Index to Sessions
The Ohio Branch of The American Society for Microbiology (OBASM) will meet jointly with The Ohio Academy of Science. Please see the following schedule. or contact: Dr. Chet Cooper at Youngstown State University. Phone 330-941-1361; fax 330-941-1483 or by email crcooper.01@ysu.edu

Saturday, April 17th
8:00 AM – 3:00 PM Registration
8:30 AM Welcome - Auditorium, DeBartolo Hall
9:00 AM – 10:00 AM *My virus is nastier than your virus!! Strain dependent differences in the molecular properties of the ICP34.5 protein of HSV-1 that determine the virulence of HSV-1* Dr. Ken Rosenthal, Northeastern Ohio Universities College of Medicine
10:00 AM - 11:00 AM General Microbiology Lecture
*Cepacia means more than onions* Dr. Christine Weingart Denison University
10:15 AM - 12:15 AM Roundtable: Intellectual Property
1:30 PM – 3:00 PM *Molecular Biology Forum: 50 Years of the Double Helix* Co-sponsored by Sigma Xi, YSU Chapter
Chaired by Dr. Diana Fagan, Department of Biological Sciences, Youngstown State University

*Clinical Applications of Genomics and Proteomics*
Dr. David Buzzee, Lab Corporation of Ohio

*Ancient DNA*
Dr. Bruce Rothschild, Northeastern Ohio Universities College of Medicine

Other participants to be announced
3:00 PM – 5:00 PM “Late Breaker” Session – brief oral presentations on recent discoveries in the microbiological sciences
5:00 PM OBASM General Meeting
6:00 PM -OBASM Dinner and Student Awards
Chestnut Room, Kilcawley Center. Contact Dr. Chet Cooper by April 9th. $16.00

**Index to Sessions in DeBartolo Hall**

**Poster Session-Multidisciplines**
- 09:00 AM – 10:00 AM p. 6

**Poster Session-Multidisciplines**
- 10:00 AM – 11:00 AM p. 13

**Poster Session-Multidisciplines**
- 02:00 PM – 03:00 PM p. 20

**Pre-College Poster Session**
- 03:00 PM – 04:30 PM p. 27

**Physical Sciences & Education**
- 09:00 AM Saturday, April 17, 2004
  DeBartolo Hall Room 347
  Dr. Paul Szalay-Presiding

**Zoology**
- 09:00 AM Saturday, April 17, 2004
  DeBartolo Hall Room 358
  Dr. Courtenay Willis-Presiding

**Phycology & Aquatic Ecology**
- 09:00 AM Saturday, April 17, 2004
  DeBartolo Hall Room 356
  Dr. Robert Heath-Presiding

**Basic & Applied Microbiology**
- 09:00 AM Saturday, April 17, 2004
  DeBartolo Hall Room 346
  Dr. Paul Baker-Presiding

**Earth & Environmental Sciences**
- 09:30 AM Saturday, April 17, 2004
  DeBartolo Hall Room 345
  Mr. Wilmer Stowe-Presiding

**Genetics, Biochemistry & Physiology**
- 02:00 PM Saturday, April 17, 2004
  DeBartolo Hall Room 358
  Dr. Kerry Cheesman-Presiding

**Plant Ecology/Wetlands**
- 02:00 PM Saturday, April 17, 2004
  DeBartolo Hall Room 356
  Mr. Tracy Engle-Presiding
The production worldwide of more than nine billion tons of carbon dioxide each year by industrial processes is affecting greenhouse gases in the atmosphere. The injection and sequestration of carbon dioxide scrubbed from the flue gases of coal-fired power plants is an option to mitigate this problem being investigated by the US Department of Energy’s National Energy Technology Laboratory (NETL) in Bruceton, Pennsylvania. However, as the behavior of carbon dioxide in underground brine aquifers is not well understood, NETL is developing a Geological Sequestration Simulation Facility (GSSF) to gather data on the behavior of carbon dioxide, brine and reservoir rock in conditions that exist at depth. The GSSF is envisioned as being capable of subjecting carbon dioxide, brine and a variety of reservoir rocks to the pressure and temperature conditions that exist at depths up to 3,000,000 feet. The GSSF is envisioned as being instrumented to record real time as well a pre- and post-test data. Data acquisition is envisioned to be generated by instruments such as MRI, CT scan, temperature and pressure sensors, x-ray diffraction, atomic absorption, and potographic imaging equipment, among others. This study reports on the initial progress toward the development of the GSSF, including estimates of the funds proposed instrumentation specifications and timeline for development.

This ongoing study will examine the hydraulic soil characteristics of three central Ohio wetlands areas. The first of the three study sites is a natural wetland site located in Pickerington Ponds Metro Park in Fairfield County, a 1,200-acre park in the Blacklick Creek Watershed. The second site is a mitigated wetland located in Three Creeks Metro Park also in Franklin County, a 74.1-acre site that is fed by Blacklick Creek. The third and final site of this study is the new Albany Wetland Nature Preserve in Delaware County; a 30-acre mitigated wetland site in the Rocky Fork Watershed established by the Ohio Department of Transportation (ODOT). The Rocky Fork Site is currently considered to be successful by the Environmental Protection Agency. Data for this study will consist of six random core samples from all three wetland sites. These samples will be sifted for the iron or manganese concretions, and other percent of organic matter will be tested via loss-on-ignition (LOI) technique. Samples will be analyzed to determine whether the soil is a mineral soil, the presence of sulfidic material, as well as their aqulic/permoquatsic moisture regime. The tank that will consist of evidence of reducing conditions, and proper matrix chromas, and motting.

Stark County, located in northeastern Ohio, is covered by a mosaic of forest and agricultural lands. Unharvested forests cycle nutrients internally, while croplands receive external nutrients such as manure and fertilizers and lose nutrients through harvest, erosion, and leaching. Nitrate, a highly mobile ion, and phosphate, a less mobile ion, can be used to understand nutrient dynamics in these landscapes. For example, through cultivation, homogenizes the surface horizon; in contrast, the same horizon is spatially variable in a forest. Understanding spatial variability of nutrients in the landscape is useful for studying patterns of productivity in future experiments. The goal of this study is to observe the effects of land use by contrasting namely a seventy-five-year-old unmanaged ten acre forest and a six acre adjacent plot that has been farmed for the past fifty plus years, on the concentrations and spatial patterns of nutrients in soils. Forest levels of nitrate and phosphate should be lower due to the lack of external additions. The spatial variability of cropland should be lower due to constant tillage. Since the cropland has had treatment with manure, fertilizers, and legumes in rotation with wheat, the expected nitrate should be present at high levels. Ten samples of soil were taken from the forest and adjacent farmland at 1-meter intervals on three different dates. The soil samples were extracted in a potassium chloride (1M) solution. Extracts will be analyzed spectrophotometrically with a Flow Cytometer and values will be reported on a per gram of dry weight and organic matter basis.
in Hiram Township, Portage County, Ohio. Replicated mesocosm studies were performed to test the effects of nutrient supplementation on community structure using six 20 L plastic buckets as mesocosms. All were filled with 10 L of wellwater: Four were inoculated with 1.0 L of unfiltered pondwater, (38 species of plankton were found in these inoculations). Total phosphorus was elevated to 5.67 mg/l using a commercial plant food in two of the mesocosms. The nutrient treatment mesocosms were inoculated with pond water and controls were inoculated with pond water as controls for airborne colonization by plankton propagules. Initially, species diversity increased in the nutrient-treatment mesocosms whereas in the nutrient-free treatment mesocosms the diversity decreased. After two weeks, the nutrient-free mesocosms displayed an increase in diversity then stabilized after two weeks. There was a strong influence of nutrient supplementation on mesosomatic community diversity, leading to competitive dominance by cyanobacteria.

**Board 07**

**THE CALCIUM/CALMODULIN-DEPENDENT PROTEIN PHOSPHATASE, PP2B, HAS ROLE IN REGULATING EXOCYTOSIS IN PARAMECIUM.**

Dean Fraga (fraga@wooster.edu), Sabrina Brown (sabrina.brown@wooster.edu), and Barbara Schonfeld (wschofield@wooster.edu) Department of Biology, 931 College Mall, The College of Wooster OH 44691.

Paramaecium tetraurelia are ciliated protozoa that contain membrane-docked vesicles called trichocysts. The trichocysts fuse with the membrane in a calcium-dependent manner and release proteins that form long crystalline spines, which help Paramaecium escape predators. To determine whether PP2B plays a role in the regulation of calcium-dependent exocytosis, we used a bacterial-derived RNA interference (RNAi) protocol to determine if the calcium/calmodulin-dependent protein phosphatase, PP2B, was involved in trichocyst discharge. Paramaecium cells were fed Escherichia coli containing an inducible plasmid as a screening vector as well as Escherichia coli with minor modifications. After treatment, Paramaecium cells were selected and exocytosis triggered by the addition of a saturated picric acid solution. Cells were viewed at 20x using a phase contrast objective and images captured digitally. Cells were scored visually to determine exocytosis efficiency. Scores were verified by digital image analysis and the total area covered by the discharged trichocysts was determined and normalized to the total cell body area. Normalized control and treated cells were scored and the results indicated that PP2B RNAi treatment resulted in a reduced efficiency of exocytosis. The number of cells exhibiting full exocytosis was reduced from 76% in control cells (n=129) to 23% in PP2B treated cells (n=150) with reduced exocytosis (<50% full discharge) increased from 2% (control treatment) to 41% (PP2B treatment). Treated and control mesocosms had no visible effects upon endocytosis, cell morphology, or swimming motility. Reduced exocytosis (<50% full discharge) increased from 2% in PP2B treated cells (n=190). Cells exhibiting dramatically reduced exocytosis (<50% full discharge) increased from 2% in control treatment to 41% (PP2B treatment). Treated and control mesocosms had no visible effects upon endocytosis, cell morphology, or swimming motility.

**Board 08**

**P232 AND P258 ARE INVOLVED IN NifM MEDIATED FOLDING OF THE Fe PROTEIN OF NITROGENASE.**

Sudheer Tungtur, stungtur@bgsu.edu; Lakshmi Pulakat, lpuilakat@bgsu.edu; and Praveen NagaVini, nagavini@bgsu.edu; Department of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.

Nitrogenase, the enzyme responsible for conversion of atmospheric nitrogen to ammonia, consists of two separable protein components designated the Iron (Fe) protein and the Molybdenuim-Iron (MoFe) protein both of which are extremely oxygen-sensitive. The Fe protein is a 64 kDa y, homodimer encoded by NifH. The maturation of the Fe protein which contains 8 proline residues is assisted by the nif accessory protein NifH that has peptidyl prolyl cis/trans isomerase activity. To identify the proline residues that function as the substrate for NifH, a library of Fe protein mutants was generated by DNA Shuffling. This technique results in the generation of a large number of mutants that assist in the study of structure-function relationship of proteins and in obtaining insights into the evolution of proline isomerases. This library was screened for NIFM independent mutants as follows. The NifH gene of these mutants were PCR amplified using the specific NifH primers and cloned into TOPO 2.1 vector. These were transformed into Azotobacter vinelandii BG98 as a NifM mutant which has a nif- phenotype. One of the NifM mutants was able to complement the Azotobacter vinelandii BG98 and give a Nif+ phenotype. Sequence analysis of the NifH mutant from this strain showed that it encoded a Fe protein carrying two mutations, P232K and P258S. Further analysis showed that a single mutant P258S was sufficient to obtain partial complementation of the Nif- phenotype of BG98. This result implied that P258S region of the amino acid sequence is the major substrate for NIFM.

**Board 09**

**DETERMINATION OF MITOCHONDRIAL ENRICHMENT AND ACTIVITY THROUGH VARIATIONS IN DIFFERENTIAL CENTRIFUGATION SPEEDS AND STORAGE CONDITIONS.**

Chanda L. Kimes (chanda.lynee@hotmail.com) 5240-B NORTHOWNE BLVD, COLUMBUS, OH 43229.

To study mitochondrial function in the laboratory, it is necessary to have reliable, reproducible methods to isolate and store mitochondria. However, most methods suggested for isolation and storage of mitochondria do not produce active mitochondria. This research determined the proper differential centrifugation speed which will cause the mitochondria alone to pellet in the appropriate fraction and the determination of the best time interval at which mitochondria can be frozen before they become inactive. An initial test was completed to conclude which centrifugal speed is appropriate to pellet the majority of mitochondria during the second spin and then anywhere from ten to fifteen days per run was needed to test the effect of the three different freezing possibilities. This enzyme was assayed on all three runs to determine if freezing techniques influence the activity of mitochondrial enzymes. Transport of mitochondria was measured in the range from 1800 RPMs (250 x g) to 2700 RPMs (600 x g) and the freezing techniques include flash freezing versus normal freezing and a −20 and a −80 degree Celsius refrigerator. A centrifugal spin at 2000 RPMs (600 x g) was used to recover the mitochondria and is determined to be desirable results after calculating mitochondrial activity in milligrams of protein per minute. However, at least two more runs will be conducted comparing two mitochondrial samples with a second spin and either 1800 or 2200 RPMs before the storage aspect of the experiment is attempted.
surface of the Fe-protein. It was suggested that the loss of diastrophic growth in A. vinelandii UW97 may due to global conformational disruption or by the disruption of the conformational change upon Mg-ATP binding. To isolate genetic revertants of A. vinelandii UW97 that can show diastrophic growth, mutations were induced in the nifH gene. To do this, the region of nifH spanning codon 45 - 289 was PCR amplified and was cloned into pCR2.1-TOPO. This clone was designated as pBG3205. This clone was digested with HindIII and EcoRI. It was shown that the codon 44 would remain unchanged (44phe) throughout this mutagenesis process. Random mutations were introduced into this truncated nifH gene (nifH 45-289) by transforming red cells (strain BG1158) with pBG3205. The mutated pBG3205 was isolated after propagation through red cells, and the ability of the mutated nifH 45-289 to complement the nif phenotype of A.vinelandii UW97 was analyzed. The pBG3205 carries only colEl replication origin and no replicon for methylating P clusters and FeMo-co. In vitro assays have identified that nifH is necessary for FeMo-co biosynthesis and the nifH gene product is required for activation and stability of the Fe protein. The chloroplast genome of Chlamydomonas contains a gene encoding a protein that is 30% identical to nitrogenase Fe protein (encoded by nifH) subunit and the cysteine residues required for liganding the FeS cluster in Fe-protein are conserved in ChlL. Further using DNA shuffling technique we generated a nifM independent nifH mutant capable of nitrogen fixation.

Nitrogenase is an enzyme complex consisting of two oxygen-sensitive protein components, the Fe-protein and the MoFe-protein. The Fe-protein (encoded by nifM) is a homodimer (encoded by nifH) which contains a single Iron-Sulphur (Fe 4S4) cluster whereas Iron-Molybdenum protein (MoFe-protein) is a 2x2 beta heterotetramer (encoded by nifDK) containing 2 Mo atoms and 30 Fe atoms contained in 5 iron-sulfur clusters. pBG1380 and the resultant construct was designated as pBG2470. When pBG2400 was introduced into A. vinelandii strains of various genetic backgrounds, it was capable of rendering nif-minus strains with nif + activity. To identify the proteins that interact with and mediate angiotensin II receptor AT2-specific signaling, a mouse 17-day embryo kidney cDNA library was screened with pBG2470, and designated the resultant plasmid as pBG2478. By contrast, Tyrosine at position 45 of active Fe-protein. The NifM gene product has been suggested to be involved in the biosynthesis or insertion of the Fe4S4 cluster into the apo Fe-protein and synthesis of the inorganic sulfide needed for the 4Fe4S cluster assembly. Therefore, the role of NifM protein could be to impart activity and stability to the Fe protein. Based on sequence analysis of the NifM polypeptide, we have been able to isolate an Azotobacter vinelandii strain BG1158, which codes for a Fe-protein containing the mutations M225ST and Y230H, which could functionally complement A. vinelandii strain. M3 counting the synthesis of nifH from A. vinelandii BG1158 into the his-tag bearing vector, pBG1380, and designated the resultant plasmid as pBG247. On transforming A. vinelandii AV98 strain (which does not synthesize the Fe-protein) with pBG247, the nifH gene product was expressed and its molecular weight was determined to be 60,000 daltons. The nifH gene product is an accessory gene of nif-gene cluster required for the accumulation of active Fe-protein. The nifH gene product plays an important role in conferring activity and some stability to the Fe-
protein. The possibility that NiFM promotes the proper conformation of NiF/H polypeptides necessary to accept the [4Fe–4S] cluster is particularly attractive. Since isolated Fe-protein does not contain any NiF/H protein, it is unlikely that the NiF/H is a subunit of the Fe-protein. Therefore, the role of NiF/H could be to impart activity and stability to the Fe-protein through some sort of catalytic event. Based on this reasoning, we isolated a mutant Azotobacter vinelandii in which the NiF/H protein was no longer required for nitrogenase activity. Further analysis showed that the NiF/H gene from this mutant strain contained multiple mutations spanning three easily recognizable regions in the Fe-protein. We constructed mutants in all three regions, isolated one region, and performed genetic complementation experiments using growth curve analysis. Growth curve patterns showed that the mutants were able to grow independent of NiF/H. These analyses, combined with molecular modeling analysis showed that the region spanning amino acids 220 to 240 is involved in the NiF/H-mediated folding of the Fe-protein of nitrogenase.

Board 17 Functional NifD-K Fusion Protein in A. vinelandii Is a Homodimeric Complex as Determined by Using Bacteriophotomatch™ Two-Hybrid System
Surobi D. Lahiri, Saha Hirt @BGSU,GSU.edu, Lakshmi Pulakat, Pulakat @BGSU,GSU.edu, Gavini Nara, Nara Gavini @BGSU,GSU.edu, DeP of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.

The MoFe protein of the complex metalloenzyme nitrogenase folds as a heterotetramer containing two copies each of the homologous alpha and beta subunits, encoded by the nifD and nifK genes respectively. The functional expression of the nifD-K fusion protein of nitrogenase was demonstrated in A. vinelandii, consistent with the MoFe protein being flexible as it could accommodate major structural changes, yet remain functional. This finding led us to further explore the type of interaction between the fused MoFe protein units. We aimed to determine whether an interaction exists between the two fusion MoFe proteins to form a homodimer that is equivalent to native heterotetrameric MoFe protein. Using the Bacteriophotomatch™ Two Hybrid System, fused constructs of NifD-K(fusion) with the full-length αCI of the PBT bact vetor and also NifD-K(fusion) with the N-terminal α-RNAP of the PTRG target vector were made. To compare the extent of interaction between the NifD-K fusion proteins to that of the β-β interaction in the native MoFe protein, we proceeded to generate fused constructs of NifK with the β-RNAP of the PTRG vector and βCI protein of the PBT vector. The strength of the interaction between the proteins in this study was determined by measuring the β-galactosidase activity and extent of ampicillin resistance of the colonies expressing these proteins. This analysis demonstrated that direct protein-protein interaction exists between NifD-K fusion proteins, suggesting that these homodimers. We propose that these homodimers of NifD-K fusion protein may function in a similar manner as that of the heterotetrameric native MoFe protein. The observation that the extent of protein-protein interaction between the β-subunits of the NifD-K fusion proteins to that of the β-β interaction in the native MoFe protein is comparable to the extent of protein-protein interaction observed between the NifD-K fusion proteins in the same system supports this hypothesis.

Board 18 Genetic Complementation of Human Pin1 in Azotobacter Requires the Substrate Recognition Sequence of NiFM.
Kumaraguru Raja, RajaRaj@BGSU,GSU.edu, Lakshmi Pulakat, Pulakat @BGSU,GSU.edu, and Nara Gavini, Gavini @BGSU,GSU.edu, DeP of Biological Sciences Bowling Green State University, Bowling Green OH 43403.

Nitrogenase, which catalyzes dinitrogen to ammonium, is composed of iron molybdenum (MoFe) protein and iron (Fe) protein. The NiFM protein is required for the activation and the stabilization of the Fe protein through interactions to the PPIase domain Pin1. PPIases Pin1 is an essential prolyl isomerase that is specifically required for proper progression of mitosis in humans. It has very high similarity to the NiF/H protein of the Azotobacter vinelandii. Azotobacter vinelandii BG98 is a NiFM-/-kanamycin strain and does not grow on Burk’s nitrogen free media due to the deletion of the NiF/H gene. The human pin1 gene was cloned into pBG1380 that has a nifH promoter, histidine tag and chloramphenicol resistance marker. and the recombinant construct was designated as pBG1553. Plasmid containing the pin1 gene was transformed into A. vinelandii BG98. Azotobacter vinelandii BG98, after transformation with human pin1 gene did not show any growth on Burk’s nitrogen free medium indicating that the PPIase activity of Human PIN1 is not sufficient for the A. vinelandii BG98 strain to show nif+ phenotype. We hypothesized that the pin1 gene might require a recognition sequence from NiFM to recognize NiF/H for interaction. Therefore, we fused the NiFM recognition sequence upstream of the pin1 gene in the plasmid pBG1553. Azotobacter vinelandii BG98 was transformed with the plasmid pBG1553. The resulting transformants could grow on Burk’s nitrogen free medium, indicating that the PPIase activity of Human PIN1 combined with the recognition sequence of NiFM is sufficient for the human PPIase protein to interact with the Fe protein of A. vinelandii BG98 with nif+ phenotype.

