per cage. Long-term (LT) colonies of 10 months and short-term (ST) colonies of 4 months were established. Colony housing conditions consisted of 8 males with 8 females, thereby exposing the males to environmental stressors and allowing a social hierarchy to form. Resident intruder (RI) tests were used to observe resident aggression as the number of attack by the intruder (AN) and scars given to the intruder (S) in LT and ST colonies. Brain norepinephrine (NE), dopamine (D) and serotonin (5-HT) were measured postmortem by HPLC with electrochemical detection in the medial (AME) and lateral (ABL) amygdala. RI tests showed that the LT had more indices of aggression showed by higher AN and higher S compared to the ST (p<0.05). DABL, 5-HT AME and 5-HT ABTL were significantly lower for LT rats compared to ST and NC groups (p<0.05). There were no significant differences in any of the measured variables between LT and ST colonies. Subsequently, a long-term social environment may decrease amygdala serotonin, increase aggression and develop a DNE relationship between the medial and lateral amygdala.

CRITICAL SPATIAL FREQUENCIES INVOLVED IN FACE AND FEATURE RECOGNITION. Alicia L. Yongko, alyonkof@cwu.edu (Jeffrey L. Beighley, jbeighley@bow.edu) David O. Robbins, doroibonn@bow.edu (Ohio Wesleyan University, HWCC Box 715, Delaware OH 43015).

Theories of visual encoding have traditionally implemented relatively simple stimuli. One theory suggests that visual encoding is accomplished through channels within the nervous system. The task of this study was to determine the critical spatial frequencies involved in face recognition. Thirty-one college-age participants were shown progressively higher frequency digital images of faces that were systematically degraded by Fourier low-pass filters. To illustrate the frequencies critical for facial and feature recognition, measures of these channels have been examined using square wave and sinusoidal gratings.

THE ROLE OF NONVERBAL CUES IN THE FORMATION OF ACADEMIC IMPRESSIONS IN A COLLEGE CLASSROOM. Michelle L. Spader, mspader@hotmail.com (Holly M. Stubnar, hstubnar@ashland.edu) Dept of Psychology, Ashland University, 401 College Ave., Ashland OH 44805.

Nonverbal communication research has demonstrated that nonverbal cues are important in impression formation in a variety of situations that include interviews, interpersonal relationships, and academic settings. This study examined the effects of positive or negative nonverbal cues of eye contact, facial expression, posture, clothing, and proximal placement of educational materials on the academic impressions formed by 27 professors and 28 undergraduate students. Using a Likert scale, the professors and undergraduate students rated 28 photographs of unfamiliar college students based on their agreement with a statement that conveyed a perspective of academic performance of each photographed student (e.g., "Overall, I believe this student's grade will be superior."). The twenty-seven professors were surveyed initially and sixty-three months later on their use of subjective evaluation methods (e.g., essay tests, written papers) in their actual classrooms, and how their students are identified per method (e.g., name, code word). A t-test indicated both students and professors rated the photographs showing positive nonverbal cues significantly more favorably than the photographs showing negative nonverbal cues (r = 15.73, p<0.001). Of the professors surveyed, 100% used subjective evaluation methods, and all were able to identify their students on these evaluations. Nonverbal cues may be important in a college classroom because professors may form favorable or unfavorable academic impressions of their students based on a student's nonverbal cues in class, which may provide an avenue for their grades to be influenced by these impressions if the professors use subjective evaluation methods in which students can be identified.
vials to settle and excessive water removed. More than 75 slides were prepared from the residue using glycercin jelly. Among these algal cysts a number of cysts that are neither Tasmanites nor Leiosphaeridia were observed. They differ in shape being fusiform, spindly-shaped, thin walled, and with a pore at one end. This is the first report of these fusiform cysts from the Late Devonian Cleveland Shale. The average size of the fusiform cysts is (321 mm X 136 mm) while the diameters of the relatively circular Tasmanites and Leiosphaeridia were (143 mm) and (260 mm) respectively. These averages are based on a random measurement of thirty different individuals of each form. The fusiform algal cysts comprised 71% of total 500 algal cysts counted from the 9 microslides examined.