Board 19 Substrate Recognition Domains of PPIases: Genetic Complementation of S. cerevisiae ESS1 by the Single Domain PPIC of E. Coli. Vandana Chaturvedi, vchaturi @BGSU,GSU.edu, Lakshmi Pulakat, Pulakat @BGSU,GSU.edu, and Nara Gavini, Gavini @BGSU,GSU.edu, DeP of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.

Peptidyl prolyl cis/trans isomerases (PPIases) catalyze the intrinsically slow process of cis/trans isomerization of peptide bonds amino terminal to the proline. Studies on Saccharomyces cerevisiae have shown that the ESS1 (which specify PPIase) mutants were lethal and defective in 3′RNA processing. Temperature sensitive S. cerevisiae ESS1 strains were isolated used for structure/ function analysis of PPIases from various organisms. It was reported that plant pin1 which has only the PPIase domain with four conserved amino acids could rescue ESS1 in S. cerevisiae. The multiple alignment of amino acid sequences revealed that the Escherichia coli PpiC has considerable homology with PPIase domain of human Pin1 and Ess1, and is devoid of WW domain as well as four conserved amino acids. This interest led us to see whether the E.coli PpiC, a prototype member of the parvulin family, could rescue the ESS1 mutations in S. cerevisiae. The E.coli PpiC is 92 amino acids long and the entire protein represents the PPIase domain. The protein was cloned such that the expression of the PpiC is under the control of galactose inducible gal1 promoter in S. cerevisiae. Growth patterns showed that the transformed strains were able to grow at the restrictive temperature of the mutated PPIase. This observation, combined with other molecular analyses confirmed that the E. coli ppiC complements essential functions of the Ess1. This observation is consistent that the WW domain, of the PPIase being essential to interact with cognate substrates under these conditions.

Board 20 Isolation of Second Site Functional Compensatory Mutation for Azotobacter vinelandii UW97 Fe-Protein in the Beta Subunit of MoFe-Protein. Ritesh Tandon, L. Pulakat, and N. Gavini, DeP of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.

Azotobacter vinelandii UW97 is not capable of diazotrophic growth due to a specific mutation in the nifH. This mutation replaces serine by phenylalanine at position 44 rendering the protein incapable of its functions. The loss of function of the Iron-protein due to this mutation was modeled to be a conformational disruption of the catalytic domain in the MoFe protein. We disrupted the disruption by expressing the protein in the Molybdenum-Iron -protein renders the A. vinelandii strain UW97 incapable of diazotrophic growth in many cases. We have isolated second site genetic mutants of A. vinelandii UW97 specifically in the beta subunit of the Molybdenum-Iron -protein by using cloned nifK and subjecting it to spontaneous mutagenesis in DNA repair compromised E. coli XL1-RED cells. Further analyses by nucleotide sequencing and genetic complementation showed that the A. vinelandii strain UW97 retained the original mutation at Ser44Phe while acquiring a suppressor mutation in the beta subunit of the Molybdenum-Iron -protein. The mutations in the Molybdenum-Iron -protein were mapped using mutagenesis and found that these proteins are most likely involved in facilitating binding to the defective Iron-protein from UW97. The purification and characterization of these altered proteins is consistent with a mechanism of the suppression of the mutation and the formation of the complex.
many prokaryotes and eukaryotes. In order to decipher the functional role of orf9 in the biogenesis of nitrogenase, we have investigated its interaction with nif-structural genes, the nifDHOK, by utilizing BacterioMatch™ Two Hybrid system. The DNA corresponding to ORF8 was PCR-amplified and cloned into pORF8. Orf9 was detected by analyzing the expression of the reporter gene, Orf9 lacZ, in bacterial media. The interaction of Orf9 with nif genes was detected by analyzing the expression of the reporter genes, the nif genes, the Orf9 marker. The Orf9 showed positive interaction with Nif/K whereas no detectable interaction was observed with NifD and NifH. Amino acid sequence comparisons of the Nif/K revealed that it shares an 11-amino acid homology in its carboxy-terminal with the ClpX sequence necessary for the ClpX interaction. A deletion in carboxy-terminal of Nif/K abolished its interaction with Orf9. Furthermore based on an analysis of interactions of Clp/P with ClpX and Orf9, no interaction was detected with Orf9. Thus indicating the functional role of Orf9 might be in protein unfolding. Based on interaction of Clp/P with the three nif-structural genes, we propose that the Orf9 is a nif specific ClpX and its putative functions include a role in MoFe-protein assembly.

Board 22  EVALUATION OF ELECTRON BEAM IRRADIATION ON ENDOSPORE-CONTAMINATED MATERIAL. SHANNON L. HUFFENSTINE, smlettle2@Kent.EDU, CARLOS VARGAS-ABURTO, cvargas@kent.EDU, CHRISTOPHER J. WOOLVERTON, cwoolver@kent.edu, KENT STATE UNIVERSITY, DEPT OF BIOLOGICAL SCIENCES, 500 E. MAIN ST., CHH 256, KENT OH 44242.

Concern of anthrax-tainted letters has necessitated a comprehensive investigation of the use of electron beam (e-beam) irradiation to sanitize US mail of endospore contamination. A culture of Bacillus atrophaeus (an anthrax surrogate) endospores was sterilized by e-beam sterilization utilizing BacterioMatch™ Two Hybrid system. The DNA corresponding to ORF8 was PCR-amplified and cloned into pORF8. Orf9 was detected by analyzing the expression of the reporter gene, Orf9 lacZ, in bacterial media. The interaction of Orf9 with nif genes was detected by analyzing the expression of the reporter genes, the nif genes, the Orf9 marker. The Orf9 showed positive interaction with Nif/K whereas no detectable interaction was observed with NifD and NifH. Amino acid sequence comparisons of the Nif/K revealed that it shares an 11-amino acid homology in its carboxy-terminal with the ClpX sequence necessary for the ClpX interaction. A deletion in carboxy-terminal of Nif/K abolished its interaction with Orf9. Furthermore based on an analysis of interactions of Clp/P with ClpX and Orf9, no interaction was detected with Orf9. Thus indicating the functional role of Orf9 might be in protein unfolding. Based on interaction of Clp/P with the three nif-structural genes, we propose that the Orf9 is a nif specific ClpX and its putative functions include a role in MoFe-protein assembly.

Board 23  BACTERIAL MOTILITY OF FRESHWATER ISOLATES FROM THE KRAUS WILDERNESS PRESERVE. AMANDA R. ROBINSON, arrobins@owu.edu, LAURA TOHELLA-REUNING, ltohella@owu.edu, DEPT OF BOTANY AND MICROBIOLOGY, OHIO WESLEYAN UNIVERSITY, HWCC Box 2056, DELAWARE OH 43015.

The low motility of freshwater systems requires bacteria to employ mechanisms which aid in their survival and growth. Pseudomonas spp. and Burkholderia spp. can move to areas of desirable concentrations of nutrients via chemotactic responses and also produce siderophores – low molecular weight compounds that chelate iron and make it available as a cellular nutrient. Due to their ability to live in oligotrophic environments, the goal was to investigate how the bacteria respond to various concentrations of nutrients via chemotaxis and the physical nature of the flagella used for chemotaxis. Freshwater lake water samples were collected from the Kraus Wilderness Preserve in Delaware, OH. Bacteria were isolated from these lake water samples using modified W-R media containing sodium citrate, ascorbic acid, yarrow, and two oak species, had an inhibitory effect on the growth of the bacteria tested. If the fresh herbs have properties and is used commercially as an antiseptic agent in cosmetics, soap, and toothpastes. We investigated properties of twelve different volatile plant materials and usnic acid, on feather-degrading bacteria using a preliminary study of Mueller Hinton agar was poured into the tops of microcentrifuge tube boxes and cultures of bacteria were made. The microcentrifuge tubes were filled with fresh foliage and water then smothered to inhibit volatile gases prior to inoculation of E. coli. Water and quaternary disinfectant were used as controls. Following incubation zones of inhibition were measured. The inhibitory effect of plant extracts on bacterial lawns was also evaluated. In five trials, several types of plant materials and extracts, including usnic acid, ascorbic acid, yarrow, and two oak species, had an inhibitory effect on the growth of the bacteria tested. If the fresh herbs have a sufficient concentration of these chemicals, they could use the nestings from harmful bacteria.

Board 24  THE PRESENCE OF ANTIBIOTIC RESISTANCE IN COLIFORMS IN LAKES AND LAKE SERIES IN THE MAUMEE VALLEY WATERSHED AREA OF OHIO. TIFFANY N. CAUDILL, TIFFANY_CAUDILL@hotmail.com (HEATHER HUG, hhhug@defiance.edu) THE DEFINANCE COLLEGE, 701 NORTH CLINTON, W12, DEFIANCE OH 43512.

Antibiotics are used to treat bacterial infections. However, bacteria can gain resistance to antibiotics causing them to be ineffective. The overuse of antibiotics in medicine and agriculture is contributing to the development of antibiotic resistant bacteria. This study was designed to determine the extent of antibiotic resistance within lakes in the Maumee Water Valley Watershed Area of Northwest Ohio. It was hypothesized that isolated lake ecosystems will have exceptional ability to degrade feather butts from the raches. Because this can be difficult and costly to do mechanically, fungi may more efficiently remove the chitin (protein) extracted from the feathers, paper, plastic replacements, and lighter, more conductive computer chips.

Board 25  BIRD'S, HERBS AND BACTERIA: THE EFFECTS OF ANTIMICROBIAL PLANT NESTING MATERIAL ON FEATHER-DEGRADING BACTERIA. NICOLE-MARIE K. COTTON, nmcotton@owu.edu and JANN M. ICHEIDA, jmicheida@owu.edu, DEPT OF BOTANY AND MICROBIOLOGY, OHIO WESLEYAN UNIVERSITY, UNIVERSITY OHIO WESELY, DELAWARE OH 43015.

Bacillus licheniformis, a feather-degrading bacterium, occurs in the plant kingdom. Studies of the plant kingdom have demonstrated that plants brought to the nest might have an inhibitory effect on the bacteria. This study was designed to determine the extent of antibiotic resistance within lakes in the Maumee Water Valley Watershed Area of Northwest Ohio. It was hypothesized that isolated lake ecosystems will have less antibiotic resistant bacteria than lake ecosystems that receive water as run off from agriculture. In this study, four lakes were tested for the measure of antibiotic resistant bacteria and coliforms. To do this, three, replicate samples were taken at each site. Two lakes having drainage ditches that carry run off from farms were...
Ronald L. Green, and B. J. King, respectively. The newly obtained fragments were further analyzed on DNA sequence comparison. The primer pair was used to amplify 16S rDNA (5' GTGTGTACAAAGGGCAGGG 3') for 18S rDNA was derived based on universal primers (5' TGCATGGCCGTTCTTAGTTGG 3' and 5' TACGCAGCAGGAACCACTC 3') for 16S rRNA gene fragments. However, few methods exist to compare TRFs from multiple digestions to the TRFs expected based on phylogenetic information can be obtained without direct sequencing of 16S rRNA genes. Terminal restriction fragment length polymorphism analysis (T-RFLP) is a microbial community profiling method involving nucleic acid extraction, PCR amplification with fluorescently labeled primers, restriction digestion, and automated sizing of labeled terminal restriction fragments (TRFs). T-RFLP has advantages over other community analysis methods in that TRFs obtained from samples processed with widely conserved ribosomal gene database sequences to access this valuable phylogenetic information. T-RFLP FRAGSORT is a MS Windows based program that compares TRFs obtained from samples processed with widely used primers (BF, 907R, 11F, 226F, 111R) and restriction enzymes (MspI, HhaI, RsaI, HaeIII, and BfaI) to TRFs from simulated amplification and digestions of 34,531 ribosomal gene sequences. The output is a list of microorganisms and TRF sizes that correlate with the T-RFLP profiling order from the greatest to the least normalized TRF peak areas. Validation experiments showed that three different digestions must be used to identify accurately pure cultures and members of defined bacterial communities. Terminal restriction fragment length polymorphism analysis (T-RFLP) was performed in duplicate. Results of T-RFLP analysis are presented as a Bar Chart. A useful tool for rapidly analyzing microbial community composition based on multiple digestion T-RFLP data.

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high deer density are expected to show higher browsing pressure than in areas of low density. Also, plants with higher browse pressure are expected to show an increase in the number of flowering shoots and less root biomass to increase the chance of reproduction. In areas of low density it is expected that plants will have less shoots and more root biomass because the need for replacement of stem tissue is not as important.

**Board 33** IMPACT OF DEER BROWSING ON SUGAR MAPLE (ACER SACCHARUM) REGENERATION

**PHILIP K NICKEL, NICKEL, PHD, 38@WRIGHT.EDU 49 BOULDER DR. FRANKLIN, OH 45005.**

Deer populations in North America are larger now than previously described, exacerbating their potential for damaging plants. Previous studies have described the effects of deer browsing on herbaceous species, and have shown relatively quick vegetative rebounds after deer removal or exclusion. However, little work has focused specifically on regeneration of woody species. The existing literature is based on sycamore. This study is designed to examine the impact of deer browsing on sugar maple (Acer saccharum) which is palatable to deer and of ecological and economic importance in midwestern and northeastern North America. The position of sugar maple as a major species in forest types in this region of the country means that the inability of sugar maple to regenerate can result in dramatic changes in forest composition. Sugar maple seedlings/saplings were aged using annual bud scars in six properties managed by Five Rivers Metroparks in Greene and Montgomery counties, Ohio with deer densities ranging from 19 to 93 deer per mi². The Wright State University campus woods in Greene county, Ohio served as a control with its low deer density (<20 deer per mi²). Maple seedlings less than 1m in height were collected in sixty (60) 1m² plots randomly placed in each park. A total of 350 maple seedlings were sampled in 2003. Average ages of maple seedlings ranged from 2.8 to 4.6 years. Absence of deer browsing has been associated with high deer densities suggests that deer are reducing the ability of sugar maples to replace themselves by browsing and killing seedlings.

**Board 34** THE EFFECTS OF HERBICIDE (ROUNDUP®) APPLICATION ON GARLIC MUSTARD (ALLIARIA PETIOLATA) DENSITY AND SUBSEQUENT EFFECTS OF GARLIC MUSTARD ERADICATION ON THE FOREST FLOOR PLANT COMMUNITY. B R RADFORD S. GORCHOD, GORCHOD@MUOHIO.EDU. DEPT OF BOTANY, MIAMI UNIVERSITY, OXFORD OH 45056.

The invasive biennial herb Alliaria petiolata (garlic mustard) is considered a threat to native forest herbes in the eastern United States. We assessed the effects of herbicide (Roundup®) on A. petiolata density and associate species richness in a second-growth forest stand in Hueston Woods State Nature Preserve, Preble Co., OH. In each stand 25 1 x 1 m plots were spot-sprayed each November 2000-2003 and 25 plots were unsprayed controls. In May 2003 five herbicide resistant A. petiolata adults and rosettes in each plot. Cover of forest floor plants was quantified in early May and late June 2003. Herbicide significantly decreased adult A. petiolata frequency in both the old-growth (F = 15.9, p = 0.001) and second-growth (F = 11.2, p = 0.040) stands. Log-transformed A. petiolata rosette density was not affected by treatment in the old-growth stand (Student t = 0.22, n = 45) but was reduced in the second-growth stand (t = 2.71, n = 48, P = 0.010). Native species richness was not affected by treatment in either stand (t = -0.75, t = -1.02). Local herbicide application reduced adult A. petiolata density but was less effective in reducing rosette density, likely due to the presence of nearby seed sources. Of a treatment setup of five garlic mustard, five native species richness suggests A. petiolata may not competitively exclude native species, or that post-treatment recovery of the native flora is slow or difficult to detect at the 1 m² plot scale.

**Board 35** THE DISTRIBUTION AND ASSOCIATED PLANT SPECIES OF QUEEN OF THE PRAIRIE (FILIPENDULA RUBRA). AMY L SCHULER, SCHULER@YSU.EDU, CTY Range Tech. C, OH 44471. J MURRAY CWILLIS@YSU.EDU, DEPT OF BIOLOGICAL SCIENCES, YOUNGSTOWN STATE UNIVERSITY, YOUNGSTOWN OH 44555.

Filipendula rubra (Rosaceae) is a perennial herb native to calcareous fens in the northcentral United States. Although only considered potentially threatened in Ohio, F. rubra is state listed as threatened or endangered in four states. The goal of this study was to determine the distribution and associated plant species of F. rubra. The plant species distribution was determined by examining herbarium records from herbaria throughout the expected range of F. rubra and comparing where the plant occurred historically (<1960) and recently (<1960). According to herbarium records, F. rubra occurred in 35 counties historically and 30 counties recently. In Illinois, Ohio, Missouri, and West Virginia, F. rubra is expanding its range while in Indiana, Michigan, and Pennsylvania, F. rubra is decreasing its range. In New York, the distribution of F. rubra has remained constant. From May through September in 2001 and 2002, associated plant species were collected and used to generate a list for each study site: Jackson Bog in northeast Ohio and Gallagher/ Soden Bog, Kiser Lake Bog, Midway Road Fen in west-central Ohio. Population sizes of F. rubra were N = 30 (JB), N = 269 (GSF), N = 130 (KLW), and N = 81 (PRF). Voucher specimens were deposited in the Youngstown State University herbarium (YUO). The plant species commonly associated with F. rubra were Pychathemum tenuifolium (Schr.), L., Lythrum salicaria L. (Lythraceae), Andropogon gerardii Vitman (Poaceae), Phlox maculata L. (Polyonemaieae), Steironema quadriflora Sims (Primulaceaieae), Potentilla fruticosa L. (Rosaceae), Galium aparine L. (Rubiaceaieae), and Thelypteris palustris Schott (Thelypteridaceaieae).

**Board 36** LDH/ADH ACTIVITY IN VASCULAR AQUATIC PLANTS IN RESPONSE TO HYPOXIC STRESS. JORDAN R. BEACH, BEACHJR@OHIO.EDU 500 JORDAN BEACH, BOX #153 1972 CLARKE AVE. ALLIANCE, OH 44601 (EPP, LEONARD).

During hypoxic conditions, crop plants have been shown to switch from oxidative phosphorylation to fermentation in order to produce sufficient levels of ATP. The increase in fermentative glycolysis results in lower harvest products, primarily because the amount of photosynthesis occurring and the relative increase under hypoxic conditions can be found through the enzyme activity lactate dehydrogenase (LDH), which along with NADH reduces pyruvate to lactate, and alcohol dehydrogenase (ADH), which along with NADH reduces acetaldehyde into ethanol. The amount of enzyme activity can be found by isolating and purifying the enzyme, followed by analyzing the amount NADH (usually in milligrams) and the number of milligrams of LDH or ADH to find crop plants response to hypoxia, little to no research was found on natural aquatic vascular plants and the levels of LDH and ADH associated with them. The purpose of this experiment is to analyze the response of four native Ohio aquatic vascular plants to anoxic conditions with regards to the levels of LDH and ADH. Hypoxic conditions will be induced using NO₃⁻. The extraction will done using a KPi buffer and the amount of enzyme present will be found using ELISA. The plants include Saururus cernius, Pontederia cordata, Polygonum amphibium, and Mentha arvensis.

**Board 37** SURVEY OF OHIO’S NURSERIES FOR THE SUDDEN OAK DEATH PATHOGEN, PHYTOPHTHORA RAMORUM, AND RELATED SPECIES: OAK (PNEUMOCITRICA) AND RHODODENDRON (ERICACEAE). MIKE P. SCHIEL, SCHIEL@OHIO.EDU JEFFREY S. LEHMAN, LEHMAN@OTTERBEIN.EDU, MARIA BELIZZI, BELIZZI@OHIO.EDU, BONELLO, BONELLO@OSU.EDU, 155 MAIN ST DEPT OF LIFE SCIENCE, OTTERBEIN COLLEGE, WESTERVILLE, OH 43081, 2DEPT OF PLANT PATHOLOGY, OHIO STATE UNIVERSITY, COLUMBUS OH.

Phytophthora ramorum is an oomycete responsible for the Sudden Oak Death (SOD) disease currently affecting several species of oak and other woody species in the western USA. Despite attempts to quarantine the pathogen, there is an increasing concern that SOD may spread eastward to Ohio because many Ohio nursery growers import foliar hosts of P. ramorum (e.g., rhododendron) from the Pacific Northwest. The objectives of this study were to: 1) isolate and identify the species of Phytophthora from leaf and shoot samples of SOD affected plants; and 2) determine whether P. ramorum is present in Ohio. Rhododendrons in 15 nurseries throughout Ohio were sampled for foliar/shoot disease. A fifty-five culture plate was used to obtain a selective medium from a total of 213 diseased leaves and shoots. Based on ELISA, 52 of the diseased tissue samples tested positive for the presence of Phytophthora spp., and 40 samples showed concuring positive results for Phytophthora spp. in culture and with ELISA. We successfully sequenced the ITS region of the rDNA operon of 51 isolates, and this information was used to determine species identity and whether P. ramorum was among the isolates. Bacterial-like sequence data, A. porphyrina, C. cacti, and P. nicotianae are among the foliar and shoot pathogens of rhododendron in Ohio ornamental nurseries, while P. ramorum is not. Within a nursery sample set, one or two phytophthora species were typically isolated.

**Board 38** GAMETOPHYTE DEVELOPMENT OF PTERIS VITTATA AND PLATYCLERIS BIFURCATUM IN THE PRESENCE OF POTASSIUM ARSENATE. SARAH M. JURAK AND JEFFREY S. LEHMAN, 155 WEST MAIN ST, DEPT OF...
Ferns differ in their ability to tolerate arsenic, a widespread environmental contaminant. This study describes gametophyte development of *Pteris vittata* (an arsenic hyperaccumulator) and *Platycerium bifurcatum* (a non-accumulator) in the presence of potassium arsenate. Specifically, the objective was to quantify the percentage formation and mean development time (MDT) of prothallia. Spores of *Pteris vittata* and *Platycerium bifurcatum* were grown on basal salts medium amended with arsenic (0, 100, 500, and 1000 ppm). Throughout development, numbers of spores that produced prothallia were counted and used to calculate the percentage formation and MDT (days) for prothallia. Data were analyzed as a completely random design with two fern species, four arsenic levels, and five replications. MDT values (±SD) for *Pteris vittata* were 6.4 ± 0.6, 7.0 ± 1.0, 7.0 ± 0.3, and 7.2 ± 0.5 days at 0, 100, 500, and 1000 ppm of arsenic, respectively, and statistically were not different. In contrast, MDT values for prothallia of *Platycerium bifurcatum* were 8.1 ± 0.8 and 8.9 ± 0.9 days at 0 and 100 ppm, respectively. Values for 500 and 1000 ppm were statistically longer and were 18.8 and 100 ppm, respectively. Percentages for prothallium formation at 0 and 100 ppm arsenic were significantly larger than values for 500 and 1000 ppm. Results indicate that prothallia of *Pteris vittata* were unaffected by high arsenic while prothallia of *Platycerium bifurcatum* are greatly inhibited and exhibit delayed development by arsenic levels > 100 ppm.

**Board 02** HOW DOES ODOR SAMPLING CHANGE AS CRAYFISH GROW: HIGH-SPEED VIDEO STUDIES OF ORCONECTES IMMUNIS

*Crayfish, like many crustaceans, can interpret their chemical environment using chemosensors located on their antennules. Crayfish move their antennules in rapid "flicks" which allow them to sample surrounding fluids in a pulsed flow, and are affected by odorants.*

**Board 03** MALE BIASED SEX RATIO IN YOUNG OF EASTERN BLUEBIRDS (SIALIA SIALIS)

*Eastern bluebirds (Sialis sialis) are socially monogamous, with males and females paired for life. The mechanism for a male-biased sex ratio occurred prior to egg-laying; fatalities among hatchlings were not caused by predation.*

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**Poster Session 10:00-11:00 am**

**Board 01** ANALYSIS OF N-CADHERIN FUNCTION IN DEVELOPING ZEBRAFISH (DANIO RERIO) RETINAL GANGLION CELLS

*Cadherins are homophilic Ca²⁺-dependent cell adhesion molecules that control development of a variety of tissues and maintenance of adult structures, including the visual system. Spatiotemporal expression pattern of N-cadherin and functional studies in embryonic vertebrate retinae suggests that N-cadherin plays an important role in retinal histogenesis and differentiation of retinal ganglion cells. In this study, N-cadherin function in zebrafish RGC development was analyzed using a zebrafish N-cadherin dominant negative construct (NcadC). The NcadC was generated using standard RT-PCR and ligation techniques. This NcadC construct maintains the extracellular and transmembrane domains, while its cytoplasmic domain was replaced with a myc tag sequence. The accuracy of the construct was confirmed by enzymatic digestion and sequencing. Injection of this construct into one-cell stage zebrafish embryos resulted in no processes or 1-2 short processes, whereas RGCs transfected with a control construct (Ncad) had several processes (4-6), suggesting that N-cadherin plays an important role in the differentiation of zebrafish retinal ganglion cells.*

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**Board 04** SPIDER MITE CONTROL IN RELATION TO DEHYDRATION TOLERANCE OF THE LADYBIRD BEETLE, STETHORUS NIGRIPES

*This study investigated the variation in reproductive success that drives male biased sex ratios in this socially monogamous species.*

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**Vol. 104 (1) The Ohio Journal of Science A-13.**
Climatic adaptation is of fundamental importance in classical biological control programs that consider the suitability of an arthropod’s natural enemy in a new geographic application. The present study was conducted to examine the possibility for release and establishment of the ladybird beetle, Steatoda nigripes, a spider mite predator imported into New Mexico, for potential use in soybean fields in the midwestern United States. Typically water-balance profiles of larval stages of A. americanum were conducted at 14:10 h: L:D and 22-24°C (15 per replicate; N=3 for each determination). Rapid water loss rates were characteristic of the tiny-sized adults (2.8%/h) and actively feeding larvae (0.9%/h). Neither adults nor larvae were capable of absorbing water vapor to counter water stress, evidenced by their failure to maintain equilibrium water content (hence, gain ‘• loss) in subsaturated air. Their mostly likely source is stenohydric, thus implying a specific ecological need which has likely played a key role in promoting occurrence in hot, humid habitats. The high moisture requirement of S. nigripes may act as a component of bird excreta may act as a host cue (kairomone) to A. americanum ticks. We anticipate that uric acid’s arrestment properties would appear useful as a way to prevent the crawling away from acaricide-treated surfaces if applied with acaricide simultaneously.

Grape phylloxera, Daktulosphaira vitifoliae (Homoptera: Phylloxeridae), is an important pest of grapevines. The foliar form of the phylloxera has been a pest of grapes in the Ohio region since the late 1800’s. The high moisture requirement of A. americanum agrees with their tropical origin and occurrence in moist habitats. The high moisture requirement of S. nigripes may act as the fast water loss rate of the adult, indicating a preference for a moisture-rich environment. This hydrophilic water balance characteristic of S. nigripes agrees with their tropical origin and occurrence in moist habitats. The high moisture requirement of S. nigripes may act as the primary component of bird excreta and is used here because birds are the primary hosts for the Lone Star tick. In short standard, four-quadrant 9cm i.d. petri dish bioassays, 62-65% of nymphs and adults engaged in rigorous search behavior became arrested on filter paper discs treated with 0.005M acetone solutions of uric acid as pronounced with other treatments. Ticks that came in contact with uric acid-treated surfaces could not maintain their equilibrium acid (acetic), cuticularized upper body, and remained akinetic for 2-4h. Natural attraction response to uric acid was noted, or any attraction or arrestment response to acetone alone or untreated filter paper discs were noted (10 per replicate; N=10; t2, P>0.05), consistent with their preference for maintaining acidmetry. Our study reports water balance characteristics of tick eggs from field-collected fed females to help better understand this northern tick species. Sixteen vines of each cultivar were evaluated. The cultivar Kozma 525, Frontenac and Bianca had the highest percentage of infested shoots with 75% and 73%, respectively, and Traminette had the lowest infestation with 35%. The Condor and Pinot-Gris cultivars were the only ones that had no galls present on the shoots at the time of the survey. Frontenac had the highest number of galls and was the only cultivar that had new Phylloxera on the first leaves and the galls were larger than those on other cultivars. The cultivar Traminette was found to have more galls when adjacent to Bianca and Kozma 525.

Identification of host odors, chemical cues known as kairomones, is important for enhancing pheromone-assisted techniques as baits in tick control, because their natural function is for location of hosts and, therefore, elicits heightened attraction responses. We tested the response to uric acid by nymphal and adult (mixed sexes) Lone Star ticks, Amblyomma americanum (L), potential vector of Lyme-like rash, ehrlichiosis and tularemia. Uric acid is a primary component of bird excreta and is used here because birds are the primary hosts for the Lone Star tick. In short standard, four-quadrant 9cm i.d. petri dish bioassays, 62-65% of nymphs and adults engaged in rigorous search behavior became arrested on filter paper discs treated with 0.005M acetone solutions of uric acid as pronounced with other treatments. Ticks that came in contact with uric acid-treated surfaces could not maintain their equilibrium acid (acetic), cuticularized upper body, and remained akinetic for 2-4h. Natural attraction response to uric acid was noted, or any attraction or arrestment response to acetone alone or untreated filter paper discs were noted (10 per replicate; N=10; t2, P>0.05), consistent with their preference for maintaining acidmetry. Our study reports water balance characteristics of tick eggs from field-collected fed females to help better understand this northern tick species. Sixteen vines of each cultivar were evaluated. The cultivar Kozma 525, Frontenac and Bianca had the highest percentage of infested shoots with 75% and 73%, respectively, and Traminette had the lowest infestation with 35%. The Condor and Pinot-Gris cultivars were the only ones that had no galls present on the shoots at the time of the survey. Frontenac had the highest number of galls and was the only cultivar that had new Phylloxera on the first leaves and the galls were larger than those on other cultivars. The cultivar Traminette was found to have more galls when adjacent to Bianca and Kozma 525.

The Multicolored Asian lady beetle (MALB), Harmonia axyridis (Pallas), has become a major pest in grape production in North America since 2000 when a dramatic increase in their population coincided with the arrival of the soybean aphid, Aphis glycines. When soybean aphid numbers are high, MALB adults feed on them and lay eggs of which a large number are then able to mature to adulthood. As the soybean aphid is depleted and the soybeans become hard, the MALB will typically move to nearby plants and fruits as a source of sugar and moisture before seeking an overwintering site. When grapes are harvested with MALBs present, it has been found that it takes only 12 beetles per lug (33 lb.) of grapes to contaminate the wine can lead to major financial losses for wineries. Laboratory bioassays exposing MALB to chemically treated grape slices in ventilated plastic containers were conducted during 2002/2003. Our objective was to determine MALB presence on grapes (attraction), absence from grapes (repellance), and knockdown (debilitation). The resultant recovery or mortality of the MALB after knockdown was also noted. Consequently, we found several products with potential for reduction of MALB in grapes tested, Aza-Direct had the greatest repellent properties while Provado and a mixture; Rotenone/Pyrethrin showed knockdown of MALB with subsequent recovery. Assail showed knockdown and knockdown of these products have potential for use in field trials for MALB control on grapes.
SENSORINEURAL HEARING LOSS AND CAUSES HAIR CELL GROWTH IN THE COLOURLESS MUTANT OF ZEBRAFISH. PATRICK MCKENZIE (pmckenzie@wooster.edu), RICHARD LEHTIEN (klehtien@wooster.edu), and DEAN FRAGA (dfraga@wooster.edu) C-2215 1189 BEALL AVENUE, WOOSTER OH 44691

Zebrafish (Danio rerio) contain the same hair sensory cells as humans, which makes them an excellent model for studying many hearing defects in humans. In particular, noise-induced sensorineural hearing loss and profound hearing loss due to the Sotos Syndrome are affected by the colourless mutant. To study deafness in fish, wild-type zebrafish were exposed to a white noise 168db tone for twenty-four hours causing temporary deafness. The fish were either injected with 0.05cc of a saline/BSA solution or a saline/BSA solution with Neurotrophin-3 (100ng/ml). Hearing recovery was measured using a behavioral assay that tested the fish’s response to a 400Hz tone. The colourless mutants were exposed as fry to either a solution of saline/BSA or a saline/BSA solution with NT-3 (100ng/ml). Changes in inner ear morphology were studied using a Scanning Electron Microscope. Noise-induced deafness fish exposed to saline/BSA (n=63) had a recovery time of 11.2 ± 0.7 (s.d.) hours while the fish exposed to Neurotrophin-3 (NT-3) had a recovery time of 4.9 ± 0.7 (s.d.) hours. The NT-3 treatment group had a significantly decreased time to recovery compared to the control treatment. This indicates that NT-3 may be a therapy employed to treat humans that experience temporary hearing loss. Scanning Electron Microscope data showed increased hair cell development in zebrafish treated with NT-3, suggesting that NT-3 may prove viable for use with patients suffering from Shah-Waardenburg Syndrome.

BOARD 10  EFFECTS OF EXPERIMENTALLY INCREASED COSTS OF REPRODUCTION ON THE PARENTAL INVESTMENT OF HOUSE WRENSES (TROGLODYTE AEDON). JENNIFER, LASKY, lasky@kenyon.edu; ROBERT A. MAUCK, mauckr@kenyon.edu.

Animals of different life expectancies face different reproductive challenges and should display different strategies. We expected that a short-lived species, the house wren (Troglodytes aedon), would prioritize maintaining chick provisioning over self-maintenance when faced with an experimentally increased cost of reproduction. Study wrens nested in wooden boxes at the Brown Family Environmental Center at Kenyon College from May-August 2003. Five days after their first egg hatched, female wrens of the treatment group had wingspans trimmed to increase work required for flight and adult field metabolic rate (FMR) was measured using a t-test. Embryos were evaluated using an artificial light environment. Adult female field metabolic rates were measured using a t-test.

BOARD 11  THE EFFECTS OF PP1C, PP1Y, AND PP1W IN THE PARAMECIUM CELLULAR DIVISION. SABRINA BARROS (sbarr@wooster.edu), DR. DEAN FRAGA (dfraga@wooster.edu). DEPT OF BIOLOGY, WOOSTER OH 44691

Paramecium tetraurelia is a ciliated organism that is complex and interesting because it contains two nuclei: a micronucleus and a macronucleus. The macronucleus contains the expressed genes and undergoes mitotic cell division. The micronucleus contains the germ line genome and undergoes meiotic division. It has been shown that the regulation of cellular division of mammalian cells is thoroughly affected by the expression of Protein Phosphatase type-1 (PP1). Paramecium has three PP1 isoforms: the PP1C, PP1Y, and PP1W. This study will determine if those isoforms have an effect on the cellular division of Paramecium. In order to determine the importance of the PP1 genes in the regulation of Paramecium cell division, the genes will be silenced by RNA interference (RNAi). To accomplish this, 1-5 Paramecium is/are fed bacteria expressing PP1C, PP1Y, or PP1W dsRNA. After the treatment, the Paramecium cells are counted using a light microscope at 48 and 72 hours after initial feeding. It has been currently observed that the Paramecium cells containing γ or Y vectors divide slower, especially the cells containing the γ vector. In addition, cells fed PP1 γ dsRNA seem to be dying after 48 hours. In the following weeks, DAPI stain will be used to identify the stages of meiosis in which the RNAi-treated Paramecium cells are affected.

BOARD 12  THE EFFECTS OF VALPACIC ACID ON LIMB DEVELOPMENT IN CHICKEN EMBRYOS. DENISE M. POST, d-post@ou.edu, (ANY L. AULTHOUSE, aaulthouse@ou.edu), 116 FRANKLIN STREET, APARTMENT C, ADA OH 45810.

The antiepileptic drug valproic acid (VPA) is a teratogen whose embryopathic mechanisms remain uncertain. VPA is known to cause several deformities in the body including defects in posterior neural tube closure, cardiac malformations, cleft palate, and limb defects. An in ovo model was used to reproduce the teratogenic effects of VPA on limb development in chicken embryos. It is anticipated that limb deformities in VPA treated embryos will be apparent when compared to controls. In phase I, White Leghorn eggs, from LaRue Hatchery in Marion County, (N=22) between the stages of 14-16 are double stained for cartilage and bone using three different protocols. During phase II, mixed Bantam eggs, from St. Charles Seminary in Mercer County, (N=38) between the stages of 14-16 are treated with VPA (N=19) and Ringer’s solution (N=19). A dosage of 20 ml VPA in chicken Ringer’s solution (15 mg VPA/ml which approximates the human dosage) was applied topically to chicken embryos in ovo between the stages of 14-16. Some embryos are treated only with Ringer’s solution and will serve as controls (N=19). To monitor the limb development whole embryos will be stained with Hanks solution (1981) protocol. Cartilage will be detected using alcanic blue, which stains the sulfated proteoglycans, and bone will be detected using alizarin red s, which stains the calcified matrix. Embryos will be evaluated for the presence of abnormalities in the limbs using a vernier caliper. Total length of cartilage and bone will be compared using a t-test.

BOARD 13  POPULATION STRUCTURE AND EVOLUTION OF THE HAWAIIAN CHIRONOMID TELMATOGETON TORRENTICOLTA (DIPTERA). MARINA STANBERY STANBERRY@NOTES.UDAYTON.EDU, (MARK G. NIELSEN, MARINA.STANBERRY@NOTES.UDAYTON.EDU), DEPT OF BIOLOGY, UNIVERSITY OF DAYTON, OH 45469-2320.

The Hawaiian Islands provide an exceptional opportunity to address evolutionary hypotheses because of their isolation and known age. Chironomids (midges) colonized the oldest island, Kauai’s, 3-5 million years ago from a marine form. From this marine ancestor, terrestrial forms have evolved and colonized the other islands. As these insects cannot fly, there are two plausible hypotheses for this colonization: 1) the terrestrial form on each island evolved independently from a marine form or 2) the terrestrial form evolved only once, and was carried to the different islands by animals. To resolve these hypotheses, the population structure and evolutionary history of the chironomid Telmatogoton torrenticollta is determined using the mitochondrial gene cytochrome oxidase as a molecular clock. Cytochrome oxidase has been determined from three different streams on Maui. Sequence comparisons resolve these insects into two groups, those individuals from Hanalei and Kehoma streams, and those from Iao stream. There is no geological evidence that explains the colonization of the 50 remaining DNA samples representing marine and terrestrial forms from three islands are analyzed, patterns may emerge that could resolve the hypotheses and serve as a model to understand the more general phenomenon of insect evolution in these islands.

BOARD 14  THE EFFECTS OF NOCTURNAL LIGHT ON ODOTOTAENIUS DISJUNCTUS (COLEOPTERA: PASSALIDAE). MARINA RAVENSEEKER1978@yahoo.com, COURTENAY N. WILLIS, cnwillis@ysu.edu, YOUNGSTOWN STATE UNIVERSITY, DEPT OF BIOLOGICAL SCIENCES, YOUNGSTOWN OH 44455.

Little is known of the effects of nocturnal light on the activity of insects, particularly burrowing insects that rarely may be exposed to light. The goal of this study was to examine the effects of nocturnal light intensity on nocturnal activity of Bess beetles (Odototaenius disjunctus). Individuals (n=12) were exposed to one of three artificial light treatments (25w, 50w and 75w Exo terra™ Night glo® bulbs) that were used to simulate nocturnal light (near moonlight). Tenebrionid beetles were assigned to one of the three lunar phases. Aboveground nocturnal activity, which includes feeding, walking, and burrowing, of O. disjunctus was videotaped for four h under artificial light on the three nights around each lunar phase. The beetles were separated into two groups. One was exposed to three artificial light treatments and the other was exposed to darkness. In one group, beetles were exposed to middle light treatment and the medium and low light treatment (Kruskal Wallis, P <0.001). However, there was
no difference either in time spent feeding, walking, or burrowing when considered separately. These results suggest that nocturnal light intensity may have an effect on the total nocturnal activity of O. disjunctus.

**Board 15** STARVATION AFFECTS MOVEMENT OF SAND FIDDLER CRABS, UCA PUGILATOR, BETWEEN WATER AND LAND. KEVIN E. CAMERON, cameronk@kenyon.edu, HEIDI E. SCHERMER, schermerh@kenyon.edu, (CHRIS GILLEN, gillenc@kenyon.edu) P.O. Box 1247, Kenyon College, Gambier OH 43022.

Sand fiddler crabs (Uca pugilator) are sexual dimorphic, semi-terrestrial and live in estuaries. It has been shown that differences in energy acquisition strategies exist between males and females. We tested the hypothesis that energy status affects time spent by crabs on land compared to water. Five crabs (n=96) were randomly assigned to two groups, and then starved or fed for one week prior to testing. They were observed for one hour in isolated divisions of ten-gallon aquaria. In each division, crabs had access to both a sandy terrestrial environment and seawater. Fed crabs spent 84.8% of the time on land while starved crabs spent 76.1% of the time on land. Thus energy status did not have an effect on where crabs spent their time (two-sample t-test, p=0.177, n=96). Starved animals moved 2.7±0.6 times between land and water, which was more than fed animals (0.5±0.2, times two-sample t-test, p=0.001).

Echinoderms such as sea cucumbers (Class: Holothuroidea) and sea stars (Class: Asteroidea) are able to rapidly and reversibly alter the stiffness of their connective tissues, which are known as mutable collagenous tissues. Previous research has shown that two distinct extract solutions can be made from the inner and outer body walls of the sea cucumber, *Cucumaria frondosa*. These extracts have either a stiffening or a softening effect on tissues of the same species as well as other species of sea cucumbers. We hypothesized that the extracts from sea cucumbers would, furthermore, affect the tissues of members of a different class: Asteroidea. We tested this hypothesis by cutting frozen arms of the sea star *Othilia longispina* and *C. frondosa* into square, 1 inch (2.5 cm) samples, and then placing these samples into two distinct extract solutions: one made from inner body walls of *C. frondosa* and the other made from outer body walls of the same species. We then observed the breaking points for ten samples from each species, and found that the extract from inner dermis was more effective in causing a decrease in breaking point than the extract from outer dermis. These results suggest that extracts from the inner and outer body walls of sea cucumbers can have a significant effect on the stiffness of connective tissues.

**Board 16** MECHANICALLY EFFECTIVE AGENTS IN THE MUTABLE COLLAGENOUS TISSUES OF THE CLASS HOLOTHOIDEA ALSO AFFECT THE TISSUES OF THE CLASS ASTEROIDEA. MONICA L. DURBIN, durbinml@hiram.edu, LAURA T. MOLE, mollet@hiram.edu, and GREG K. SZULGIT, szulgitgk@hiram.edu, HIRAM COLLEGE, DEPT OF BIOLOGY, POB 67, HIRAM, OH 44234.