9:30 THE FIRST GEOLOGIC MAPS OF THE SERPENT MOUND DISTURBANCE DISCOVERY AND REVISION OF AUGUST FOERSTE'S 1:24,000 SCALE MAPS. Gregory A. Schumacher, maps@ohiodnr.gov, Ohio Dept of Natural Resources, Division of Geological Survey, 4383 Fountain Square Dr., Columbus OH 43224-1362. Most authors credit Walter Bucher as the first geologist to map the Serpent Mound disturbance (SMD). Prior to Bucher’s mapping of the SMD in 1920, August Foerste, with contributions from Raymond Lamborn, produced the first maps detailing the complex geology of the SMD. In 1918, mapping at the scale of 1:62,500, Foerste produced a manuscript geologic map of the SMD illustrating the central uplift area of Ordovician- and early Silurian-age rocks surrounded by faulted and folded Silurian- and Devonian-age rocks. Foerste did not show the outer ring of down-dropped Devonian- and Mississippian-age rocks on the 1918 map, but a second manuscript map dated 1919 shows the outer ring and the contacts between the undeformed Ordovician, Silurian, Devonian, and Mississippian rocks. In 1920, Foerste’s mapping, generalized for presentation at the scale of 1:500,000, was published in the Ohio Geological Survey’s 1920 Geologic Atlas. Over 80 years later, the Ordovician rocks of the central uplift were incorrectly shown as Silurian age. Researching why this error occurred resulted in the discovery of Foerste’s original SMD field notes stored at the Smithsonian Institution Archives in Washington, D.C. The notes provided substantial new information detailing the locations of numerous faults, strike-and-dip observations, road cuts, and quarry exposures that were not plotted on his manuscript maps. Revised geologic maps incorporating Foerste’s notes compare favorably to the geologic maps produced by later geologists. Clearly, August Foerste was the first to map the complex geology of the Serpent Mound disturbance.

9:45 Break

10:00 PENNSYLVANIAN SANDSTONES OF EASTERN OHIO—THEIR USES BUILDING STONES Mark J. Camp, mcamp@geology.utoledo.edu, Dept of Earth, Ecological and Environmental Sciences, The University of Toledo, Toledo OH 43606. Settlement of the Ohio Valley in the 1700s-early 1800s led to the search for local building materials, including sandstone and limestone of the Pennsylvanian strata of the Allegheny Plateau. Due to its cyclic deposition of the Late Paleozoic coal basins strata were continuous and highly variable in thickness. Most sandstones did not exceed 25 feet in thickness. The Lower Pennsylvanian Massillon Sandstone has the longest history of usage; from the early 1800s to the present. Major quarrying centers included Massillon, Coshocton, Glenmont, Masury, Youngstown, and Zanesville. Middle Pennsylvanian Lower Freeport Sandstone came from the hills around Lisbon, East Liverpool, and Uhrichsville; Lower Mahoning and Buffalo sandstones were extensively quarried at Coning, Steubenville, and Tippacanoe. The Upper Pennsylvanian Pomeroy Sandstone served the Pomeroy-Middleport area. The sandstones served as foundation stone for many local houses and barns, along the Sandy & Beaver Canal, the B&O Viaduct at Bellaire, and the suspension bridge at Wheeling, WV; better grades found use in the walls of courthouses in Cambridge, Lisbon, and Millersburg; Broad Street Presbyterian Church and the Southern Hotel in Columbus; St. Mary’s Catholic Church in Massillon; Gallipolis State Institute; brownstone residences in New Philadelphia; and many other prominent churches, mansions, and government buildings throughout the region. The brown phase of the Massillon sandstone was shipped as far as California and Massachusetts for use in brownstone buildings. The old gymnasium at Yale University in New Haven, CT was constructed of Massillon stone from the Briar Hill Stone Co. By 1900 most of the quarries were idle. The picturesque nature of the stone, its tendency to discolor with age, and increased competition from more widely marketed stones led to its demise. The Briar Hill Stone Co. of Coshocton is the lone present producer; 24,094 tons were quarried in 2000.

10:15 THE MAKING OF THE 3-D SURFICIAL-GEOLGY MAP OF THE MAD RIVER AND LITTLE DARBY CREEK WATERSHEDS. Douglas L. Shrake, doug.shrake@odnr.state.oh.us C. Scott Brockman, Kim E. Vorba, and Richard Wyskoop, Ohio Dept of Natural Resources, Division of Geological Survey, 4383 Fountain Square Dr., Columbus OH 43224-1362. The 1:100,000-scale 3-D surficial-geology map of the Mad River and Little Darby watersheds depicts multiple map-unit areas that show the thickness and stratigraphic sequence of unconsolidated materials from the surface down to including the uppermost bedrock unit. Mapping was partially funded by an Ohio EPA 319 grant. The map area for the Mad River and Little Darby watersheds covers 267.5-minute quadrangles and encompasses portions of 10 counties in west-central Ohio: Champaign, Clark, Delaware, Franklin, Greene, Logan, Miami, Montgomery, and Union. Production of the map occurred in phases. The initial phase had several steps: 1) obtaining and inventorying existing geologic data and maps for the map areas on file at the ODNR, Division of Geological Survey, and the USGS geotechnical data from the ODOT, Office of Materials Management, soils and Foundations Section, the Southwest and Central Ohio EPA District offices, the ODNR, Division of Water, the ODNR, Division of Soil and Water Conservation, and the USGS Water Resources Division; and 2) transcribing these data onto 7.5-minute topographic maps. The first phase involved digitization of the 1:24,000-scale 3-D map-units and their compilation at the scale of 1:100,000. The final phase had: 1) an edit step, for verification of the 3-D-map-area labels and contacts, and 2) a cartographic step, for the colorization and labeling of the maps using ArcView®. The print-on-demand map will be available from the Ohio Division of Geologic Survey.