Chinastars are known to be able to move between the sea and the land. To test this hypothesis, we cut off the arms of chinastars and placed them in two extract solutions: one made from inner body walls of *C. frondosa* and the other made from outer body walls of the same species. We then observed the breaking points for ten samples from each species, and found that the extract from inner dermis was more effective in causing a decrease in breaking point than the extract from outer dermis. These results suggest that extracts from the inner and outer body walls of sea cucumbers can have a significant effect on the stiffness of connective tissues.

**Board 17** THE MECHANICALLY EFFECTIVE AGENTS IN MUTABLE COLLAGENOUS TISSUES OF CUCUMARIA FRONDOSA AFFECT THE TISSUES OF ISOSTICHOPTUS BANDOTONUS. RORI L. PRESTON, prestonrl@hiram.edu, ALICIA R. Sampson, sampsonar@hiram.edu, RACHAEL D. NASH, nashrd@hiram.edu, and GREG K. SZULGIT, szulgitgk@hiram.edu, HIRAM COLLEGE, DEPT OF BIOLOGY, POB 67, HIRAM, OH 44234.

Chinastars are known to be able to move between the sea and the land. To test this hypothesis, we cut off the arms of chinastars and placed them in two extract solutions: one made from inner body walls of *C. frondosa* and the other made from outer body walls of the same species. We then observed the breaking points for ten samples from each species, and found that the extract from inner dermis was more effective in causing a decrease in breaking point than the extract from outer dermis. These results suggest that extracts from the inner and outer body walls of sea cucumbers can have a significant effect on the stiffness of connective tissues.

**Board 18** THE FUNNEL-WEB SPIDERS AGALENOPSIS PENNSYLVANICA AND A. UTAHENSIS DIFFER IN WEB DISCRIMINATION ABILITY (ARANEAE: AGALENIDAE). KENDY W. VAN, vanshleman@hiram.edu, J. H. BARKOW FIELD STATION, DEPT OF BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234, KEELY DAVIDSON, davidsonk@hiram.edu, and SAMUEL MARSHALL, marshallso@hiram.edu.

Two web choice tests were conducted on *A. pennsylvanica* and *A. utahensis* utahana: 1. own web vs. conspecific web, and 2. own web vs. heterospecific web. In the conspecific web choice test, all spiders chose their own web, whereas 53% of the heterospecific web choice test spiders chose their own web, five did not choose, and two escaped. Based on a binomial test of an *a priori* expectation of random settlement (i.e. 50/50 own web vs. strange web) *A. pennsylvanica* chose their own web more often than *A. utahensis* (P = 0.0440). Of the *A. utahensis* spiders tested, seven chose their own web, six chose the other web, and six did not choose. Based on a binomial probability, *A. utahensis* did not discriminate between webs (P = 0.2095). For the heterospecific web choice test six *A. pennsylvanica* chose their own web, two chose the heterospecific web and four did not choose. Based on a binomial test the *A. pennsylvanica* did not discriminate between webs (although there was a noticeable trend, P = 0.1093). *A. utahensis* spiders were tested: four chose their own web, six chose the heterospecific web and two made no choice. Based on the binominal probability, they did not discriminate between webs (P = 0.2051). Taken together these results indicate significant differences between these two spider species in web discrimination. Evidence was found that *A. utahensis* settled randomly with respect to web identity.

**Board 19** DIEL VERTICAL MIGRATION IN LAKE ERIE: IMPORTANT PELAGIC-BENTHIC LINKAGE? HEATHER M. Hickey, hikeycc@bgsu.edu, TODD A. HAYDEN, and JEFFERY G. MINER, PROGRAM IN ECOLOGY, EVOLUTION, AND CONSERVATION BIOLOGY, DEPT OF BIOLOGY, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

Vertical migration of zooplankton is generally acknowledged but not well documented. However, in Lake Erie, the reduction in loading of phosphorus and the presence of dreissened mussels have caused water clarity to increase and thus may have a strong influence on the extent of vertical migration. Moreover, linkages between the pelagia and benthos may have a strong influence on the extent of vertical migration. In order to determine the extent of zooplankton vertical migration in the shallow waters of western Lake Erie, replicate horizontal tows (500μ m mesh net) were taken on three dates in summer 2002 at three depths (2, 5, and 8m) in water 3 meters deep at 0100 and 0700 hours (nocturnal and diurnal samples, respectively). Nocturnal abundance of herbivorous *Daphnia retrocurva* increased as much as eight fold in the upper 2 meters of the water column as compared to the diurnal period, while abundance at 5m and 8m did not change between day and night. For the carnivorous cladoceran *Leptodora kindtii*, nocturnal abundance was two-fold greater at all depths (2, 5, and 8m) compared to the diurnal period. This increase in nocturnal abundance cannot be explained by individuals moving upward from the sampled depths; clearly, individuals must have been migrating upward from the epibenthic region below 8m. These data indicate that diurnal sampling may strongly underestimate zooplankton biomass unless samples are also taken near the bottom. These data may provide supporting evidence that there may be an important plankton-based nutrient link between the pelagic and benthic regions of Lake Erie.

**Board 20** THE EFFECTS OF ISOLATED HABITAT PATCHES ON POPULATION DEMOGRAPHICS OF MEADOW VOLE (MICROTUS PENNSYLVANICUS) AND WHITE-FOOTED MOUSE (PEROMYSCUS LEUCOPUS) AT THE WILDS. ELL B. HACKER, ekacker@muskingum.edu, and JAMES L. DOOLEY, Vol. 104 (4)
The purpose of this research was to examine the degree to which habitat isolation affects sex ratios and age ratios of meadow voles (M. pennsylvaticus) and white-footed mice (P. leucopus) within the boundaries of The Wilds, which is located near Cumberland, OH 43733. Differences in population parameters among habitat patches were compared using six two-treatment study plots (small isolated grassland patches and larger grassland isolated patches) and one control (large contiguous grassland). Isolation patches were compared to the property of a given patch to other grassland patches without being fragmented by barrier (forest, road, or stream). Each sampling plot had an area of 1600 m² (40m x 40m) and contained 25 Sherman live traps placed in 10 meter increments throughout the entire plot. Each captured individual (n = 95) was marked by toe-clipping and species, sex, approximate age, sexual characteristics, date, and weight were recorded. The composition and structure of the vegetation in the different plots was also recorded. Analysis of the data will be designed to determine whether or not there is a significant difference of age and sex ratios of M. pennsylvaticus and P. leucopus across the different habitats.

Board 21 IMPACT OF A WETLAND DEVELOPMENT PROJECT ON GRASSLAND BIRDS IN HARDIN COUNTY, OHIO. CARL W. HOAGSTROM, C- hoagstrom@ohio-northern.edu, OHIO NORTHERN UNIVERSITY, DEPT OF BIOLOGICAL SCIENCES, ADA OH 45810.

Ohio Northern University and the Ohio Department of Natural Resources are working together on a wetland project located three miles north of Roundhead, Ohio. In light of the concern for grassland bird populations, the impact of this development on the birds of the fields in which the wetlands were established is of interest. Each spring surveys of the bird fauna were undertaken in May, June and July of 2002 and repeated in 2003. Diking, digging and seeding for the project were carried out in the spring, summer and fall of 2003. The impact of those disturbances on the grassland birds was explored by comparing the surveys of 2002 and 2003. Estimates of the number of singing males of each species for each year, with the estimate for 2002 given first, were:15 and 13 Bobolink (Dolichonyx oryzivorus); 10 and 8 Eastern Meadowlarks (Sturnella magna); 12 and 14 Grasshopper Sparrows (Ammodramus savannarum); 2 and 6 Henslow’s Sparrows (Ammodramus henslowii); 2 and 2 Vesper Sparrows (Poecetes gramineus); and 6 and 6 Savannah Sparrows (Passerculus sandwichensis). Numbers were similar between the two years for each species. Two of the new ponds were dug and diked within the area occupied by the Bobolink colony with no meaningful difference between years. The wetland development activities appeared to have little effect on the bird populations.

Board 22 PREDATION PREFERENCES OF THE EASTERN COYOTE (Canis latrans) IN SOUTHEASTERN OHIO. CHARLOTTE M. MCCOY-STALL, c_mccoy-stall@ohio.edu, (JAMES L. DOOLEY, JDOOLEY@MUSKINGUM.EDU), DEPT OF BIOLOGY, MUSKINGUM COLLEGE, 163 STORMONT STREET, NEW CONCORD OH 43762.

This study will determine the predation habits of the Eastern Coyote (Canis latrans) in southeastern Ohio during the months of mid-May through late November of 2003. Through collection of scat samples data will be gathered on content, amount of each prey species, and environment of scat dropping site. The study sites, Blue Rock State Forest/Park area, Chandersville/Salt Creek, and the Wilds reclamation area, all located in Muskingum County, Ohio, have been identified as areas supporting coyote density. While sites are somewhat similar in local vegetation and prey species, with the exception of the exotic species found at the Wilds, there are some important differences. The Wilds consist of prairie-like habitat with limited deciduous forest cover. The Chandersville sites provide some dense forest cover mixed with a large water source, agricultural fields, and domesticated cattle and sheep areas. The Blue Rock sites are located in densely wooded settings mixed with hay fields and domesticated cattle and sheep fields. These differences have played a role in determining the predation habits of Canis latrans. Larger amounts of scat were collected at the Wilds and Blue Rock sites than the Chandersville sites due to differences in understory and forest cover. Samples have been analyzed by first drying then identifying the fecal material of each scat using bone identification and hair analysis techniques. Preliminary results have shown remains of small mammals, insects, and some vegetation. By identifying the predation habits of Canis latrans specifically in southeastern Ohio a further understanding of the regional ecology of the area will be gained.

Board 23 HERPETOFAUNAL SPECIES DIVERSITY IN THE WILDS, A RECLAIMED STRIP MINE. AARON J. BINCKLEY, aaron@muskingum.edu1648 JACKSON RD. ZANESVILLE, OH 43701 (DANNY J. INGOLD, ingold@muskingum.edu).

Herpetofauna are often used as indicator species to evaluate the health of an ecosystem. The Republic of Palau has shown remains of small mammals, insects, and some vegetation. By identifying the predation habits of Canis latrans specifically in southeastern Ohio a further understanding of the regional ecology of the area will be gained.

research wetland facility called the Aquatic Ecology Research Facility (AERF). The AERF contains 10 constructed wetlands (10 m X 30 m) along a first-order stream. In summer 2003, five wetlands (flow-pulse wetlands) were allowed to fluctuate with creek water levels to simulate hydrologic regimes in natural floodplain wetlands; the other five wetlands (stable wetlands) were maintained at constant water levels. We monitored wetland water levels to determine flooding periodicity. Following heavy rain events, water levels in flow-pulse wetlands increased from 3 cm to 160 cm whereas stable wetlands maintained a constant level of 80 cm. It took an average of 7 days after storms for flood-pulse wetlands to return to baseline levels. Macroinvertebrate diversity was higher in stable wetlands (p<0.02). Trophic analyses revealed that collector-gatherers and predators were more abundant in flood-pulse wetlands than in stable wetlands (p<0.02). Based on these results it is apparent that hydrologic regime significantly influences macroinvertebrate community structure in headwater systems.

### Board 26
**SURVEY OF TWO LONG-TERM REPTILE POPULATION STUDIES AT THE J. H. BARRY FIELD STATION: TURTLES AND SNAKES.**

**T. Guider, guider@hiram.edu, J. H. Barry Field Station, Hiram College, Hiram OH 44234, (M. Marshall, marshallsd@hiram.edu, W. Meshaka,) The State Museum of Pennsylvania.**

We report on two ongoing reptile population monitoring studies at the J. H. Barry Field Station in Hiram Township, Portage County. The first is a cover board study of snake population and the second is a trapping survey of the turtle population of a 1.0 ha pond. Each of five cover board arrays consisted of 10 pieces of 1.2 by 1.2 m pieces of 1.3 cm thick exterior grade plywood and five 0.5 by 2.0 m pieces of corrugated sheet steel. We captured snakes under the boards and ad hoc by hand and measured them and immediately released them where they were captured. Species captured were eastern garter snake (Thamnophis sirtalis), northern brown snake (Storeria d. dekayi), northern red belly snake (Storeria o. occipitomaculata), black rat snake (Pantherophis s. sirtalis), and eastern water snake (Nerodia s. sipedon). The second is a trapping survey of the turtle population of a 1.0 ha pond. Each of five cover board arrays consisted of 10 pieces of 1.2 by 1.2 m. We captured the following species: Snapping Turtle (Chelydra serpentina), and Eastern Mud Turtle (Kinosternon subrubrum). We captured a total of 32 turtles from the pond in 2002 and 2003.

### Board 27
**EFFECTS OF TEMPERATURE LEVELS AND FLUCTUATIONS ON THE GROWTH AND DEVELOPMENT OF RANA PIPIENS.**

**Jennifer M. Karow, jkarow@hiram.edu, J. Dooly@muskingum.edu, Dept of Biology, Muskingum College, 163 Stormont Street, New Concord OH 43762.**

This study observed the effects of temperature and temperature fluctuations on the hatching success and rates of metamorphosis of *Rana pipiens* (the Northern leopard frog) in the laboratory. Due to anthropogenic influences, amphibian habitats have been greatly altered and many species are declining and declining trends are evident. Many causes for these declines have been suggested, such as disease, climate change, habitat alteration, environmental contaminants, and increased exposure to ultraviolet-B radiation. This study was designed to examine climate change as a possible complicating factor in the declines. Larvae are known to have higher mortality rates in warmer temporary ponds, and this study will investigate whether this could be due to decreased hatching success, deformities, or slowed metamorphosis that could lead to a higher susceptibility to disease, predation, and/or depletion of resources. The study will be performed in the laboratory to maximize control over variables. Constant temperatures range from 72 to 82 °C with 50 ml of a chelating ligand solution. The pressure is increased with 50 ml of a chelating ligand solution. The pressure is increased on the bomb using nitrogen gas. This method is hypothesized to take less time than the extraction of heavy metals from the sawdust study. It is hypothesized that CyDTA, the ligand with the highest binding affinity for metals, will extract the heavy metals most effectively. Graphite furnace atomic absorption spectroscopy will be employed to measure the amount of heavy metals present in the leachate and thus allow for the estimation of heavy metals present in the leachate and will thus allow for the estimation of heavy metals present in the leachate and will thus allow for the estimation of heavy metals present in the leachate and will thus allow for the estimation of heavy metals present in the leachate and will thus allow for the estimation of heavy metals present in the leachate and will thus allow for the estimation of heavy metals present in the leachate and will thus allow for the estimation of heavy metals present in the leachate and will thus allow for the estimation of heavy metals present in the leachate and will thus allow for the estimation of heavy metals present in the leachate and will thus allow for the estimation of heavy metals present in the leachate and will thus allow for the estimation of heavy metals present.
effectiveness of the removal of heavy metal contaminants to be determined.

**Board 31** SYNTHESIS AND CHARACTERIZATION OF CYANIDE COORDINATION COMPLEXES AS PRECURSORS TO COMPOUNDS WITH MAGNETIC PROPERTIES. Ashley L. Leach, (Paul S. Szalay, pszalay@ohio.edu), 163 Storvold Street, New Concord OH 43762, leach50@hotmail.com.

The field of cyanide coordination chemistry has developed over the last three centuries based on the versatile bridging capabilities of cyanide that were first observed in Prussian Blue. Despite these efforts, little progress has been reported in the preparation of homo-complexes composed of low-valent transition metals and cyanide. With the cyanide complexes comprising solely of the ligand, cyanide, the goal of this research is to synthesize coordination complexes of these metals from anhydrous metal starting materials. These coordination complexes will be utilized as building blocks in future experiments to create cluster compounds or solid state compounds with magnetic properties. Initially, cyanide salts of potassium, tetrabutylammonium, and tetraethylammonium will be used in reactions with metal starting materials such as gadinolium (III) nitrate and tetrabutylammonium octachlorodurene. The resulting coordination complexes’ structures and physical properties will be elucidated using UV-Visible spectroscopy, including spin interference, nuclear magnetic resonance spectrometry, and single crystal X-ray diffraction.

**Board 32** HIGH RESOLUTION NMR IMAGING OF OBJECTS WITH DIPOLAR-BROADENED SPECTRA. M.-J. Kim, mkim2@kent.edu, A. K. Khitrin, akhitrin@kent.edu, Dept of Chemistry, Kent State University, Kent OH 44240-0001.

Magnetic resonance imaging (MRI) is among the most powerful techniques for nondestructive study of various objects. MRI has been widely used in biological science and medicine. The images are reconstructed from Fourier transforms of nuclear spins in the presence of radiofrequency and magnetic field gradient pulses. The achievable spatial resolution is restricted by the linewidth of NMR signals. For high spatial resolution, sharp NMR signals can be achieved by one of the existing techniques, the resolution is considerably less for solids “or soft solids” where, in comparison to liquids, dipolar interactions between nuclear spins are not averaged out by fast molecular motions. We have experimentally demonstrated that long-lived coherent response signals, excited by long and weak radio frequency pulses, can be used to produce high resolution NMR images for objects with dipolar-broadened conventional NMR spectra. A high spatial resolution is an achievable line-narrowing achieved with this new type of signal excitation. Compared to other techniques, the method does not require strong gradients of the magnetic field or radio frequency fields and, therefore, can be applied to large objects.

**Board 33** DISSOLUTION OF COPPER(II) OXIDE IN VARIOUS CONCENTRATIONS OF NITRIC ACID TO DEFINE THE SURFACE COMPOSITION USING ATOMIC ABSORPTION SPECTROSCOPY. Erica J. Newbold, enewbold05@jcu.edu (Michael P. Setter, msetter@jcu.edu), Box 221, John Carroll University, 20700 North Park Blvd., University Heights OH 44118.

Examination of the surface of fine powders is an important process in characterizing materials. For example, the power of a battery depends on the rate that ions can pass through the surface of the powdered material within a battery. In this project, copper(II) oxide was chosen for dissolution in nitric acid concentrations ranging from 9% to 0.0001%. CuO(s) + 2HNO₃(aq) → Cu(NO₃)₂(s) + H₂O(l). It was hypothesized that the powder would dissolve in the acidic solution and the amount of dissolution could be monitored by atomic absorption spectrometry (AAS). Preweighed samples of copper(II) oxide powder were added to the nitric acid solutions. Small volume aliquots of the resulting mixtures were passed through a 0.1µm filter and then analyzed for copper using AA. It was found that the best way to linearly relate the AA data to time was a square root model. For short periods of dissolution (~2 hours), this square root model yielded correlation coefficients of 0.95 for twelve trials. The fraction of powder that would dissolve was linearly dependent on the pH of the solution; the lower the pH of the solution, the higher the fraction of powder that would dissolve. This result contradicted the theory that the powder would not dissolve with a pH higher than 6.3 ± 0.8. When copper(II) oxide was placed in deionized water, no dissolution could be detected. This supports the linear model of the pH dependence of the dissolution.

**Board 34** STUDIES ON THE DEVELOPMENT OF BOTH THE ASEXUAL AND SEXUAL REPRODUCTIVE STAGES OF THE PATHOGEN NEMONIA LEPTOSTYLA (Fr.) C. & P. DE Not., ON POT’S HOST JUGLANS NIGRA L. IN VITRO. David L. Mason, dmason@wittenberg.edu, Dept of Biology, Wittenberg University, Springfield, OH 45501.

Host tissues expressing the asexual and sexual reproductive stages during the pathogen’s life cycle on its host were chemically fixed, embedded (paraffin or Spurr plastic), sectioned, stained, and viewed by light and transmission electron microscopy (TEM). For scanning electron microscopy (SEM) small pieces of diseased tissues were placed onto holding stubs and viewed directly at 30KV. In vitro cultures of the pathogen derived from conidia and ascosporas were studied primarily by light microscopy. The results from the sections, on the pathogen, revealed that two-fungus formed acervular bearing spores, two-celled conidia, and three-celled areas of the host, primarily on the upper side of leaves, during the summer months. During the fall months, spermogonia bearing small, rod-shaped spermatia and ascogonial coils with extending trichogyne were observed. Developing perithecia containing ascospores were detected during late fall, and in November and December on old partially decayed leaves, asci bearing two-celled ascosporas were observed. Cultures started from conidia and ascosporas were induced to produce conidia, spermatia, ascogonial coils with thichogynes and developing perithelia. Successful inoculations were carried out on healthy leaves from conidia produced in acervular on infected leaves and from those produced in vitro.

**Board 35** CONTRIBUTION TO THE KOGAN AND THE HERBARIUM OF YOUNGSTOWN STATE UNIVERSITY. John J. Atwood, s0184779@cc.yusu.edu, Carl F. Chuey, cfchuey@ysu.edu, Youngstown State University, Dept of Biological Sciences, One University Plaza, Youngstown OH 44555.

The bryoflora of West Virginia has a diverse amount of species and a few disjunct surprises. Recently, the "Annotated Checklist of the Hornworts, Liverworts, and Mosses of West Virginia" published by Studlar et al. in 2001 listed the known taxa for the state, based on the holdings of specimens at the Herbarium of West Virginia University (WVU) and the Herbarium of Youngstown State University (YSU) provide for 219 additional county distribution records. Also, one state distribution record, *Sphagnum tenellum*, is reported new to West Virginia. This disjunctive species from the upper northeastern coast has been collected only once outside of its range. All of the represented taxa from both WVU and YSU are plotted on county dot maps for the state. Mapping bryophyte distribution at the county level can be done where the amount of cryptogamic diversity can be found. Since the destruction of habitat through strip-mining and moss harvesting threatens bryophyte diversity, these distribution maps also establish a baseline by which the gain or loss can be measured. Furthermore, distributional maps show regions where collecting is strongly localized, as in the mountainous counties of Pocahontas, Randolph, and Greenbrier counties. Areas that remain relatively understudied are also highlighted as in the counties along the Ohio border.

**Board 36** MORPHOLOGICAL AND PHYSIOLOGICAL TRADEOFFS OF AMERICAN CHESTNUT (CASTANEA DENTATA) AND OTHER HARDWOODS IN VARYING NUTRIENT AND LIGHT REGIMES. Dana J. Thomas, dthomas6@muohio.edu, M. Henry H. Stevens, stevemm@muohio.edu, Carolyn Howes Keiffer, keifferc@muohio.edu, Dept of Botany, Miami University, Oxford OH 45056.

American chestnut (Castanea dentata) once dominated the eastern deciduous forest, but was virtually eliminated in the early 1900’s by the exotic fungus, *Cryphonectria parasitica*. Understanding the morphological and physiological traits that contributed to the former success of American chestnut would enhance understanding of temperate deciduous forest dynamics and help lay the groundwork for reintroduction of resistant chestnut strains. Seedlings of *C. dentata* and *C. flammula* were grown in vitro in localized, as in the mountainous counties of Pocahontas, Randolph, and Greenbrier counties. Areas that remain relatively understudied are also highlighted as in the counties along the Ohio border.

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root and shoot biomass of each seedling. Results indicate clearly that American chestnut outperformed the other hardwoods in all treatments. The strong competitive ability of chestnut under a wide range of light and nutrient conditions could help explain chestnut’s former dominance in the temperate deciduous forest. This research also suggests that chestnut will be able to thrive in a wide variety of intact forests when reintroduction experiments begin.

**Poster Session 2:00-3:00PM**

**Board 01** A COMPARISON OF ORDER DIVERSITY OF PLANKTONIC CRUSTACEANS IN STRIP MINE AND UNDISTURBED AREAS. Sarah K. McBeth, smcbeth@muskingum.edu, Danny Irick, Muskingum College, 163 Stormont St., New Concord OH 43762.

Planktonic crustaceans are an important part of the aquatic food chain, consuming algae and bacteria while providing food for insects, fish, amphibians and waterfowl. Because of their ubiquity and their sensitivity to environmental variation, these organisms often serve as indicators of water quality. This study compared the diversity of orders from the Phylum Crustacea in samples taken from a wetland on a reclaimed strip-mine (The Wilds - Muskingum Co., OH), to a similar body of water in an area that was not strip-mined (Otsego Field Station - Muskingum Co., OH). Samples (n=6) were collected from a plankton net and preserved in a solution of formalin, sucrose, and glycerol. A light microscope was used to key the organisms. Representatives of the orders Podocopa, Notostraca, Cladocera, and Eucopepoda were found on both sites. Additionally, more invertebrates were found for every order and for every site on the strip-mined site. A contingency table $\chi^2$ revealed significant differences in the frequencies of the orders at the two sites ($\chi^2 = 15.38$, df = 4, p<0.01).

**Board 02** ASSESSMENT OF SOIL MOISTURE CONTENT BELOW SOYBEANS GROWN WITH DIFFERENT [OZONE], [CARBON DIOXIDE] AND RAINFALL LEVELS. CAYE CADANCE LOWELL, chalancew@hotmail.com, 1Department of Natural Sciences, Mathematics & Computer Science, Central State University; PO Box 1004, Wilberforce, OH 45484 (Andrew Leakey, andrewleakey@csu.edu), 2University of Illinois, Dept of Plant Biology.

The SoyFACE (Free Air Concentration Enrichment) facility operated by the University of Illinois aims to determine how soybeans will perform in the year 2050 in response to elevated concentrations of CO$_2$ and O$_3$, and greater drought caused by global climate change. Research at the site investigates a wide range of topics from crop productivity and canopy energy fluxes to leaf physiology, and interactions with herbivores. The objective of my research during the summer of 2003 was to measure the water content of the soil profile under soybeans, crops grown at different concentrations of CO$_2$ and O$_3$, and under drought and non-drought conditions. The site consisted of 16 experimental plots. There were four replicate plots growing soybeans at each of the following atmospheric treatments: ambient conditions (370 ppm CO$_2$/~60 ppb O$_3$), elevated CO$_2$ (550 ppm), elevated O$_3$ (~90 ppb) and elevated CO$_2$/O$_3$ combined (550 ppm CO$_2$/~90 ppb O$_3$). Levels were generated by rings of pipes surrounding the plots at canopy level and releasing CO$_2$ or O$_3$. Soil water flux measured and carried the gases through the canopy. A gutter system also was installed to a section of all ambient and elevated CO$_2$ plots to catch 50% of the rainfall. A Sentek soil moisture probe was used to measure the moisture in the soil on 10 cm increments from the soil surface to a depth of 1 m approximately every other day. Where rainfall inputs were intercepted, soil moisture was up to 13% lower in the rooting zone. For most of the season, there were two growth periods: one in soil moisture averaged 30% lower under ambient conditions than the combined elevated CO$_2$/O$_3$. This finding suggests that soybean crops may suffer less drought stress in 2050.

**Board 03** THE IMPACT OF AVIAN PREDATION ON SEA URCHINS ARBACIA PUNCTULATA INHABITING A SEA WALL IN BEAUFORT NC. Adrianna N. Zito1,504.426.7081, zito@wittenberg.edu, James M. Welch1,504.426.7081, William W. Kirby-Smith, Jr1,504.426.7081, Department of Biology, Wittenberg University, PO Box 45, Springfield, OH 45501; 2Duke University Marine Laboratory.

The purple sea urchin Arbacia punctulata inhabits subtidal hard-bottom habitats on the southeastern coast of the United States. Where natural rocky substrate is rare, the urchins inhabit intertidal pilings and sea walls. However, this alternate habitat may come with a cost: in other intertidal areas, gulls have been observed feeding selectively on sea urchins in late winter and early spring, which has been hypothesized that gull predation would have a significant effect on the population of A. punctulata living on the sea wall at the Duke Marine Laboratory in Beaufort, NC. To test this hypothesis, dead urchins (observed or overturned tests cleaned free of bottom) were counted daily along 450m of sea wall from April 2002 through April 2003. The population size was estimated (n=83) by visual survey during a spring low tide in April to determine the proportion of survivors killed during the survey (the survey total was added to the number killed n=157). Since daily predation varied (range = 0-16), weather and tide effects on predation were also examined. Gulls removed 74% of the sea urchin population over three months. Cloudiness was an important factor that may affect gull predation on urchins; higher cloud cover correlated with greater predation. This study supports the hypothesis that gulls prey upon sea urchins on sea walls. Thus, these man made intertidal structures, while providing alternate habitat in the absence of subtidal rocks, simultaneously expose urchins to high levels of avian predation.

**Board 04** SOIL MOISTURE PATTERNS AT A SUMMER ROOSTING SITE AT OHIO northern UNIVERSITY’S CAMPUS, ADA, OHIO. Lauren B. Hrecik, l-hrecik@ou.edu, 312 South Simon Street, ADa OH 43810.

A barn on the Ohio Northern University campus in Ada houses a summer colony of brown bats (Eptesicus fuscus). Their numbers and activity patterns were studied by counting bats as they departed from the barn. Counts were conducted once a week in the fall (mid-September to mid-November) and the spring (third week in March to the second week in May), and once a month June through August. The bats initiated evening activity ten to twenty minutes after sunset throughout the year. On the south side of the barn consistently provided the highest number of bats. Since it was not possible to count exiting bats from all four sides at every survey, the exit counts from the south side were used to evaluate the activity patterns of the bats. The highest exit counts for fall 2002, spring 2003, summer 2003 and fall 2003 were 90, 100, 100, and 70 respectively. The spring, summer and autumn exit counts for 2003 were compared and found to differ (Chi square = 6.4, df = 2, p < 0.05). The small autumn count was the basis for the difference and probably reflected early departures to explore hibernacula. In the fall of both years the bats disappeared gradually, but with a major decline in a one or two week period in late September and early October. The bats reappeared gradually in the spring of 2003 with a distinct change, from 10 to 47 bats, between April 13, and April 14.

**Board 05** AVIAN SPECIES DIVERSITY IN A CONTAMINATED RIPARIAN ECOSYSTEM. Shawn U. Blohm, shawnblohm@yahoo.com, Courtenay N. Willis, cnwillis@ysu.edu, Youngstown State University, Dept of Biological Sciences, Youngstown OH 44555.

An avian species diversity study was conducted along a 25.6 km portion of the Mahoning River located in Mahoning and Trumbull counties in northeast Ohio. Sediments in the Mahoning River are heavily contaminated from steel mill pollution, particularly near low head dams. The goal of this study was to examine the relationship between sediment contamination and avian species diversity in a riparian ecosystem. During June of 2003, avian point counts were conducted at Lowellville, Youngstown, and Girard. At each study site, four avian point counts were conducted above and below low head dams and were at least 200 m apart. The American Robin (Turdus migratorius), Northern Cardinal (Cardinalis cardinalis) and House Sparrow (Passer domesticus) were the most common species observed. Diversity was estimated using the Shannon-Weiner diversity index and indices were compared using a Student’s t-test. Diversity did not differ at Lowellville (n = 21 sp.), Youngstown (n = 21 sp.) and Girard (n = 19 sp.). However, diversity was higher below the dam (n = 16 sp.) than above it (n = 8 sp.) in Girard (t=3.625,P<0.05) and diversity tended to be higher the dam (n = 16 sp.) than above it (n = 12 sp.) in Lowellville (t=1.698,0.10>P>0.05). Although diversity did not differ between study sites it was significantly greater below than above low head dams. Diversity of plants and insects will be investigated to better understand the observed differences.

**Board 06** THE EFFECT OF FEEDING ON GLAND CELL PROLIFERATION IN HYDRA. Nicole K. Anderson1,504.426.7080, (LEPP, epplel@wittenberg.edu) Mount Union College, 1792 Clark Avenue, Alliance, OH, 44601.

This research also suggests that chestnut will be able to thrive in a wide variety of intact forests when reintroduction experiments begin.
This study is investigating the rate of proliferation of gland cells compared to epithelial cells. Gland cells in hydra are endodermal cells that secrete proteolytic enzymes into the gastrovascular cavity. Gland cells maintain their population both by mitosis and by differentiation from interstitial cells. Observations of gland cell populations in epithelial hydra, hydra which have had their interstitial cells and their interstitial cell progeny eliminated, seem to indicate that the latter occurs at a lower rate. When the interstitial cells are dramatically reduced it does epithelial cells. Proliferating cells are being labeled with BrdU by injecting BrdU into the gastrovascular cavity of the animal. After staining with BrdU antibody, proliferating cells are then identified and counted. After baseline labeling indices of gland cells and epithelial cells are known, the relative effect of feeding and starvation on the proliferation of these two cell types will be determined.

**Board 07**  THE EFFECTS OF REGULATORY PEPTIDES ON FOOT REGENERATION IN HYDRA
Jessica L. Gordon, gordonj@wssu.edu, (L. Epp, epp@wssu.edu) Mount Union College, 1972 Clark Ave, Alliance, OH 44601.

Regulatory peptides have been found to influence pattern formation and regeneration in hydra. For example, the peptides pedin, pedbin, and Hym 323 have a positive effect on the rate of foot regeneration. Peptides isolated from hydra tissue have not been bioassayed. In this study the effects of 15 such peptides on foot regeneration are being evaluated on different species and strains of hydra. The rate of foot regeneration in peptide-treated hydra is being compared to that of controls by timing the onset of basal disk specific peroxidase staining during regeneration. Peptides which prove to have an effect on the regeneration process will then be tested to determine their effect in lateral transplantation (grafting) experiments. These tests will be made in positional values of hydra tissues; that is, these experiments will test for the effect of regulatory peptides on the determination of polarity during regeneration.

**Board 08**  BROMOTYROSINE LEVELS IN THEOPHYLLINE THERAPY
Kimberly L. Bronson, bronsonk@wssu.edu, 216 Center Road Apt. 312, Elyria, OH 44035.

Asthma is a globally prevalent disease. Theophylline was once a popular and inexpensive medication prescribed for asthma, however adverse side effects such as nausea, headache and rapid heartbeat occurred when given at its optimal dosage. Recently, the LoDo Trial investigated the effectiveness of theophylline as an add-on therapy in lower than usual doses which may decrease side effects in patients. The study included 627 asthma patients from 19 clinical centers in the United States. Three follow-up visits were performed over a six-month period tracking patients treated with theophylline, montelukast and a placebo. For our sub-study, serum samples collected during each visit were processed and analyzed for several oxidative metabolites including bromotyrosine, a sulfonic acid which is indicative of theophylline toxicity. A method was performed on serum of 96 asthma patients’ using liquid chromatography-electro spray ionization mass spectrometry. Results show an average decrease in bromotyrosine levels of 20 percent after six months of treatment for 53 out of 96 patients. Our sub-study is double blinded as to which medicine the patient was given, however, we expect to see lower levels of bromotyrosine in patients treated with either montelukast or theophylline when compared to those receiving a placebo. Equivalent bromotyrosine levels when the sera of patients receiving montelukast or theophylline are compared.

**Board 09**  ANALYSIS OF THE KERATINASE GENE FROM FEATHER DEGRADING BACILLUS LICHENIFORMIS
Patricia B.S. Celestino, ppcoselst@owu.edu, Allison K. Morrell, amorrelk@owu.edu, and Gordon J. Mattlee, gordonj@wssu.edu, Ohio Wesleyan University, 61 S. Sandusky St., HWCC Box 799, Delaware, OH 43015.

The poultry industry produces over eight hundred million kilograms of feather waste per year in the United States. Feathers are composed of beta-kerin, which can be degraded by the keratinase enzyme produced by several strains of bacteria such as Bacillus licheniformis and Bacillus subtilis. Observations of keratinase enzyme sequences found in Genbank. Differences in the nucleotides of the gene that codes for the keratinase enzyme might determine the enzyme’s ability to degrade beta-keratin. In earlier studies, it was found that there were no significant differences between the nucleic acid sequences of keratinase genes of different B. licheniformis strains. However, this study focuses on the isolation of specific promoter regions involved in controlling keratinase gene expression, which determines optimal production of keratinase messenger RNA by B. licheniformis. The results show no variation in the promoter regions of keratinase genes of fast and slow feather degrading strains of B. licheniformis. Therefore, more complex systems must be involved in the control of expression of keratinase genes.

**Board 10**  INVESTIGATION OF OXIDASE-ASSOCIATED REACTIONS BY THE S-DOUPING FLUORESCENT METHOD
Katherine E. Miller – kmiller@muskkingum.edu, 163 Stormont St. New Concord, OH 43762 (Dr. Deepmali Perera).

The fluorogenic probe, Amplex red, N-Acetyl-3,7-diethylthiophenoxazone, is tested for its ability to measure antioxidant activity of herb and tea infusions, as well as other phenolic compounds known for their antioxidant properties. Given its high sensitivity and specificity, it has broad applications for the measurement of H2O2 in a variety of oxidase-mediated reactions and for the measurement of very low levels of H2O2 which may be found in water products. Hydrogen peroxide is easily and sensitively measured by using peroxidase-coupled assay systems. The assay is based on the oxidation of Amplex red to its oxidized fluorescent form, resorufin, and is a determination of hydrogen peroxide scavenging activity. The results of this work can be compared to previous work done with a similar probe, Homovanillic acid (HVA). This method of implementing Amplex red to determine hydrogen peroxide has a wide application in determining and monitoring the activity of many oxidase enzymes, owing to the usage of higher wavelengths that reduce the background fluorescence and quenching of most biological samples. Resorufin has an excitation maximum at 563 nm and emission maxima at 587 nm, both of which are in the visible region of the spectrum as opposed to the ultraviolet region. This makes it of particular interest for the detection of biological samples because most other probes use wavelengths in the ultraviolet spectrum and cannot be used to detect oxidative activity in crude biological samples.

**Board 11**  LIVER PROTEOME OF MICE WITH ALTERED GROWTH HORMONE PHYSIOLOGIES
Joseph A. Riemann – jriemann@capital.edu (Kerry L. Cheeseman – kcheesman@capital.edu) Biological Sciences Dept. Capital University, 2199 E. Main St, Columbus, OH 43209

Although much data has been obtained regarding the human genome, there is very limited knowledge about the human proteome. The proteome refers to the protein component of the genome and is essential for determining the function of a particular cell or tissue. This research aims to determine what proteins are critical in proper growth hormone function, thus expanding our knowledge of the proteome. Samples from the livers of mice (n=12) with altered growth hormone physiologies were taken, and their proteins were separated by 2-dimensional polyacrylamide gel electrophoresis (2-D PAGE). This technique separates proteins by isoelectric point and molecular weight. Currently, the proteins of interest are being identified by mass spectrometry. Once the proteins are identified, they will be tested for presence in various other organs and eventually utilized to optimize growth hormone function in the body.

**Board 12**  AMINO ACID ANALYSIS WITHOUT DERIVATIZATION: CYCLIC VOLTAMMETRY AND FLOW INJECTION ANALYSIS
Krista Stemple – kstemple@artsci.livescience.edu and Patricia B.S. Celestino – ppcoselst@owu.edu, Biological Sciences Dept, Capital University, E. Main St., Columbus OH.

The detection of small concentrations of amino acids presents challenges using popular methods such as electroanalysis. Only three of the twenty common amino acids found in proteins, proline, glutamic acid, and aspartic acid, can be detected with conventional electrodes. Using a boron-doped diamond thin-film (BDTDF) electrode, amino acids can be oxidized and are therefore detectable. A mechanism of oxidation, specific to diamond thin-film electrodes, has been developed from previous research. Results supporting this mechanism for individual amino acids were obtained through various electrochemical experiments, primarily cyclic voltammetry (CV), run in aqueous pH buffers ranging from pH eight to twelve. To assess the feasibility of electrochemical detection with liquid chromatography...
for amino acid analysis, flow injection analysis (FIA) was utilized. In FIA the amino acid is injected in a mobile phase that flows over a diamond electrode. Positive results of this work provide the means to detect small concentrations of specific amino acids.

**Board 13** EVIDENCE FOR RNA INTERERENCE IN THE PLANT PATHOGEN *PHYSALIS INFESTANS*, Mark L. Hanke. Mianke@wooster.edu C-778, 1189 Beall Ave, Wooster Ohio 44691. Nicolas Champouret champouret1@osu.edu, Sophie Kamoun kamoun1@osu.edu, (William Morgan Worgan@wooster.edu).

Potato late Blight, caused by a fungus-like organism *Phytophthora infestans*, is one of the most devastating plant diseases. Responsible for the loss of over 15% of the potato crop, it is estimated to cause annual losses at a cost of around 3 billion dollars. Recent years have seen a dramatic intensification in molecular biological studies of *P. infestans*, including the genomic sequencing project. With the recent availability of sequencing data, it is now necessary to use new tools for RNA interference (RNAi) to characterize these genes. Double-stranded (ds) RNA interference (RNAi) is a recent technological advance that enables researchers to reduce gene expression at the post-transcriptional level. The purpose of this study is to assess the ability of dsRNA in producing small interfering RNAs, siRNA, for RNAi in *Phytophthora infestans*. This study will investigate the effects of small interfering RNAs on the growth and development of *P. infestans*.

**Board 14** STUDIES REVEALING CELLULAR AND SUBCELLULAR FEATURES HELPFUL FOR THE IDENTIFICATION OF SELECTED SARCOMAS, Kristy J. Arnowczyk, s04.karnoczky@wittenberg.edu, (David L. Mason, dmason@wittenberg.edu), Dept of Biology, Wittenberg University, Springfield OH 45501.

Microscopic analysis of various cancer types identifies unique cellular and histological features that aid in their diagnosis. Tissue samples from twenty-five patients presenting with sarcomas at Community Hospital in Springfield, Ohio were collected between 1999 and 2001, and were chemically fixed in neutral buffer formalin for light microscopy and glutaraldehyde for electron microscopy. Samples were embedded in Spurr plastic, sectioned, stained, and viewed by high-resolution light microscopy, immunomicroscopy, and electron microscopy. The following tumors were evaluated by these techniques, and the results showing fine-structural features and selected cellular markers for identification of each are presented here in summary form. Examination of a human rhabdomyosarcoma displayed remnants of sarcomeres and a positive reaction for the primary antibodies actin and myoglobin. Other tumors that were examined in this way include Leiomyosarcoma (condensation regions), Ewing's sarcoma (condensation regions, cytoplasmic membrane and immunoidentification of desmin), Haemangiosarcoma (Weibel-Palladie bodies and immunoidentification of Ulex European Agglutinin), Kaposi's sarcoma (deterred dermal capillaries with blood cells), and Fibrosarcoma (disorganized fibroblasts having a high mitotic index and surrounded by collagen fibers), Osteosarcoma (disorganized osteocytes with surrounding collagen and calcium and immunoidentification of vimentin), Ewing's sarcoma (lymphoid-like cells, strongly glycogen positive and immunoidentification of desmin and vimentin), and Liposarcoma (large distanced adipose cells containing large lipid inclusions).

**Board 15** THE EFFECTS OF POLYCHLORINATED BIPHENYLS ON SHORT-TERM AND LONG-TERM MEMORY IN SPRAGUE-DAWLEY RATS AS DETERMINED BY THE MORRIS WATER-MAZE TECHNIQUE. Edward J. Doughan, edward@bgnet.bgsu.edu, Douglas A. Donahue, dougdon@bgnet.bgsu.edu, Lee A. Meserve, lmeserv@bgnet.bgsu.edu, Bowling Green State University, Dept of Biological Sciences, Bowling Green OH 43402-0212.