10:30 GEOCHEMISTRY OF THE MUNICIPAL WATER AND OF THE SANDUSKY RIVER AT BUCYRUS. OHIO. Everett L. Fortner, Jr., fortnerJ1@osu.edu and Gunter Faure, faure.1@osu.edu, The Ohio State University, 275 Mendenhall Laboratory, 125 S Oval Mall, Columbus OH 43210. Streams provide cities and towns with water and a means of discharging wastewater. The discharge of this effluent may significantly alter the chemical composition of a stream. Further downstream, other cities and towns use the same water, which could pose possible health risks. To study this problem, the municipal water system and the Sandusky River at Bucyrus, Ohio were sampled on December 15, 1999, to determine the effect of the municipal use on the chemical composition of the river. Bucyrus has a population of 16,000 and is located in Crawford County, north-central Ohio. The Sandusky River flows through the city and continues north discharging into Lake Erie. Eight water samples from the Sandusky River and five water samples from the Bucyrus municipal water system were collected. All of the samples were filtered and acidified prior to analysis by XRAL Laboratory in Toronto, Ontario, using ICP-OES. The results showed increased concentrations of Mg, Ca, K, Na, and Sr in the effluent compared to the purified tap water. The discharge of the effluent also increases the concentrations of trace elements Co, Cu, and Zn by 50ug/L. Overall, the Sandusky River is not significantly altered by the city of Bucyrus and therefore does not pose a health risk to near-by towns and animals.

EARTH AND SPACE SCIENCE II
2:00PM SATURDAY, APRIL 6, 2002
Battelle Hall 254
JEFFREY J. GORDON-PRESIDING

2:00 A HIGH-RESOLUTION GIS FOR ENVIRONMENTAL MODELING, NORTH APPALACHIAN EXPERIMENTAL WATERSHED, COSHOCTON, OHIO. Erik R. Venters. venters.1@osu.edu and Brian K. Slater, slater.1@osu.edu, The Ohio State University, School of Natural Resources, 2021 Coffey Rd, Columbus OH 43210. A high resolution (1:2400 scale) GIS was created for the North Appalachian Experimental Watershed (NAEW) for use in environmental modeling. The intended application for the dataset was regression-based spatial modeling of soil properties such as percent organic carbon. It was hypothesized that a 2m resolution DEM created with this GIS would predict soil properties better than DEMs created from USGS 1:24,000 contour maps. The central task in creating the GIS was to digitally capture existing contour maps and convert them into a 2m digital elevation model (DEM). Elevations, streamlines, and watershed boundaries were digitized from legacy 1:24,000 topographic maps derived from aerial photograph in 1966. Contours and streamlines were captured using a computer system and the system was then compared to contour maps drawn in a process of hand tracing, scanning and finally raster to vector conversion. Elevation contours and streamlines were used as inputs to a GIS software code to create a DEM with realistic surface drainage properties. Additional products such as slope, profile curvature and the topographic index (CTI) were calculated using GRASS 5.0 software. Final vector products of the GIS include elevation contours, legacy soil data, zero-order watersheds with management records from 1939 to the present, land cover derived from digital orthophotography, and streamlines. Final raster components include the DEM and many derived topographic parameters, mostly of significance to modeling surface hydrology. The predictive capability of the GIS was evaluated by comparing the GIS DEMs calculated with ANUDEM from 1:24,000 USGS contour maps was compared. A multiple least squares regression was conducted on 185 soil samples to predict % carbon from topographic parameters derived from the DEMs. Two topographic parameters were the...
predictive (F-score > 1, Probability of F-score < 0.01) in tests from the 2-meter DEM, none from the 10-meter DEM. The 10-meter DEM is insufficient for modeling soil properties for zero-order (5,000 m) watersheds.

2:15 THE LOCATION OF BACTERIAL AND Fungal CELL WALL PRODUCTS IN SOIL AGGREGATES FROM NO-Tillage AND CONVENTIONAL TILLeAGE ECOsYTEMs. Rod T. Simpson¹, simpson.231@osu.edu Serita Frey¹, frey.77@osu.edu Johan Six², johan@nrel.colostate.edu ¹The Ohio State University, School of Natural Resources, 2021 Coffey Rd, 210 Kottman Hall, Columbus OH 43210 and ²Colorado State University, Natural Resource Ecology Laboratory, Fort Collins CO 80523.

Microbial-derived organic matter is deposited on and distributed throughout soil aggregates. This material can originate either from bacteria or fungi, but is not distributed evenly throughout the aggregate. This study determined where bacterial and fungal-derived organic matter is located within the aggregate structure of soil collected from no-tillage (NT) and conventional tillage (CT) agroecosystems. Soil samples (112) from a long-term tillage comparison experiment in Fhoneshaw Bend, GA were collected for aggregate formation. This research demonstrates that bacterial versus fungal-derived organic matter is found in different locations within the soil aggregate structure and may be differentially protected from decomposition.

2:30 THE EFFECT OF CLAY CONTENT ON THE DEGRADATION OF MICROBIAL CELL WALL PRODUCTS IN NO-Tillage AND CONVENTIONAL TILLeAGE ECOsYTEMs. T. K. Smith, F. St. Barbe, white.80@osu.edu Serita Frey¹, frey.77@osu.edu Johan Six², johan@nrel.colostate.edu ¹The Ohio State University, School of Natural Resources, 2021 Coffey Rd, 210 Kottman Hall, Columbus OH 43210 and ²Colorado State University, Natural Resource Ecology Laboratory. Gluconosamine and muramic acid concentrations can be used to establish cumulative bacterial and fungal (respectively) cell wall product concentrations in soil. This is of interest because microbial organic matter may contribute to the sequestration of carbon and agricultural soils. The purpose of this study was to investigate the effect of clay content on the degradation of microbial cell wall products within two tillage treatments (no-tillage and conventional tillage) at three long-term tillage comparison sites in Ohio, using laboratory incubation. The sites were Hoytville (50% clay), South Charleston (52% clay), and Wooster (25% clay). Eighteen samples (9 of each treatment) were collected in May and June 2000 at each field site to a depth of 0-20 cm, sieved (2mm) and analyzed for soil moisture, texture, bulk density, and total organic carbon and nitrogen. Subsamples (108 of 50 g each) were incubated at 25°C for 270 days. At 15 days, 30, 60, 90, 180, and 270 days were analyzed for gluscosamine and muramic acid concentrations, total C and N, and particulate organic matter C and N. The data were analyzed by analysis of variance. As hypothesized, clay content had a positive effect on the retention of amino sugars. As clay content increased, the degradation rate decreased. Tillage regime, particularly C-T, had a decreased effect on glutosamine degradation, while there was no effect of conventional tillage on the degradation of muramic acid. Tillage regime did not outweigh the effect of texture; with the high clay plots showing a decrease in the rate of microbial derived amino sugar decay over the incubation period.

2:45 CLIMATIC AND GEOLOGIC FACTORS CONTRIBUTING TO SINKING HOMES ON THE OHIO TILL PLAIN. C. Scott Brockman, scott.brockman@ohio.edu Thomas M. Berg, Thomas.Berg@ohio.edu Ohio Dept of Natural Resources, Division of Geological Survey, 4531 Fountain Square Dr, Columbus OH 43224-1362.

Surficial organic deposits are not common on the Ohio till plain; however, three houses in the north Columbus neighborhood of Sharon Woods had to be leveled because of structural damage from sinkholes. The factors that contributed to the damage, which developed after nearly 150 to 30 years of stability, were investigated. Coring, laboratory testing, and topographic interpretation indicated that four factors contributed to the collapse of organics. First, the location of standing water recharge and overland flow would result in a late-glacial, closed, linear depression. In a battery of tests on 11 samples, deposits from the north Columbus neighborhood of Sharon Woods were seeped into the shallow water table, are important for aggregate formation. This research demonstrates that bacterial versus fungal-derived organic matter is found in different locations within the soil aggregate structure and may be differentially protected from decomposition.

3:00 RECENT ACTIVITIES AROUND, OVER AND IN AN ABANDONED, UNDERGROUND COAL MINE, STARK COUNTY, OHIO. James R. Bauder

During the past six decades, the spatial distribution of the elderly in most US cities has experienced a significant change. In city of Toledo, Ohio, for example, the census tracts with higher percentages of the elderly were concentrated in the downtown area in 1950 and 1960. This pattern of inner city concentration, however, started to change
in 1970. By 2000, the census tracts with the highest percentages of elderly population were mostly distributed in suburban areas. Even though the spatial distribution of older Americans has changed, the location pattern of services has not shifted substantially. In Lucas County, the senior service centers are mostly located in the same places as 30 years ago. In this presentation, the strategies of relocating such services with the use of GIS (Geographic Information Systems) are demonstrated.

**Environmental Science**

9:00 AM Saturday, April 6, 2002

**Battelle Hall 289**

**Carolyn J. McQuattie-Presiding**

9:05 **EFFECT OF RIPARIAN HABITAT ON BIODIVERSITY IN SMALL AGRICULTURAL DITCHES.** Gregg T. Subak, gsubak@osu.edu Virginia Bouchard, bouchard@osu.edu Environmental Science Graduate Program and School of Natural Resources, 2021 Coffey Rd, Columbus OH 43210. Our research determined the effect of riparian habitats on the aquatic biodiversity of agricultural ditch ecosystems. Channel modification is common in agricultural landscapes and in-stream habitats are altered and streams are disconnected from their floodplains. Little research has been conducted in agricultural ditch ecosystems despite their large numbers, particularly in the Midwest. Our central hypothesis was that reestablishment of a floodplain connection and riparian habitats will increase biodiversity in agricultural ditches. Fifteen reaches were selected along ditches in Northwest Ohio according to the following conditions: five were surrounded by a riparian system (i.e., presence of trees), five were connected to a small floodplain, and the last five had no riparian or no floodplain connection. To measure biodiversity, benthic invertebrates, amphibians and plants were sampled at 4 to 8 locations in each reach during the summer and fall of 2001. Our data suggest that benthic substrate is the limiting factor controlling biodiversity in such a stressed landscape. Up to 25 species of macroinvertebrates were found in some reaches, but our preliminary results indicate no significant differences between the three treatments. Our data however suggests that benthic community structure (e.g., feeding groups) respond to increased food resource (e.g., detritus) inputs from riparian zones with tree cover.