Although polychlorinated biphenyls (PCB) have not been produced in the United States since 1971, they continue to be a potentially harmful environmental contaminant. Leaksage during transportation, or improper disposal of PCB containing products has led to the introduction of PCB into the environment. As PCB is stable, persistent, and lipophilic, it has been shown to bioaccumulate in the food chain. PCBs have been shown to bioaccumulate through food webs. When present in large amounts, PCB has been shown to have damaging effects including thyroid gland impairment, liver damage, miscarriage, and death. During the present study, three groups of experimental Sprague-Dawley rats were fed a diet containing a mixture of PCB 47/ 77 from conception (day 0) to 30 days post-gestation, while control rats received a normal powdered diet containing 0 ppm PCB. The study contained three experimental group permutations, each consisting of 8 pups per litter, each group being removed at a controlled amount of PCB. These groups received a normal powdered diet containing 1.25 ppm, 12.5 ppm, or 25.0 ppm of PCB. On day 24 and 29, a standard probe analysis was performed to examine short-term and long-term memory respectively. On day 29, rats were euthanized and Choline Acetyltranserase (ChAT) activity was also examined, as acetylcholine is expected to play a role in learning and memory.

**Board 16** IDENTIFICATION OF IMMUNOREACTIVE AUTOANTIGENS PRESENT IN SEROPOSITIVE AND SERONEGATIVE MYASTHENIA GRAVIS, Cristopher A. Kesler, ckkesler@yahoo.com, (Chester R. Cooper, crcrooper.01@ysu.edu, Gary R. Walker, grwalker@ysu.edu, Thomas C. Watkins, twwatkins@prodigy.net), Youngstown State University, One University Plaza, Biology Dept Ward Beecher Hall, Youngstown OH 44555.

Myasthenia gravis (MG) was the first autoimmune disorder of the peripheral nervous system to be characterized, and is still the most well understood as one of the few clear examples in which mechanisms are thought to be entirely antibody-mediated. This disease is generally caused by autoantibodies that bind to the nicotinic acetylcholine receptors (AChR) at the post-synaptic membrane, however, about 15% of patients do not have detectable levels of this antibody and are diagnosed to have seronegative myasthenia gravis (SNMG). Previous research in this lab has focused on autoimmune ripping muscle disease (ARMG), with a focus on cell adhesion prior to this. The ARMG autoantigens have been characterized through the immunoscreening of human skeletal muscle cDNA expression libraries using sera from patients with seropositive myasthenia gravis (SPMG) and (SNMG). SDS-PAGE analysis and Western Blot studies have been carried out to better understand these target proteins. Immunoreactivity of the patient’s IgG and IgM antibodies has been used to identify the muscle protein titin isoform(N2A). Titin is a large well known protein that is found in skeletal muscle. The protein extends from the Z line to the M line of the sarcomere that provides passive tension to the muscle and acts as a template for normal muscle formation. Previous research in this lab has shown that the ARMD patients’ sera also react with a 140k.d. The significance of this study is that the SPMG titin isoform(N2A) is still known protein in the muscle membrane. However, about 15% of patients do not have detectable levels of this antibody and are diagnosed to have seronegative myasthenia gravis (SNMG). Previous research in this lab has focused on autoimmune ripping muscle disease (ARMG), with a focus on cell adhesion prior to this. The ARMG autoantigens have been characterized through the immunoscreening of human skeletal muscle cDNA expression libraries using sera from patients with seropositive myasthenia gravis (SPMG) and (SNMG). SDS-PAGE analysis and Western Blot studies have been carried out to better understand these target proteins. Immunoreactivity of the patient’s IgG and IgM antibodies has been used to identify the muscle protein titin isoform(N2A). Titin is a large well known protein that is found in skeletal muscle. The protein extends from the Z line to the M line of the sarcomere that provides passive tension to the muscle and acts as a template for normal muscle formation. Previous research in this lab has shown that the ARMD patients’ sera also react with a 140k.d. The significance of this study is that the SPMG titin isoform(N2A) is still known protein in the muscle membrane. However, about 15% of patients do not have detectable levels of this antibody and are diagnosed to have seronegative myasthenia gravis (SNMG). Previous research in this lab has focused on autoimmune ripping muscle disease (ARMG), with a focus on cell adhesion prior to this. The ARMG autoantigens have been characterized through the immunoscreening of human skeletal muscle cDNA expression libraries using sera from patients with seropositive myasthenia gravis (SPMG) and (SNMG). SDS-PAGE analysis and Western Blot studies have been carried out to better understand these target proteins. Immunoreactivity of the patient’s IgG and IgM antibodies has been used to identify the muscle protein titin isoform(N2A). Titin is a large well known protein that is found in skeletal muscle. The protein extends from the Z line to the M line of the sarcomere that provides passive tension to the muscle and acts as a template for normal muscle formation. Previous research in this lab has shown that the ARMD patients’ sera also react with a 140k.d. The significance of this study is that the SPMG titin isoform(N2A) is still known protein in the muscle membrane. However, about 15% of patients do not have detectable levels of this antibody and are diagnosed to have seronegative myasthenia gravis (SNMG).
compared to WT cells depending upon the virus strain. Viruses lacking ICP34.5 replicated poorly in both cell types and there was no difference in virus production. TIA-1 acts as an antiviral protein possibly by sequestering the PICs and reducing the number of functional viral replication centers. Late in infection, different variants of ICP34.5 may determine differences in levels of sequestration of PICs into stress granules resulting in differences in viral protein synthesis and hence replication.

**Board 18: EFFECTS ON BACTERIA IN THE DENTAL FLORA EXPOSED TO DIFFERENT CONDITIONS**

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While eating and drinking habits vary greatly from person to person, little is known about how these habits influence the natural flora of the human oral cavity. Streptococcus salivarius, Neisseria sp., and Streptococcus mutans are of particular interest because in previous research some variation in occurrence was observed in S. salivarius and Neisseria sp. colonies from dental flora of adults consuming alcohol and tobacco. S. mutans play a role in the formation of dental caries. Therefore, the occurrence of these three bacteria in relation to various eating and drinking habits was chosen for this study. Young adults (N = 47, aged 18 -23 years) were questioned about their eating, drinking, tobacco use, and antibiotic use prior to sampling their teeth to obtain bacterial samples (High levels of use was defined as eating or drinking every week; moderate use: every two weeks to occasionally). Dental plaque samples from the biting surface of the lower jaw molars were collected with Dacron-tipped swabs and transported to the lab in Brain Heart Infusion Broth. Within 24 hours after collection, saliva was mixed and incubated onto Mitis Salivarius Agar (MTS) for S. salivarius, Chocolate Agar for Neisseria sp., and MTS with 30% sucrose for S. mutans and were incubated in a 4% CO₂ atmosphere at 37 °C. Bacterial colonies were isolated and the absence of S. mutans, T. denticola, and 7.7% of adults with high levels of alcohol and tobacco use, whereas its presence in adults with no use of alcohol or tobacco was 71.4%. This difference is not statistically significant. The data indicate that S. salivarius, S. mutans and T. denticola were not significantly affected by alcohol consumption and tobacco use.

**Board 19: INVESTIGATING THE ROLE OF DBSR PROTEINS IN ADENOVIRUS REPLICATION**

Shoga M. Mathew – mathewss@muhio.edu, Dept of Microbiology, Pearson Hall, Miami University, Oxford, OH 45056. Eileen Bridge bridgee@muhio.edu.

Eukaryotic cells possess mechanisms that monitor breaks in genomic DNA and repair them. The effectors of this double strand break repair (DSBR) process comprise a variety of proteins including the Mre11/Rad50/Nbs1 complex. When a cell is infected with Adenovirus which has a linear DNA genome with double stranded ends, host DSBR proteins recognize the viral DNA as broken ends and repair them by linking them end-to-end to form concatemers. The second model “repair” by producing regulatory proteins of 11kDa and 34kDa from the early region 4(E4), which relocates Mre11 and target it for degradation respectively. We were interested in studying the relationship of Mre11 re-localization and degradation to the onset of DNA replication. Our preliminary data, suggests that during a time course of wild-type Adenovirus (Ad5) infection, Mre11 is relocalized first and subsequently degraded. Mre11 degradation coincided with the appearance of viral replication centers. In contrast, an E4 mutant virus infection lacking 11 kDa and 34kDa fails to redistribute or degrade Mre11 and is significantly delayed for the onset of viral DNA replication. This leads us to hypothesize that Mre11 might bind to viral DNA in the absence of E4 proteins, and disrupt DSBR proteins in addition to contributing to concertationization of the viral genome. We are currently carrying out experiments to measure binding of host DSBR proteins to viral DNA, and to investigate their effects on immunoprecipitation.

**Board 20: PRODUCTION OF MONOCLONAL ANTIBODIES AGAINST THE CAPSULAR POLYSACCHARIDE OF STAPHYLOCOCCUS AUREUS TYPE 8**

Jery J. Mashburn, jernymashburn@yahoo.com, Chris M Caldwell, cmcaldwell22@hotmail.com, Diana L Fagan, dfagan@ysu.edu, Youngstown State University, One University Plaza, Youngstown OH 44555.

Recently, many bacteria, including Staphylococcus aureus, have become increasingly resistant to the antibiotics used for treatment. A novel approach to treatment has been the production of antibodies against the capsular polysaccharide of those bacteria in which they are present. The goal of this study is to develop monoclonal antibodies against the capsular polysaccharide of Staphylococcus aureus type 8. The capsular polysaccharide was purified by enzymatic digestion of a bacterial preparation with Lysozostaph, DNase, RNase, and proteinase K, followed by DEAE column chromatography. A Bradford protein assay was performed with dilutions of Staphylococcus aureus type 8 capsular polysaccharide with absorbance read at 630 nm. The purified capsular polysaccharide was found to be below baseline (0.158 at 630 nm) and had values between 0.132 and 0.156 with the exception of the 4th dilution (0.159). Hybridoma production via cell fusion was performed. Monoclonal antibodies were isolated and a secondary subcloning and isolation was performed. An indirect ELISA was performed on the supernatants of the primary antibodies to isotype the antibodies. All six supernatants were tested all above baseline (0.079 at 450 nm) with values from 0.147 to 0.419 for mouse IgM. All other isotypes were within baseline ranges. Studies in progress will determine monoclonal antibody affinity and opsonophagocytic activity. These studies were supported by a YSU GRANT.

**Board 21: BONE MARROW RECONSTITUTION OF AN IMMUNODEFICIENT MOUSE MODEL, Nicole R. Toth, tallsr@iol.com (Diana L. Fagan, dlfagan@ysu.edu), Dept of Biological Sciences, Youngstown State University, Youngstown, Ohio 44555.

Preeclampsia is a disease involving endothelial cell damage, affecting 4-5% of all pregnancies, and is one of the leading causes of maternal and infant mortality and morbidity. However, the cause of this disease is not fully understood. Polynesian studies have found that certain Polynesians use kava in elaborate rituals involving extracting a form of Piper methysticum. According to many women in Polynesia, kava has a contraceptive effect. Polynesians use kava in elaborate rituals involving extracting a form of Piper methysticum. According to many women in Polynesia, kava has a contraceptive effect. We hypothesize that the kava will alter the estrous cycle, and this effect has not been extensively studied in other species. To test this hypothesis, we injected five mice with kava, (without T cell depletion) had IgG levels similar to normal mice. Mice (n=3) injected with C57/B16 cells had immunoglobulin levels approximately one half of normal values. These results suggest that the implanted cells are functional four weeks following implant. Future studies will examine tissues collected from these mice to determine the location of the immune cells.

**Board 22: THE EFFECT OF KAVA ON THE ESTROUS CYCLE OF A RAT WITH POSSIBLE CONTRACEPTIVE ACTION**

Kate Jennings, kjennings@kent.edu, Jennifer L. Marcinkiewicz, jmarcinkiewicz@kent.edu, Vicki Aschwirz@kent.edu, Kent State University, Dept of Biological Sciences, PO Box 5190, Kent OH 44242-0001.

Polynesian use kava in elaborate rituals involving extracting a form of Piper methysticum. There is evidence that the kava will alter the estrous cycle, and this effect has not been extensively studied in other species. To test this hypothesis, we injected five mice with kava, (without T cell depletion) had IgG levels similar to normal mice. Mice (n=3) injected with C57/B16 cells had immunoglobulin levels approximately one half of normal values. These results suggest that the implanted cells are functional four weeks following implant. Future studies will examine tissues collected from these mice to determine the location of the immune cells.

**Board 23: PLANT LIGNAN INDUCTION OF APOPTOSIS IN CERVICAL CARCINOMA CELLS CONTAINING INTEGRATED HUMAN APOPTOSIS IN CERVICAL CARCINOMA CELLS**

The Ohio Journal of Science
Papillomavirus DNA. Deidra R. Tschantz,
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Medicine, 4209 SR 44, Rootstown OH 44272.

Human papillomavirus (HPV) infections are the cause of several
diseases (9). Inhibition of virus replication in the host cell genome permits continuous expression of viral E6/E7 genes. The E6 and E7 proteins interfere with functions of the tumor suppressors proteins, p53 and retinoblastoma protein. E6 protein binds to p53 protein to accelerate its degradation thereby preventing its ability to induce apoptosis or growth arrest. Plant lignans, 3- O-methyl-nordihydroguaiaretic acid (3’-O-methyl-NDGA), derived from the creosote bush can be used as anti-tumor agents by targeting HPV DNA (p16 and CaSkI) were treated with 3’-O-methyl-NDGA to determine the effects of the lignan on E6 mRNA and p53 protein stabilization. The cells were treated with various concentrations of lignan over a series of time points to determine the response of the cells to the lignan. Treatment of HPV positive tumor cells caused a stabilization of p53 protein and induced apoptosis. However, surprisingly, there was no induction of p21, a cyclin-dependent kinase inhibitor. Quantitative real-time RT-PCR analysis of Hela RNA shows a ten-fold reduction in E6 expression in treated cells compared to untreated cells. Apoptosis is induced as noted by activation of caspases 9 and 3. Programmed cell death was confirmed by flow cytometry. Western blotting and confocal microscopy were also performed. The plant lignan, 3’-O-methyl-NDGA, acts as an anti-tumor agent by suppressing E6 expression, permitting stabilization and activation of p53 protein, and bypassing growth arrest but inducing apoptosis in HPV positive cervical carcinoma cells.

Board 24 MECHANISM OF DOWNREGULATION OF PROLIFERATING CELL NUCLEAR ANTIGEN. RAVINDRA KOLHE, (rkolhe@neoceuom.edu) and HARIKIRAN KALLEN,
VEERAPANENI RAMY@BGNET.BGSU.EDU, CHIRAG MANDAVIA,
LAKSHMI PULAKAT, NARASAIAH GAVINI, NGAVINI@BGNET.BGSU.EDU, DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

Proliferating Cell nuclear Antigen (PCNA) is a S-phase marker that associates with DNA without actually binding, via a ring shaped trimeric, to the nuclear envelope. Though this symmetry does not have any endogenous enzymatic activity, it mediates its interaction with a large number of proteins that are crucial for DNA replication and repair. It is highly conserved across species ranging from bacteriophages, archaea, insects, plants and animals. In cancer cells, PCNA is expressed at high levels. To determine the regulation of expression of PCNA in these cells, the cells were exposed to extracts from plants of Euphorbiaceae family (EPE) and microarray analysis was carried out to identify the PCNA induced genes in the cancer cell line MCF-7. The untreated cells showed two forms of PCNA, the non-phosphorylated, active form and the phosphorylated form of PCNA, which is expressed in G1-S phase and plays a role in the G1/S phase transition of the cell cycle. The treated cells showed high-level expression and constitutive phosphorylation of PCNA, which is expressed in G1-S phase and plays a role in the G1/S phase transition of the cell cycle. The untreated cells showed two forms of PCNA, the non-phosphorylated, active form and the phosphorylated form of PCNA, which is expressed in G1-S phase and plays a role in the G1/S phase transition of the cell cycle. The treated cells showed high-level expression and constitutive phosphorylation of PCNA, which is expressed in G1-S phase and plays a role in the G1/S phase transition of the cell cycle. The treated cells showed high-level expression and constitutive phosphorylation of PCNA, which is expressed in G1-S phase and plays a role in the G1/S phase transition of the cell cycle.

Board 25 A NEW SUBSTRATE FOR PERTUSSIS TOXIN. NITIN WARIER (NITINW@BGNET.BGSU.EDU), DEPARTMENT OF MICROBIOLOGY AND IMMUNOLOGY, NORTHWESTERN OHIO UNIVERSITIES COLLEGE OF MEDICINE, 4209 SR 44, ROOTSTOWN OH 44272.

Pertussis toxin (PTX), produced by B. pertussis, is an A-B toxin containing an A-protomer, S1, that has ADP-ribosylase activity and a B-oligomer consisting of 5 binding subunits. The well known substrate for S1 is the Gαi protein. Since PTX ADP-ribosylates Gαi2 this extended substrate specificity is made possible by the presence of Gαi in the signaling mechanisms of membrane receptors that show seven transmembrane domain topology. Angiotensin II receptor AT2 is a protein with seven transmembrane domain topology and its functional analysis involving phospholipase A2 and inhibition of cell growth are inhibited by PTX. However the extent of the involvement of the Gαi in the signaling of the AT2 is not yet elucidated. We identified a direct interaction between the S1 subunit and the region spanning the third intracellular loop and C-terminal cytoplasmic domain of the AT2 using Yeast-two hybrid system. To identify the biochemical meaning of this interaction we constructed a His-tagged S1 subunit, purified this protein and analyzed its interaction with AT2 expressed in COS cells. Our experiments imply that the interaction of the 3rd ICL of the AT2 may be the mechanism though which the PTX inhibit AT2 signaling.

Board 26 REGULATION OF CYCLIN DEPENDENT KINASE INHIBITOR CDKN2A DURING GROWTH-ARREST IN MELANOMA B16 CG CELLS. RAM SAKRAN, VEERAPANENI, RAMY@BGNET.BGSU.EDU, CHIRAG MANDAVIA,
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PULAKAT@BGNET.BGSU.EDU, NARASAIAH GAVINI, NGAVINI@BGNET.BGSU.EDU,
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BOWLING GREEN, OH 43403.

Cyclin dependent kinase inhibitors (CKIs), play important roles in regulation of cell growth by causing G1/S phase arrest. CDKnb2 (p15) is a member of the INK4 family of the CKIs. This is located on the chromosome 9p21, which is a hotspot of genomic alterations in cancer. Inactivation of CKIs by methylation, mutation or deletion, leads to uncontrolled cell growth. We analyzed the regulation of CDKnb2 in mouse melanoma cell type B16 CG using microarray analysis and Western blotting and probing with anti-p15-antibody. While, normal B16 CG cells showed no expression of CDKnb2, high level expression of CDKnb2 was observed when the cells were treated with extracts of the plants of Euphorbiaceae family (EPE). Western blot analysis further confirmed that this increased transcription resulted in increased protein levels. The growth of B16 CG cells was arrested when they were exposed to these toxins. Tumors generated in C57-B16 mouse by subcutaneous injection of B16CG cells also had highly reduced growth when treated externally with the EPE, and showed increased expression of CDKnb2. In cancers including melanomas, p15 expression is reduced or down-regulated. This down-regulation of p15 may result in growth regulation of the breast cancer cells that over express p15. However, immunoprecipitation and Western-blotting studies showed high-level expression and constitutive phosphorylated states in both ErbB2 and ErbB3 receptors in this cell line. It was further shown that introduction of the AT2 in these cells by transient transfection for a period of nine days resulted in significant reduction of the phosphorylation of the ErbB2. It was found that the level of the 3rd ICL of the AT2 is involved in growth regulation and this region is needed for the interaction between the AT2 and the human ErbB3, we hypothesized that this interaction may result in growth regulation of the breast cancer cells that over express ErbB2 and ErbB3. To test this hypothesis the breast cancer cell line MDA-MB-453 was used. The ligand-binding experiments and RT-PCR studies showed that this cell line does not express the AT2. However, immunoprecipitation and Western-blotting studies showed high-level expression and constitutive phosphorylation of both ErbB2 and ErbB3 receptors in this cell line. It was further shown that introduction of the AT2 in these cells by transient transfection for a period of nine days resulted in significant reduction of the phosphorylation of the ErbB2. It was found that the level of ErbB2 itself was significantly reduced in these cells. In contrast, the AT2 receptor carrying mutations in the 3rd ICL of the AT2 did not affect the phosphorylation levels or the expression levels of the ErbB2 in these cells. The AT2 transfected cells were unable to grow more than two weeks suggesting that the AT2 inhibited the growth of these breast cancer cell lines. When the cells were treated with extracts of the plants of Euphorbiaceae family for 3 days, the phosphorylation of ErbB2 seemed normal, however exposure to Ang II significantly reduced the phosphorylation of the ErbB2. In summary, the results indicate that the AT2 regulates the growth of ErbB2 overexpressing breast cancer cells by altering phosphorylation and reducing the expression of the ErbB2. These anti-growth effects of the AT2 are enhanced by Ang II-mediated activation of the receptor. Moreover these results further confirmed the essential
role of the 3rd ICL of the AT2 in this regulation of ErbB2 expression and phosphorylation.