9:15 **VEGETATION SURVEYS FOR CONSTRUCTED WETLANDS OF THE WETLAND RESERVOIR SUBSURBURGATION SYSTEMS (1998-2001).** Lee M. Luckeyadoo, luckeyadoo.1@osu.edu Ohio State University 590 Woody Hayes Dr., Columbus, Ohio 43210. The Wetland Reservoir Subsurburbation System (WRSS) project links agricultural fields, wetland, and a storage reservoir to help minimize agrochemical runoff and sediment delivery to streams. Three demonstration sites are located in Defiance, Fulton, and Van Wert counties in northwestern Ohio, were constructed approximately six years ago. Case studies were completed onBuckeye Lake and Lake Wetland development and structure on the three sites were conducted. Surveys were completed on all sites using annually permanent quadrats, and observations were made using Braun-Blanquet scales. Survey information indicates that species richness declined during the study period at all three locations. Species richness at the Defiance location declined from 51 species in 1998 to 30 in 2001. Fulton’s species richness declined from 32 in 1998 to 22 in 2001. The species richness at the Van Wert location declined from 45 in 1998 to 21 in 2001. Over the period of this study, year three through year six post-construction, overall diversity has decreased, but there has been a general increase in percent wetland indicator species. Wetland indicator species were most abundant in Defiance (43%) and Fulton (46%) in 1999, and in 2000 for Van Wert (56%). Percentages account average for 71.4% at Defiance, 52.4% at Fulton, and 57.3% at Van Wert of wetland indicator species. Little research has been conducted on species richness on species presently on study sites and species availability in the seed bank, a management plan using water level manipulation to encourage growth of wetland and terrestrial species that have promising water quality improvement capabilities has been developed.

9:30 **DOES A CORRELATION BETWEEN FLORISTIC QUALITY INDEX AND COEFFICIENTS OF WETNESS EXIST.** Tracy L. Engle, engle.tra@urscorp.com and Jeffery R. Johansen, johansenje@ncsu.edu URS Corporation, 80W 6th Ave, Cleveland, Ohio 44113. Our results have been analyzed the floristic quality of forestland and whether a relationship between the floristic quality index and the coefficient of wetness exists. Six woodlots within the watershed of the East Branch Cuyahoga River in Geauga County were selected from the USGS topographic map. Within each woodlot we established a 1 kilometer transect with 30-meter radius plots located every 100 meters. Woody species including trees, saplings and shrubs were identified and quantified within each plot. For data analysis, a value of floristic quality and coefficients of wetness were assigned to each species encountered and the floristic quality assessment index, as well as the wetness index, was calculated for each plot. The results of this study determined that a strong correlation between the floristic quality index and coefficient of wetness could not be made during this study of forestland in the upper Cuyahoga River watershed. However, modifications to the methods proposed by Andreas and Liebhar for calculating the floristic quality index which include a weighted calculations as well as inclusion of non-native taxa was found to more strongly correlate with the coefficients of wetness.

9:45 **EXAMINATION OF THE RELATION OF NITRATE LOADS AND LANDUSE IN THE BIG DARBY CREEK AND ALUM CREEK WATERSHEDS IN CENTRAL OHIO.** Nathan B. Carse, ncarse51@hotmail.com (Terry Lahm, tlahm@capital.edu) Capital University, Environmental Science Program, 2199 E. Main St, Columbus OH 43209. From July 9 through August 1, 2001, water samples were taken from Big Darby Creek and Alum Creek watersheds in order to characterize nitrate (NO3) concentrations. At the same time, stream discharge was measured in order to determine nitrate load at each of the sampling locations. Alum Creek is part of the Scioto drainage basin with an approximate area of 520 km2 and is dominated mainly by urban uses in its southern extent, with minor agricultural areas in the north. The flow for this stream is hydrologically controlled at Alum Creek Reservoir. The Big Darby Creek is located on the west side of the Scioto drainage basin, draining approximately 1,450 km2, dominated by agricultural land use, with minor urban areas. The hypothesis for this study is that higher nitrate loads will be found in the Big Darby Creek, than in Alum Creek. To test the hypothesis, the two watersheds were hydrologically isolated from each other. A USGS pygmy flow meter was used in determining the discharges. Discharge ranged from 0.105 to 0.872 m3/sec for Alum Creek, and from 0.47 to 2.2 m3/sec for the Big Darby Creek. The nitrate concentrations were determined using Standard Methods 4500-NO3, and resulted in nitrate loads ranging from 700 to 150 kg/day for Alum Creek and 800 to 410 kg/day for Big Darby Creek. The land use data were derived from 1994 and 1998 Landis Thematic Datasets processed in Arcview GIS, to determine land use characteristics and drainage areas in both watersheds.

10:00 **COMPARISON OF LIVER SOMATIC INDEX IN BROWN BULLHEAD FROM BLACK RIVER, BUCKEYE LAKE AND OLD WOMAN CREEK.** Xin Yang, yang.318@osu.edu Mark E. Ashbaugh, mark.ashbaugh@yahoo.com Paul C. Baumann, baumann.p@osu.edu Ohio State University, Environmental Science Graduate Program, 2021 Coffey Rd, Columbus OH 43210, TA Medical Center, 3350 La Jolla Village Dr., Rd. 6,504, San Diego CA 92161 and National Biological Service, 2021 Coffey Rd, Columbus OH 43210.

The somatic index (LSI) in fish is a relatively rapid response indicator of changes in conditions of fish and the aquatic environment. A total of 563 Brown bullhead, (Ameiurus nebulosus) collected from Black River in 1981, 1982, 1993, 1994, 1995 and 1996, from Buckeye Lake in 1981 and 1982, and from Old Woman Creek in 1993, 1994, 1995, and 1996 were examined for the LSI. The sediments in Black River were highly contaminated with PAH’s in the early 1980’s, but the level of contaminated sediments declined after the closing of an upstream cooking facility in 1983, and most of the contaminated sediments were dredged in 1990. No industrial sources were found in Buckeye Lake and Old Woman Creek and therefore they were selected as reference sites. The results showed that the mean LSI of female fish tended to be higher than that of male fish. Multiple directional l-tests with a Bonferroni adjusted p-value indicated that the males from Black River had statistically higher LSI than those from the reference sites in each collection year. The females had the same trend for all the years except 1994. The mean LSI in the early 1980’s was significantly higher than that in the 1990s for both males and females from Black River using Fisher’s least significant difference test. The increase observed in the mean LSI of brown bullhead were associated with the levels of contamination. This study provides evidence that exposure to contamination can result in increased relative liver weights in brown bullhead.

10:15 **LINKAGES BETWEEN MACROPHYTE DIVERSITY, MICROBIAL DIVERSITY AND TRACE GAS FLUXES.** Janice M. Gilbert, jgilbert.153@osu.edu Virginia Bouchard, bouchard.7@osu.edu Environmental Science Graduate Program, Rm 210 Kottman Hall, 2021 Coffey Rd, Ohio State University, Columbus, OH 43210.

Our results have been determined the influence of macrophyte species on aquatic plant (macrophyte) diversity, microbial diversity, and the biochemical reduction of nitrate (denitrification) in a mesocosm experiment. Although previous studies have identified physical and chemical factors regulating the production of denitrification gases, the role that macrophyte diversity plays in this process is still not known. Our central hypothesis was that changes in macrophyte diversity would cause decreases in microbial diversity and significantly increase the flux of nitrous oxide relative to that of dinitrogen gas. Sixty mesocosms (417 liter tanks) with combinations of either 0, 2, 4, 6, 8, or 10 macrophyte species were tested for in situ gas fluxes of NO, N2O, denitrifying enzyme activity (DEA), bacterial biomass, and microbial community diversity. In situ denitrification gas samples were obtained using the acetylene block method; the
DEA method determines the potential denitrifying capacity of samples under non-limiting conditions for denitrifying bacterial metabolism; bacterial biomass was determined using epifluorescence microscopy coupled with computer assisted image analysis; and microbial community diversity was analyzed using the terminal restriction length polymorphism (T-RFLP) analysis. Denitrification activity increased with increasing plant diversity. Mesocosms with the highest plant diversity exhibited the lowest nitrosomonas fluxes between 2-6 pmol N/dm² over a 24 h period while mesocosms with the lowest plant diversity had fluxes between 1-3 pmol. Our data also suggest that the type of plant present influences denitirification and the nitrous oxide: dinitrogen ratio. Our study indicates that altering biological diversity affects ecosystem function (i.e., denitirification) and therefore has potentially important implications for global climate change.