**Board 28** QUANTIFICATION OF PP-I mRNA USING QUANTITATIVE REVERSE TRANSCRIPTASE POLYMERASE CHAIN REACTION. Anjali Nair

The expression of genes involves two main processes called transcription, where DNA is transcribed into messenger RNA (mRNA), and translation where mRNA is translated into proteins that are required by the cell to perform various functions. RNA interference (RNAi) is a technique that interferes with the process thereby affecting expression levels of genes. RNAi is a process in which double stranded RNA molecules are introduced into the cell and turn off or silence the expression of a gene with a similar DNA sequence. This study project involves measuring the specificity of RNAi in gene families and how it can affect similar sequences when only one is targeted. This will be done by isolating mRNA from cells and quantifying the mRNA using Real-Time Polymerase Chain Reaction techniques. Quantitative Reverse-Transcription PCR (RT-RT-PCR) is an in vitro method for enzymatically amplifying defined sequences of RNA. This is one of the most recently developed, reproducible and sensitive methods to quantify mRNA. This method enables determination of how specific the RNAi effect is for that target. This study will mainly focus on Type-1 Protein Phosphatase isoforms found in Paramaecium cells. Quantitative PCR will help determine that in such a gene family, if just one isoform is silenced, downstream effect is quite different compared to the other isoforms being related. In order to carry out this experiment, each mRNA will be relatively quantitated using Quantitative RT-PCR with carefully chosen primers and the concentration of individual mRNA will be measured. For the purpose of this study, focus is on Type-1 PP-I and Type-2, which are very similar to each other. As these sequences are so similar to each other, this will stringently test RNAi specificity. RNAi targeting the 3 PP-I isoforms mRNAs are being done. The concentration of the 3 isoforms after targeting each one by RNAi using Quantitative RT-PCR will be determined.

**Board 29** CHEMOTAXIS AND INDUCIBLE ANTIBIOTIC RESISTANCE IN ESCHERICHIA COLI. Kobalka, Peter

Mitochondria are responsible for the vast majority of biological ATP energy production through aerobic metabolism in eukaryotic cells. They are presumed to have evolved from early aerobic bacteria living in symbiosis with ancient archaeabacteria anaerobes. Mitochondria contain a lot of enzymes necessary for mitochondrial protein synthesis and the genes for a few proteins essential for oxidative phosphorylation. Mutations in mtDNA can cause a variety of neuromuscular diseases, and have been implicated in these maternally inherited neuroopathies, as well as free radical oxidative damage, cancer, and even the degenerative processes of ageing. The mechanisms by which most organisms’ mtDNA replicates are not well understood. The mtDNA of some eukaryotic Saccharomyces pombe has similarities to mammalian mtDNA, including small size, a circular genetic map, and little non-coding DNA. It has been hypothesized that S. pombe mtDNA replicates through a rolling circle mechanism but there has been very little direct supporting data. Using Fangman-Brewer 2-dimensional gel electrophoresis modified to allow analysis of substantially larger DNA molecules, intact S. pombe mtDNA has been analyzed for replication intermediates. We observed long heterogeneous double-stranded DNA molecules in size ranges well above through well below the unit genome length of 19,000 bp as has been previously reported. No specific origin of bi-directional replication was discovered through standard 2-D gel analysis of fragments of the mtDNA however, the model proposed by revealed circular forms attached to larger molecules forming an "eyebrow" structure that has previously been shown to be a hallmark of rolling circle replication.

**Board 30** IDENTIFICATION OF SALMONELLA GENES THAT ARE EXPRESSED IN THE PRESENCE OF OTHER BACTERIAL SPECIES. JESSICA L.

SdiA is a LuxR homolog in Salmonella enterica that detects and responds to N-acetylhomoserine lactone (AHL) production by other species. To determine the response of S. enterica to other species, a microarray analysis was performed. To ensure maximal SdiA activation during the experiment, sdiA was expressed from a plasmid in the presence of synthetic AHL. A vector control strain was used as the negative control. The two loci were known to be activated in response to SdiA and AHL were identified in the array analysis, srgE and the rck operon, confirming that the experiment was successful. At least three additional genes were also identified. Chromosomal lacZ2Y fusions were being constructed to these loci to confirm that they respond to AHL and sdiA expressed from its natural position in the chromosome. A fusion to one gene, ybbK, has been constructed and a complementation test performed for the loss of the SdiA regulator. This fusion becomes active in the presence of Yersinia enterocolitica but not in the presence of an isogenic yen1 mutant that cannot synthesize AHL. Many of these genes identified have never been isolated in genetic screens before, consistent with the idea that they are expressed only within mixed microbial communities.

**Board 31** MITOCHONDRIAL DNA REPLICATION IN THE FISSION YEAST SCHIZOSACCHAROMYCES POMBE. Heather L. Lorimer, helorime@cc.ysu.edu, and Ian J. Holt*, ijh@mrc-dunn.cam.ac.uk, Dept of Biological Sciences, Youngstown State University, One University Plaza, Youngstown OH 44555, † MRC Dunn Human Nutrition Unit, Cambridge CB2 2XY U.K.

The concentration of the 3 isoforms after targeting each one by RNAi using Quantitative RT-PCR will be determined.
The physical effects of testosterone are well-documented, but the role testosterone plays in a social context is less clear. Previous studies have indicated that testosterone levels may predispose men to divorce or abusive relationships, or, conversely, to success in business. Therefore, we set out to study this relationship in college-aged males. Two groups of men, ages 18-23, will be recruited from the ONU student body (n=1500). The control group consisted of single men (n=7) and the test group consisted of men in a committed, monogamous relationship of 12 months or more (n=7). Prior to any experimentation or sample collection, participants were asked to fill out a questionnaire about general health and previous and current relationship history. Participants were also asked to give a saliva sample passively derived (using the Innerd method) to determine if there is any significant difference in the levels of testosterone between males in a committed relationship and single, uncommitted males.

Previous studies indicate childhood abuse victims tend to have a smaller corpus callosum than those not abused in their childhood. This reduction leads to less integration of the hemispheres, thus creating dramatic alterations in mood and personality. However, the linkage between child abuse and its effect on the corpus callosum is still not fully understood. The purpose of this study is to determine, using the 3D BrainStation, to avoid any confounding factors, a univariate analysis revealed no significant differences in the number of alcoholic drinks per year (p=0.413), years of smoking (p=0.133), years of education (p=0.648), and scores on the Wonderlic Personnel assessment (p=0.135) between the two groups. The average abuse revealed a significant difference with (p=0.000). Currently with three measurements of the corpus callosum in each group, the study is being expanded to compare the level of improvement. Generally, images were found to have better resolution and overall picture quality. Included also are examples of contemporary uses of the SEM in archeological dating, art, and private industry. Based on this review, it seems that the SEM has been and will continue to be an important tool in academia, private business, and culture.

An overzealous intellectual property movement in the late 20th century, spurred by major corporations, specifically Mattel’s pursuit of the Barbie™ copyright, gained much media attention. Under the fair use portions of the United States Code for copyright, it is acceptable to use Barbie™ in art, to portray a message in a social context. These uses do not violate Mattel’s copyright. A survey was administered to 1000 participants with artistic backgrounds to see if they correctly identified 4 images using Barbie™ as fair use in a social context. The survey was a paper and pencil test with a number of questions but only two items were relevant to the issue at hand. Three persons were located locally in Kent and another 25 professional artists with art training or advanced art students. A significant number of the respondents failed to identify the pictures as “fair use.” Though only one picture was significantly identified and not considered significantly objective, the results support the fact that the pursuit of copyright seems to have had a negative impact on this process though other aspects of this issue need to be studied before this conclusion follows.

Research has shown that NR2B transgenic mice, genetically engineered with an increase number of the NR2B component of the NMDA receptor, exhibit enhanced long-term potentiation, are better at novel-object recognition tasks, cue fear conditioning, and the Morris water maze. This study examines the performance of the NR2B transgenic mice in the Hebb-Williams maze. This is a complex closed-field intelligence test for rodents, with 12 different maze configurations of increasing complexity. We predict that because these mice over-express the NMDA receptor in the forebrain region, they will perform better than the control mice that do not over-express NMDA. The mice will also be tested on a manipulated, non-traditional, version of the Hebb-Williams apparatus. The non-traditional setup will be identical to the traditional apparatus; except it will be surrounded by a curtain. The animal to use the internal barriers within the maze, as cue for locating the goal box. The experimenter is blind to the genotype of the mice during behavioral testing. This study begins when the mice are approximately 3 months old and is conducted once daily, over a continuous 38 day period. We predict that the transgenic mice that over-express NMDA receptors in the forebrain will perform better than the control mice on the complex stages of both the traditional and non-traditional setups of the Hebb-Williams maze. A total of 24 mice are being tested (NR2B=12, Control =12).

The theory of the scanning electron microscope (SEM) was credited to E. Ruska and M. Knoll in Germany in 1933. Since then, nearly every aspect of the SEM has undergone some type of change. New sample preparation techniques such as critical point drying and cryogen fixation have expanded the range of samples that can be examined in the SEM. The introduction of new instrumentation like the Everhart-Thornley detector and CRT display have also contributed to the development of the SEM. Since its inception in the early 20th century, numerous scientists, such as M. von Ardenne, V.K. Zworykin, K.C.A. Smith, T.E. Everhart and R.M.F. Thornley have advanced the development and applications of the SEM. The goal of this project was to review the development of the SEM from its inception to its current uses and to speculate what the future holds for SEM methodology and application. To do this, past images associated with specific developments of the SEM as they were discovered and, therefore, of their influences were traced in order to determine if there is any significant difference in the levels of testosterone between males in a committed relationship and single, uncommitted males.

Every year more than 100 million tons of Coal Combustion Products (CCPs) are produced in the United States with only approximately one-third being reused to create new products. Most CCPS are alkaline and rich in essential plant nutrients like Ca, Mg, Mo, S and B. Thus CCPS with other chemical properties of CCPs can be used. The animal to use the internal barriers within the maze, as cue for locating the goal box. The experimenter is blind to the genotype of the mice during behavioral testing. This study begins when the mice are approximately 3 months old and is conducted once daily, over a continuous 38 day period. We predict that the transgenic mice that over-express NMDA receptors in the forebrain will perform better than the control mice on the complex stages of both the traditional and non-traditional setups of the Hebb-Williams maze. A total of 24 mice are being tested (NR2B=12, Control =12).

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respectively. The pH of mixes ranged from 5.9 – 9.74 and the electrical conductivity (EC) was between 2.46 – 12 dS/m. We also measured the chemical properties of the mixes for different elements including N, P, K, Ca, B etc. by the saturated extract method of Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES). We evaluated 44 mixes, with 4 replicates for each, for their ability to support growth of wheat (Triticum sativum), tomato (Lycopersicum esculentum) and marigold (Tagetes patula) by weighing the biomass produced at the end of each trial. Our results showed that significantly (p<0.0001) higher growth (7-130%) was achieved with experimental mixes containing CCPs (cpa/vl) compared to mixes containing amino acids alone (control). However there weren't one mix suitable for all plants. We conclude that CCPs can be used as a readily available raw material for the production of biomass.

Pre-College Poster Session 3:00-4:30 PM

Board 01: A STUDY OF THE USE OF STRONG GRAVITATIONAL LENSING IN DETERMINING THE MASSES OF GALAXIES. Amy Hollinger, Ahollinger05@hbhs.edu, Katie Trostel, Lauren Berger, 2301 Brigadoon Court, Westlake OH 44145 (Hathaway Brown School).

Gravitational lensing is a tool that can prove useful in exploring distributions of dark matter, which does not reflect light but does interact gravitationally. The phenomenon of gravitational lensing occurs when massive objects, such as galaxies, “warp” space-time, causing the light from a source further away to bend around it, to appear bent. This results in the formation of multiple images of the source. A formula, known as the Lensing Equation, can be used to describe this phenomenon. Because one of the properties that the bending of light depends upon is the mass of the lens, one can set the mass as the unknown variable in the equation, and solve for its value. The information for the other variables in the equation can be gained from an observational survey such as CLASS, or Cosmic Lens All-Sky Survey. CLASS uses a radio survey to map instances of gravitational lensing, and publishes its results on a site accessible to the public. However, it is not simply a matter of substituting this information into the equation, as the general equations are adapted depending on the model selected. Also, some information, such as the angle of the source with respect to the observer, cannot be directly observed, and so instead must be indirectly calculated. Although there are many different models used to describe the gravitational lens, focus was first placed on the point-source, point-lens model, as it is mathematically and conceptually the simplest form. By comparing the results obtained by the model to the typical range of masses for galaxies (10^{11}-10^{12} solar masses), the accuracy of the model could then be assessed. The three CLASS lenses that contained sufficient information to complete the calculation were examined, and in fact, the results did fit this range. The singular isothermal sphere model was also studied because although more complicated than the point-source, point-lens model, it is a more likely candidate for the actual distribution of the mass, as it follows more accurately the expected distribution of dark matter. The singular isothermal sphere model also eliminates the introduction of any additional parameters. Approximately the same range of masses was found using the isothermal sphere model, supporting the mass estimates from the point-source, point-lens model.

Board 02: ROTATION = +/- ROTARY NYSTAGMUS. Kaleigh E. Gallagher, DancingOte@AOL.com 5768 Colonial Blvd., Willoughby Ohio 44094, Beaumont School.

This study compared sensory processing, specifically the vestibular systems of children with Autism compared to children without the diagnosis of Autism. Post-rotatory nystagmus is an involuntary rapid rhythmic, movement of the eyeballs that usually takes place after rotational stimulation. The hypothesis was that providing rotational stimulation to children with the diagnosis of autism as well as to children without the diagnosis of autism will result in the children with autism having significantly less post-rotatory nystagmus response than children without autism. Seven children were tested with the diagnosis of autism and seven children without the diagnosis of Autism. The Occupational Therapist spinning each child on a special rotational swing and recording in seconds, with a fly-back switch stop watch, the duration of post-rotatory nystagmus. Results were visually recorded using a video camera. Results indicated that all seven children with Autism have little or no post-rotatory nystagmus reaction. Some researchers would believe that this is suggestive of poorly integrated vestibular systems in children with Autism. Implications of study findings were that the vestibular system of children with Autism is poorly integrated. These findings may be used when diagnosing children with Autism, or with sensory processing disturbances in general.

Board 03: FACTORS INFLUENCING THE GROWTH OF PROTEIN CRYSTALS. Jason A. Robson jrobson@accessex.net 2873 Township Road 179 Bellefontaine OH 43311.

Proteins are the vital elements that make up life. They are responsible for every physical trait and every life process in all living things. An assortment of 22 amino acids that bond together to form polypeptide chains make up the structure of a protein. The structure of a protein directly correlates with its function. To study the structure of a protein, protein crystals are grown and, if large enough (.2-6mm) goes through x-ray diffraction to create an electron density map used to determine the sequence of amino acids. The most difficult step in this process is growing crystals to a size of .2mm or greater. Finding more reliable ways of growing these crystals is the focus of this experiment. In this experiment, samples of protein solution grown in environments of pH’s 4,5,6,7,8,9,10, and temperatures of 4°C, 22°C, and 30°C were or will be taken and run on an electrophoresis gel checking contamination along with the possibility of multiple proteins. In all trials that have been tested (pH 4,5,6,7, and 22°C) contamination was a common problem and probability for multiple protein structures appearing occurred only once in the pH 7 trial. Finding a more efficient, reliable way to grow protein crystals will lead to quicker and easier analysis of amino acid sequencing in different proteins, which in turn will lead to a better understanding of the basis of life’s functions and processes.

Board 04: THE ROLE OF ENOLASE PHOSPHORYLATION IN SALMONELLA TYPHIMURIUM. Taruna Singh, tsingh@hbhs.edu, 25405 Byden Road, Beachwood OH 44122 917-443-3467, tkahl@harm.ohio.edu, David G. Kehres, dkg2@case.edu, Case Western Reserve University, Dept of Pharmacology.

Little is known about the specifics of protein phosphorylation in bacteria, despite the abundant information known about it in eukaryotes. The Salmonella genome encodes hundreds of phosphorylated proteins and at least nine protein kinases and phosphotyrosine phosphatases. Two alternatively adapted substrates for the enzyme that phosphorylates the Salmonella "phosphoproteome." One approach entails for the overall survey in phosphoprotein patterns in mutants that lack kinases or phosphotyrosines. The second approach is to study specific phosphoprotein that have been identified in surveys using the ppa and ppp double mutant. This study seeks to characterization of such candidates, the central carbon metabolic enzyme, enolase. In addition to its role in carbon metabolism, enolase is associated with a RNA degradation complex, and is also expressed on the cell surface where it binds to mammalian plasminogen. Furthermore, several distinct phosphorylated forms of Salmonella enolase were found on 2-D polyacrylamide gels. The working hypothesis is that it is phosphorylation of enolase will affect its physiological activity. That is, phosphorylation determines the number of functions enolase performs, and/or modulates the efficiency of those functions. In addition to finding the several distinct forms of enolase and characterizing Ppa and Ppp, two Mnt-dependent phosphoprotein phosphotyrosines, enolase has been cloned onto a plasmid and will be used to complement a strain that is under construction whose enolase gene has been deleted. These constructs will provide the foundation for answering the two critical questions; 1.) What is the protein's phosphorylation sites? 2.) What impact does this phosphorylation of enolase have on its physiological activity?

Board 05: PRESSURE VARIATIONS WITHIN BONE GRAFT AFTER SPINE FUSION SURGERY. Madeleine M. Coquillette, coqullime@bmc.rcc.cf.org, (216) 921-7800, 3104 Elyria Ave., Elyria OH 44035, Ely M. Ferrara, Spine Research Laboratory, Richard Schlenk, Edward Benzel, Cleveland Clinic Spine Institute, Aaron Fleischman, Shuvo Roy, Elyta Gordon, BioMEMS Laboratory, Dept of Biomedical Engineering.

The goal of this study was to investigate pressure fluctuations within bone grafts during vertebroplasty after spine stabilization surgery. Current methods that involve imaging techniques, such as x-ray and MRI, are not optimal in their ability to accurately monitor the bone fusion process. Consequently, we are investigating the feasibility of monitoring bone fusion using microelectromechanical systems (MEMS) technology. MEMS will produce miniature wireless sensors for direct implantation within bone grafts to monitor healing. The range of pressure variations, which might indicate vertebral fusion status, was investigated in a caprine (goat) model with 2 test groups, each with a sample size of 3 male goats.
An autologous bone graft was implanted in the C3-4 intervertebral space and a commercially manufactured telemetric pressure catheter was implanted at top and bottom of each bone graft. Data was transmitted to an external portable data acquisition system to record the in vivo pressure variations in the bone grafts, months post surgery. Pressure data was analyzed to determine pressure ranges and fluctuation patterns. The pressure at top of the bone graft increased from a mean of 0 mmHg just after 1 week post-surgery, and slowly decreased to 0 mmHg at the end of the study period. In contrast, the pressure at the bottom of the bone graft increased to a maximum of 245 mmHg after 8 weeks post-surgery, and subsequently, decreased to 0 mmHg after 9 weeks post-surgery. These results confirm the feasibility of monitoring pressure fluctuations within bone graft, which might be a determinant of fusion status. Future experimentation will include in vivo experimentation to examine pressure reactions of the telemetric catheter in specific conditions and to further substantiate the previous findings.

Board 08

**APOTOPSIS OF THE CELLS IN Atherosclerotic Lesions; Inhibition by Antioxidants.** Christina van Lier1, Sara G. Carlson2, and Guy M. Chisolm3, 1The Student Research Program, Hathaway Brown School, Shaker Heights OH 44122 and 2The Department of Cell Biology, The Lerner Research Institute, The Cleveland Clinic Foundation, Cleveland, OH 44195.

Atherosclerosis, the primary cause of heart disease and stroke, is a disease of major arteries. During atherosclerotic lesion formation, monocytes from the blood migrate through the endothelial cell layer. There, in the inner layer (the intima), monocytes become macrophages and take up oxidized low-density lipoproteins, a chemically modified form of LDL, which is normally involved in cholesterol transport. The cholesterol-engorged macrophages are called "foam cells." Smooth muscle cells (SMC) also migrate into the lesion and proliferate during lesion development. SMC and foam cells in the lesion die by programmed cell death, called apoptosis. Apoptosis pathways involve the activation of enzymes called caspases that lead to fragmentation of DNA (DNA laddering) and membrane blebbing. Cultured cells were treated simulating conditions in lesions, with 7-ketocholesterol (7K), a toxic component of oxLDL. DNA laddering and caspase-3 activity were examined in untreated cells, 7K-treated cells, and 7K-treated cells pretreated with the antioxidant vitamin E. Interestingly, in SMC, 7K induced DNA laddering but not caspase-3 activity. This suggests that endothelial cells, monocytes, and SMC, which can be inhibited by antioxidant pretreatment; however, apoptosis in SMC may proceed by a pathway independent of caspase-3. Further studies will determine other caspases and seek the mechanisms of vitamin E inhibition. Revealing the mechanisms of cell death in atherosclerotic lesions may suggest targets for therapy against the disease.

Board 09

**DESIGN AND DEVELOPMENT OF A CREATINE KINASE-MB BIOSENSOR.** Julia R. Jarrell1,2, Jiarrell07@hhs.edu, (Chung-Chien Lu), CLXL9@cwru.edu, 1Hathaway Brown School, 19600 North Park Boulevard, Shaker Heights OH 44122 and 2Case Western Reserve University, Electronics Design Center, Cleveland OH 44106.