10:30 YELLOW-POPULAR FOLIAR ANATOMY FOLLOWING FOUR YEARS’ EXPOSURE TO ELEVATED CARBON DIOXIDE AND/OR CARBON DIOXIDE. Carolyn J. McQuat, cmcquat@fs.fed.us, Vindyarani Velagandula, Civil Engineering Dept., Howard H. Lo, Dept of Biological, Geological, and Environmental Sciences, Cleveland State University. Cleveland State University, Cleveland, OH 44115. The objective of the study is to determine the effect of phenol on the treatment performance of batch activated sludge reactors treating food wastewater. The types of food wastewater investigated include potato wastewater, sugar wastewater, and combined potato and sugar wastewater. The experimental parameters investigated in this study consist of 3 types of food waste strength, 3 levels of aeration tank biomass concentration, 3 levels of phenol concentration, and 4 aeration periods. Effect of yeast addition on the reactor performance was evaluated with the LLMO (live liquid microorganisms) addition. The batch reactor run was conducted for 24 hours. Two sets of experiments were conducted. Set 1 consisting of runs 1, 2, and 3 were without bioaugmentation with LLMO, while set 2 consisting of runs 4, 5, and 6 were with bioaugmentation of LLMO. TOC (total organic carbon) was determined for the reactor content at 0, 3, 6, 12, and 24 hours. Three levels of phenol consisted of 35, 50, and 75 mg/L (125, 250, and 375 mg/L), for sets 1 and 2, medium was 150 mg/L, for runs 2 and 5, and was high (255 mg/L) for runs 3 and 6. The percentage TOC removal at 12-hour aeration period ranged from 17.7 to 44.97% for set 1 without LLMO bioaugmentation and ranged from 83.3% to 73.9% for set 2 with LLMO bioaugmentation. The general trend indicated that TOC removal efficiencies decreased as phenol concentration increased. Food wastewater strength was found to have an important effect on the reactor performance. When aeration period was increased to 24 hours the toxic effect of phenol was decreased. Bioaugmentation with LLMO improved batch activated sludge reactor performance. A 24 hours aeration period is necessary to overcome the toxic effect of phenols.

2:00 PM SATURDAY, APRIL 6, 2002 WATERSHELL HALL 289 YUNG-TSE HUNG-PRESIDING

2:00 THE IMPACT OF URBANIZATION ON GROUNDWATER DISCHARGE TO THE HELLBRANCH TRIBUTARY OF THE BIG DARBY WATERSHED. Andrew P. Hudgins, ahudgins@capital.edu (Terry Lahm, tlahm@capital.edu). Capital University, Environmental Science Program, 2199 East Main St., Columbus OH 43209.

The Hellbranch Run is a slow stream located in Franklin County, Ohio that drains 56.9 km² from the western edge of the city of Hilliard to the village of Darbydale in the south. The upper part of the stream is comprised of two main tributaries known as the Hamilton Ditch and the Clover Groff Ditch both draining the Darby Till Plain. This study examines the impact of urban development and the implementation of impervious surfaces on the groundwater discharge to the Hellbranch Run. The hypothesis is that the groundwater discharge to the stream will decrease as a result of increased areas of impervious surfaces and storm sewers that discharge water directly into the creek. The urbanization process can short circuit the hydrologic cycle limiting the amount of groundwater recharge. Stream flow measurements using the velocity-area method were gathered at five locations throughout the Hellbranch watershed over five sampling times throughout the summer and fall of 2001. The discharge measurements indicated a net groundwater influx of 22340 m³/d over the Clover Groff Ditch and 740 m³/d over the Hamilton Ditch. The land use in the Hamilton Ditch drainage is predominately agricultural compared with the Clover Groff Ditch drainage that is dominated by suburban development. The lower part of the Hellbranch had a groundwater discharge of 12,920 m³/d. Currently, a second methodology is being employed to examine the base flow recession for any temporal changes in groundwater discharge over the entire watershed for a nine-year period of record.

2:15 EFFECT OF PHONOL ON TREATMENT OF FOOD WASTEWATERS BY AEROBIC BATCH REACTOR. Yung-Tse Hung and Elizabeth Atu, Civil Engineering Dept., Howard H. Lo, Dept of Biological, Geological, and Environmental Sciences, Cleveland State University. The objective of the study is to determine the effect of phenol on the treatment performance of batch activated sludge reactors treating food wastewater. The types of food wastewater investigated include potato wastewater, sugar wastewater, and combined potato and sugar wastewater. The experimental parameters investigated in this study consist of 3 types of food waste strength, 3 levels of aeration tank biomass concentration, 3 levels of phenol concentration, and 4 aeration periods. Effect of yeast addition on the reactor performance was evaluated with the LLMO (live liquid microorganisms) addition. The batch reactor run was conducted for 24 hours. Two sets of experiments were conducted. Set 1 consisting of runs 1, 2, and 3 were without bioaugmentation with LLMO, while set 2 consisting of runs 4, 5, and 6 were with bioaugmentation of LLMO. TOC (total organic carbon) was determined for the reactor content at 0, 3, 6, 12, and 24 hours. Three levels of phenol consisted of 35, 50, and 75 mg/L (125, 250, and 375 mg/L), for sets 1 and 2, medium was 150 mg/L, for runs 2 and 5, and was high (255 mg/L) for runs 3 and 6. The percentage TOC removal at 12-hour aeration period ranged from 17.7 to 44.97% for set 1 without LLMO bioaugmentation and ranged from 83.3% to 73.9% for set 2 with LLMO bioaugmentation. The general trend indicated that TOC removal efficiencies decreased as phenol concentration increased. Food wastewater strength was found to have an important effect on the reactor performance. When aeration period was increased to 24 hours the toxic effect of phenol was decreased. Bioaugmentation with LLMO improved batch activated sludge reactor performance. A 24 hours aeration period is necessary to overcome the toxic effect of phenols.

2:30 FOOD WASTEWATER TREATMENT WITH ADSORPTION AND BIOMAGNIFICATION. Yung-Tse Hung, and Indira Yadanapudi, Civil Engineering Dept., Howard H. Lo, Dept of Biological, Geological, and Environmental Sciences, Cleveland State University. The objective of the study is to determine the effect of phenol on the treatment performance of batch activated sludge reactors treating food wastewater. The types of food wastewater investigated include potato wastewater, sugar wastewater, and combined potato and sugar wastewater. The experimental parameters investigated in the study include 3 types of food wastewater strength, 3 levels of aeration tank biomass concentration, 5 doses of clay adsorbent, and 3 levels of live liquid microorganisms (LLMO) dosages. The clay dosages used included 0.5, 1.5, and 2 g/L. Runs 2, 3, and 4 were with LLMO addition, while run 1 was without LLMO addition. For run 1, the highest ranking for TOC removal to the lowest was 54.67%, 30.18%, and 59.67% for potato wastewater, sugar wastewater, and combined potato and sugar wastewater, respectively. In general the low strength wastewater had higher TOC removal than the medium and high strength wastewater. LLMO addition was found to improve TOC removal. The highest TOC removal for potato wastewater was 60.37% for medium strength wastewater at the highest LLMO dosage and highest clay dosage. For combined potato and sugar wastewater the highest TOC removal was 66.33% for low strength wastewater at the highest LLMO dosage and highest clay dosage. The general trend indicated that as wastewater strength increased the TOC removal decreased. Both clay adsorbtion and bioaugmentation with LLMO improved the TOC removal for food wastewater.

2:45 BIOREMEDIATION OF CONTAMINATED SOIL WITH BIOSLURRY REACTOR PROCESS. Howard H. Lo, Biological, Geological, and Environmental Sciences Dept., Cleveland State University, Yung-Tse Hung, and Vidyarani Velagandula, Civil Engineering Dept., Cleveland State University. The objective of the study is to determine the effect of phenol on the treatment performance of batch activated sludge reactors treating food wastewater. The types of food wastewater investigated include potato wastewater, sugar wastewater, and combined potato and sugar wastewater. The experimental parameters investigated in the study include 3 types of food wastewater strength, 3 levels of aeration tank biomass concentration, 3 levels of phenol concentration, and 4 aeration periods. Effect of yeast addition on the reactor performance was evaluated with the LLMO (live liquid microorganisms) addition. The batch reactor run was conducted for 24 hours. Two sets of experiments were conducted. Set 1 consisting of runs 1, 2, and 3 were without bioaugmentation with LLMO, while set 2 consisting of runs 4, 5, and 6 were with bioaugmentation of LLMO. TOC (total organic carbon) was determined for the reactor content at 0, 3, 6, 12, and 24 hours. Three levels of phenol consisted of 35, 50, and 75 mg/L (125, 250, and 375 mg/L), for sets 1 and 2, medium was 150 mg/L, for runs 2 and 5, and was high (255 mg/L) for runs 3 and 6. The percentage TOC removal at 12-hour aeration period ranged from 17.7 to 44.97% for set 1 without LLMO bioaugmentation and ranged from 83.3% to 73.9% for set 2 with LLMO bioaugmentation. The general trend indicated that TOC removal efficiencies decreased as phenol concentration increased. Food wastewater strength was found to have an important effect on the reactor performance. When aeration period was increased to 24 hours the toxic effect of phenol was decreased. Bioaugmentation with LLMO improved batch activated sludge reactor performance. A 24 hours aeration period is necessary to overcome the toxic effect of phenols.
This paper describes the remediation of soils contaminated with petroleum hydrocarbons using bioreactor process. Petroleum hydrocarbons are one of the most common pollutants in the U.S. Bioreactor process is relatively new treatment technology for the degradation of soil contaminants. Pilot scale aerobic bioreactor was used in this study. The soils sampled were collected from around the leaking underground petroleum fuel storage tank. The solid concentration in the bioreactor was 26.7%. Nitrogen and phosphorus nutrients were added to the reactor. The study was conducted with or without biogas. Process gas recirculation system was used with the reactor for complete containment and eventually complete degradation of all contaminants. Results indicated that the concentrations of benzene, toluene, ethyl benzene, and xylenes (BTEX) and of naphthalene, anthracene, and phenanthrene decreased rapidly. The percentage removal after 2 days varied from 82 to 98% in the soil phase. About 100% removal was observed in the liquid phase of reactors after 8 days of treatment. However, poly aromatic hydrocarbons (PAHs) containing more than 3 aromatic rings did not show significant removal. Addition of readily metabolizable substrates such as sodium acetate and phenanthrene did not totally increase the degradation of PAHs containing more than 3 aromatic rings. The augmented phenanthrene was rapidly metabolized. Incubation, bioreactor reactor can be used for remediation of soils contaminated with aromatic compounds and aromatic compounds show a lower affinity for the GAC. Results showed that GAC could be used in treating wastewater containing aromatic and aliphatic compounds effectively.
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