Creatine kinase-MB (CK-MB) levels in the blood inform healthcare professionals of damage to the heart muscle, following a heart attack or heart surgery and aid in determining the course of treatment. Patient studies have shown that CK-MB levels 3-5 times above normal (4 mg/dL) indicate serious damage to the heart muscle. The objective of this study is to design and develop a heart muscle. The objective of this study is to design and develop a heart muscle CK-MB biosensor. J ULIA R. JARRELL1,2, Jiarrell07@hhs.edu, (Chung-Chien Lu), CLXL9@cwru.edu, 1Hathaway Brown School, 19600 North Park Boulevard, Shaker Heights OH 44122 and 2Case Western Reserve University, Electronics Design Center, Cleveland OH 44106.

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Hereditary Hemochromatosis (HH) is a genetic mutation that, when in its homozygous state, causes the body to absorb too much iron. The symptoms for the disorder are hard to link to Hereditary Hemochromatosis because they are fairly common in the general population without the genetic mutation. Hereditary Hemochromatosis can be lethal if not found early. It is estimated that 1 in about 200 Americans have the mutation in its homozygous state. A study looked at the influence of increasing temperature on bacterial communities in the highway site compared with the parking lot site. At prime growing temperatures between 50 degrees and 75 degrees, it would yield the best results after using the Polymerase Chain Reaction (PCR) technique. First, DNA was extracted from a buccal sample. The 2-tail t-test proved that there is significance in odor reduction among the ratios (p=9.9E-16). Regression analysis conducted in cooperation with the Ohio Department of Natural Resources.

### Board 11 OPTIMIZING COMPOST RATIOS FOR ODOR REDUCTION. JARED B. STEED, STONEYFARM@HSN.COM, 5979 RADNOR ROAD, RADNOR OH 43066.

Of the 75 million tons of paper produced each year in the United States, 30% known as processed paper, can not be recycled due to a lack of management. Despite this clay allows for sharper color images, the recycling process produces more clay than paper fibers. The use of paper as livestock bedding is widely accepted. Previous research has shown that the microbes in the manure digest processed paper. Volatile fatty acids (VFAs) are the source of ammonia production in swine waste. The addition of a carbon source, either paper or straw, increases ammonia production, which is an indication of VFAs breakdown. Research has shown that increase of ammonia production predicts that VFAs will be reduced in the finished compost. Constant volumes of swine waste, 1:1 mixture of feces and urine, were mixed with differing amounts of paper for five compost ratios, 0, 25, 40, 50, and 57% paper. Treatments were sampled for pH and moisture content. Air was pumped continuously through the jar and into a 250 ml flask of .6N HCl with indicator. The boric acid traps were replaced after 24, 72, 120, and 168 hours. The traps were titrated with .7 M HCl to the bromocresol green/methyl red endpoint to determine ammonia content. For the seven days, the composting chambers were reweighed and sampled for pH and moisture content. The 25% ratio most efficiently reduced the odor. A 2-tail t-test proved that there is significance in odor reduction among the ratios (p=9.9E-16). Regression analysis showed that the optimum ratio by volume was 1.2:3.

### Board 12 A BIOREMEDIATION STUDY OF POLLUTED LOT AND HIGHWAY CATCH BASIN RUNOFF WATER. VALERIE M. ANDRUS, OSVA@BEAUMONTSCHOOL.ORG, 4880 FOXLAIR TRAIL, RICHMOND HTS. OH 44143, (BEAUMONT SCHOOL).

Bioremediation of runoff water was studied using duckweed (Lemna sp. and Wolffia sp.). Runoff water toxicity was evaluated with Fathead Minnows (Pimephales promelas). All tests were performed in September and October of 2002. Rainwater precipitation was the only source of water for the experiment. A set of hallways was used for the control. There are four variables for this project. As follows: (1) runoff water from the two collection sites (Top’s Parking Lot on the corner of Richmond Rd. and Wilson Mills Rd., Richmond Hts., OH) and (Jennings Rd., Bradley Rd., and the 1-176 South Highway, Cleveland, OH). Other variables are (2) a container with duckweed (Lemna sp. and Wolffia sp.) only, (3) a container with Fathead Minnows (Pimephales promelas) only, and (4) a container with duckweed (Lemna sp. and Wolffia sp.) and minnows (Pimephales promelas). It was hypothesized that of the two runoff water collection sites, the highway site would be more toxic than the parking lot site. The highway site would display more runoff solids and oil and grease. The greater solids level and oil and grease would create a more toxic environment for the Fathead Minnows. Test and log the following: pH (standard units), total dissolved solids (ppm), turbidity (NTU), zinc (ppm), copper (ppm), nitrate (ppm), phosphate (ppm), temperature, and 10 Fathead Minnows (Pimephales promelas). All containers were aerated. The hypothesis was not supported, as there was 40% - 100% mortality in the parking lot site experiment, experiment #1, and only 10% in the highway site experiment, experiment #2. Therefore, the runoff water from the parking lot site, experiment #1, was more toxic than the highway runoff water in experiment #2.

### Board 13 THE EFFECT OF TEMPERATURE AND HABITAT ON THE ROAD MORTALITY OF SNAKES IN THE KILLDEER PLAINS WILDLIFE AREA. NATHAN J. YAUSSEY, YAUSSEY@MIDOHIO.NET, 5051 NORTH GALENA ROAD, SUNBURY, OH 43074.

Eastern plains garter snakes (Thamnophis radix radix) and eastern massasauga rattlesnakes (Sistrurus catenatus catenatus) are listed as endangered on Ohio’s endangered species list and found in Killdeers Plains Wildlife Area (KPWA), Wyandot County, Ohio, USA. All roads in the KPWA were driven twice weekly during the fall and spring migration periods, March to June and August to November 2002. Snakes were identified, and location recorded by Global Positioning System (GPS). In the spring, there was a total of 21 snakes found, two of which were eastern plains garter snakes. In the fall, there was a total of 185 snakes, one of which was an eastern plains garter snake. The days of the greatest activity may be linked to a decrease in temperature to at greatest 5°C, followed by an increase to at least 20°C in all fall periods of collection. Peak numbers of snakes found in the fall collection period occurred at different times in 2002 than in 2001 or 2000. Temperature shifts appear to have an immediate relationship with migrations, as opposed to photoperiod. Determining the cause of migrations, may lead to an understanding that limits endangered snakes’ mortality due to vehicular traffic. The number of snakes found in spring 2002 season was too few to draw statistical conclusions and may indicate a decrease in population. Studies can be used to determine species preference. Species that are not an immediate threat will be studied to find other locations for endangered snakes. Brown snakes were found in habitats with a greater percentage of developed and woodland areas, water snakes in areas with a greater percentage of ponds and wetlands, and garter snakes in areas with a greater percentage of agriculture. An unexpected outcome of this work indicates that using road surveys to assess spring migrations of snakes appears to be adequate, so other survey methods may be employed. This study was conducted in cooperation with the Ohio Department of Natural Resources.

### Board 14 SOY ANTIBIOTICS KatL. Garrett, FAIRFAX HIGH SCHOOL, SCIENCE DEPARTMENT, PROCTORVILLE OH 45669.

Soybeans are legumes and have many healthful benefits, the prevention of heart disease and osteoporosis among other things. This project tested the antibiotic properties of the soybean cotyledons. Soybeans naturally produce an antibiotic, glyceollin. The hypothesis was that this was produced in the cotyledons by a mixture of yeast and water was applied to them. The solution of baker’s yeast and water, in the proportion of one milligram to one milliliter, was prepared, heated to 100 degrees Celsius, and cooled to room temperature. The mixture was then an aqueous solution. Within 48 hours, the glyceollin accumulated, noticeable by the red coloring of the cotyledons. The cotyledons were then ready to test against bacteria. It was hypothesized that the accumulated glyceollin would be an antibiotic against E. coli after the glyceollin of 30 cotyledons was tested against E. coli, a ring of inhibition was observed. This was repeated five times for a total of six trials. For the control, a ring of inhibition was not present, possibly indicating that the glyceollin produced in the control plants was not enough to combat the E. coli. The hypothesis was supported.

### Board 15 WHY DO PEOPLE LIKE FAST FOOD? LALI J. REDDY, LOLLIPOP603@AOL.COM, 504 GREENBRIER COURT, STEUBENVILLE, OHIO 43952.

In 1970 Americans spent about $6 billion on fast food; in 2001 they spent more than $110 billion. Americans now spend more money on fast food than on higher education, personal computers, computer software, or new cars. Americans spend more on fast food than on movies, books, magazines, newspapers, videos, and recorded music combined. To ascertain reasons for this behavior, a survey consisting of 524 test subjects was conducted to find out the reasons for fast food's popularity. Out of the 332 (63.3%) females and 192 (36.7%) males who responded to the survey, 69.6% were 50 years old; 35.3% were 10-29 years old, and 60.9% were 20 years or older. Based on these responses, the typical person surveyed in Steubenville, Ohio, eats fast food 50 times per year. Males consume it 52 times per year; females consume it 48 times per year. Males spend $24 (40.3%) on fast food, whereas females spend $18 (33.8%). When asked why they eat fast food, 67.4% of the respondents and McDonald's ranking a distant second with 15.7% of the choice. The primary reason is convenience with 72.2% responding. The following in order of choices in this category are taste (56.2%), cheaper price (17%),

easy to find (15.1%), exposure from childhood (6.5%), advertisements (5.1%), others eat it (2.7%), and appearance (1.1%) following. All of this data as a whole presents a vivid overview of how fast foods affect each person, both physically and mentally as it becomes a strong and persistent foundation of American culture.

**Board 16**

**THE CHARACTERIZATION OF CONNECTIVE TISSUE PROGENITOR CELLS (CTPs) - B-CATENIN, RI RAKOS (rrakos05@hb.edu); SV MILLARRELL (villarre@cgh.org); CB BOEHM (boehm@cgh.org); DP MUSCHLER (dp@fioh.org)**

The Cleveland Clinic Foundation, Dept of Biomedical Engineering ND-20, Cleveland OH, 44195.

Bone marrow (BM) contains CTPs that can be activated to proliferate and differentiate into new tissues including: bone, cartilage, fibrous tissues, muscle, and fat. Optimization of the use of CTPs in therapeutic cellular grafts requires an improved characterization of CTPs and their protein expression and developmental pathways. One such protein, b-Catenin, is essential in intercellular junctions and regulates gene expression in the highly conserved Wnt signaling pathway. Wnt genes determine cell fate including; growth, differentiation, and embryogenesis. When mutated, the Wnt pathway activates oncogenes facilitating cancer progression via the b-Catenin transcription factor complex. We hypothesized that b-Catenin is present in CTPs and used Western Blot analysis for detection. BM was isolated from the iliac crest of patients with HOFFECK@AOL.COM, 361 MARY AVE., WESTERVILLE OH, 43081.

**Board 17**

**THE GERM SQUIR. HEIDI A. HOFFECKER, HOFFECKER@AOL.COM, 361 MARY AVE., WESTERVILLE OH 43081 (St. Francis De Sales High School).**

The purpose of this experiment was to find out how far the microorganisms in a sneeze travel, in order to avoid germs from a sneeze. During a sneeze most of the microorganisms actually issue from the mouth, but some colonies around the lungs contract what is known as the explosion of mucus-laden air through the mouth in the form of a sneeze. The question was where does the largest concentration of microorganisms land when someone sneezes? The hypothesis was that the largest concentration would land right in front of the person who sneezed. The following procedure was put in place to test the hypothesis. A 170 cm long sneeze chamber was built. The chamber was marked at 0 cm, 15 cm, 30 cm, and every 20 cm from there. Petri dishes were placed at each mark in the sneeze chamber. The chamber and petri dishes were sterilized before each balloon. The procedure was repeated using a total of six balloons with an explosion of mucus-laden air through the mouth in the form of a sneeze. The balloon was measured and compared to a lung capacity chart. The balloon was inflated using a total of six balloons with various lung capacities and a control balloon containing no mucus. The chamber and petri dishes were sterilized before each balloon. The petri dishes were labeled and incubated at 37°C for 48 hours. The number of colonies of bacteria that had grown in each petri dish, were counted and recorded. The data shows that the largest concentration of microorganisms landed between the 0 cm and 15 cm marks. The data also shows that the farther out the sneeze travels the fewer colonies of microorganisms there were. However, even at six feet (170 cm) germs still reached the petri dishes. The conclusion was that the largest concentration of mucus falls directly in front of the person who sneezed. Though in order to avoid germs, a person must be farther than six feet (170cm) away from someone who has sneezed.

**Board 18**

**TOTAL PLATE COUNT OF HETEROTROPHIC MESOPHILIC BACTERIA USING FRESH ALLIUM SATIVUM L. AND POLOXAMER 407 IN THE FORM OF A MOUTH RINSE AS VARIABLES IN COMMERCIALLY PREPARED HAMBURGERS IN COSHOTON, OHIO. AMY C. SCHLEGE.**

The Ohio Journal of Science A-30.

**Board 19**

**FACTORS INFLUENCING THE VIABILITY OF SPORES OF BACILLUS SUBTILIS AND BACILLUS MEGATERIUM. KASSIE M. YOUNG; 5307 RH 40, CLEVELAND HTS. OH 44118.**

When the first accounts of anthrax were found in America, everyone began to worry about anything that could cause anthrax didn’t help. People haven’t been as scared about anthrax recently only because there have been more recent threats against America, but my question is what if. What if America is threatened with anthrax again? Finding ways to prevent the spread of spores of Bacillus subtillis and Bacillus megaterium could prevent the spread of anthrax. Bacillus subtillis and Bacillus megaterium spores were used as models for Bacillus anthracis spores, which is the cause of anthrax. To reduce the spread of Bacillus anthracis being too dangerous to handle. In initial experiments, it was concluded that Bacillus subtillis and Bacillus megaterium spores were decreased by an average of 91% when treated with disinfectant for 24 hours and 76% when treated in a microwave for 1 hour. There did not appear to be a significant decrease in viable spores when the spores were treated in a microwave for 5 minutes, with ultra violet lights for 15 minutes, and with 70% ethanol for 24 hours.

**Board 20**

**HOW SAFE IS LOCALLY AVAILABLE CHICKEN? MICHAEL A. SEARS, m.sears@ashland.edu, P.O. Box 99B, Ashland, OH 44805.**

Consumer Reports recently found that 12% of a national sample of 484 chickens tested positive for the bacterium Salmonella. Only one brand was Salmonella free. Two hypotheses suggested by these researchers was tested: H1: Chicken purchased locally in Ashland, Ohio will have just as much Salmonella bacteria as chickens purchased elsewhere. H2: Brands will differ in terms of whether Salmonella is present or not. Three bacteria samples from each of four locally-available brands of chicken were incubated using SS agar and streak plates (N=12). Four of the 12 samples from two different brands tested positive for Salmonella, confirming the second hypothesis, but not supporting the first hypothesis. It was also found that the prevalence of Salmonella contamination in locally available chicken (33%) in Ashland, Ohio is significantly higher than in the national sample (12%), as shown by the chi-square test of statistical significance ( χ² = 4.96).

**Board 21**

**DYNAMIC HOLOGRAPHY IN PHOTOREFRACTIVE POLYMER COMPOSITES WITH METAL NANOPARTICLES. ELYSIA W. CHAO, 1*; R. KENNETH D. SINGER, 2 JESSICA M. MERLIN, 2 3489 FAIRMOUNT BLVD., CLEVELAND HTS. OH 44118 (HATHAWAY BROWN SCHOOL) AND 3 CASE WESTERN RESERVE UNIVERSITY, PHYSICS DEPT.**

The photorefractive (PR) effect involves a non-uniform light-induced change in the index of refraction of a material due to a photo-induced redistribution of charge, and is useful in a number of image processing applications. We are studying the potential improvement in photorefractive response time and diffraction efficiency due to the presence of gold nanoparticles in photorefractive polymer composites. The other materials in the composites were polyvinyl carbazole as a photoconductive polymer, CuO as a sensitizer, a...
nonlinear chromophore, and a plasticizer. The PR effect in the samples was studied using a four wave mixing set-up in which two writing beams interfere in the sample which leads to the PR effect and the diffraction of the probe beam. Each measurement was run by applying an electric field and then the writing beams in the setup to interfere in the sample. The intensity of the resulting diffracted beam was recorded as a function of time. Results show that the diffraction efficiency increases and decreases depending on the applied electric field. The photorefractive response time decreased by a factor of three. These effects are thought to be the result of the nanoparticles concentrating the electric fields which would allow the amount of charge generated by the laser light and/or increase the electric field effect on the chromophore. It is also possible that the nanoparticles alter the trapping of charge. The results show that the nanoparticles aid in the creation of the diffraction grating within the polymer composites studied.

**Board 22**  
**THE EFFECT OF ELECTROMAGNETIC RADIATION ON PLANT GROWTH.** SCOTT R. DANIELS, 3244 SPRING VALLEY ROAD, AKRON, OH 44333,  
JOGGLES01@ADELPHIA.NET, TRACY R. CHASAR, TANDTAUTOS.1@NETZERO.NET. (CUYAHOGA VALLEY CAREER CENTER, DEPT OF HORTICULTURE.)  
Bean plants (Phaseolus vulgaris) were observed for the effect of electromagnetic radiation on growth rate. Plants were placed under two levels of electromagnetic fields (high voltage at 60 watts and low voltage at 11 watts) with a third group of plants placed under the electromagnetic fields were hypothesized to have a lower growth rate compared to the control group. Three groups of fifteen bean plants were placed into flat trays. Two 16-gauge wires carrying 110 volts were suspended at a height of 30 cm over the base of each grouping. The experiment was conducted in a controlled greenhouse environment. The plants were observed daily for a total of three weeks. Bean plants grown under electromagnetic fields increased the height of the plant by 30 cm over the base of each grouping. The difference in growth between the high voltage group and the control was statistically significant (p<.05) but had a lower mean height. These results suggest the hypotheses that plants grown under electromagnetic fields have a lower growth rate.

**Board 23**  
**DETERMINATION OF DNA MARKERS FOR POSSIBLE FIBER CHARACTERISTICS OF LAMA PACOS/DEZARAY P. REED, DPEARL@LOGANREC.COM, 120 CANTWELL AVENUE, BELLEFONTAINE, OHIO 43311.**  
The alpaca industry is the fastest growing textile market in the world, but farmers know little about genetic determination of factors influencing the quality of the animal’s fiber. We hypothesize that the PCR reaction has not been optimized for this procedure. The methods used to characterize the products of these various studies include single crystal X-Ray diffraction and assorted spectroscopic techniques (IR, UV-Vis etc.)

**Board 24**  
**A STUDY OF THE RELATIONSHIP BETWEEN BEAR ENRICHMENT FOODS AND DIGESTIVE DISTRESS.** GIDEON P. STEED, FALLENANGEL.51@YAHOO.COM, 5979 RADNOR ROAD, RADNOR OH 43066 (GREATER COLUMBUS ZOO & AQUARIUM SCHOOL).  
Enrichment is anything given to an animal to reduce monotony in diet or behavior. Zoo animals are often given enrichment to their daily diet to reduce boredom, vary their nutrient sources and allow them to demonstrate wild behavior. There is concern that the indiscriminate introduction of enrichment items might disrupt a zoo animal’s digestive system. Stool consistency is often used as a measure of digestive distress. Keepers recorded daily stool consistency and number for one male and one female black bear, Ursus americanus, and one female grizzly bear, Ursus arctos horribilis, at the Columbus Zoo and Aquarium, in Columbus Ohio, for one year. Stool consistency is determined using a Likert scale, one for normal dog-like scat to five for a watery diarrhea. An ANOVA, held at a p=.01 confidence, of the stoc consistency and count one, two and three days after enrichment showed no significance. Each enrichment type examined separately did not show a correlation between food type and consistency. It can be concluded that enrichment items given to the American bear at the Columbus Zoo and Aquarium do not adversely affect the animals’ health.

**Physical Sciences & Education**  
9:00 AM, Saturday, 17, 2004  
DeBartolo Hall Room 347  
Dr Paul Szalay – Presiding

**9:00 APPLIED ORGANIC ACID CHEMISTRY** PAUL SZALAY*, HEATHER NEE*, NATALIE RADE*, MATTHIAS ZELLER*, ALLEN HUNTER* (DEPT OF CHEMISTRY, MUSKINGUM COLLEGE, NEW CONCORD, OH 43762)  
Research activity in recent years has lead to significant development in the preparation, and chemical property characterization of metal-organic compounds. This interest stems, in part, from the fact that the pores or cavities created in these metal-organic frameworks may be tailored for the inclusion of specific guest molecules. Crystalline molecular and solid state metal-organic compounds have been synthesized through reactions of solvated transition metal ions with organic ligands that serve as linking units. The results of reactions of copper (II) and cobalt (II) with the organic linker tetrabutylammonium 4,4’-diaminostilbene-2,2’ disulphonate ([Cu(N$_2$)$_2$]$_2$[DAS-(SO$_3$)$_2$]) will be presented. Organic acids that have been used in reactions with metal ions have also been the subject of anhydride syntheses. The preparation of polyanhydrides from organic acids containing nucleophilic moieties such as 1,4,7,10 - tetrazacyclododecane, N,N’,N” tetraacetic acid (DOTA) has also been investigated. These compounds, along with functionalized diamines, have been utilized in preliminary studies directed at synthesizing novel polymides. The methods used to characterize the products of these various studies include single crystal X-Ray diffraction and assorted spectroscopic techniques (IR, UV-Vis etc.)

**9:15 SYNTHESIS OF A FLUORESCENT DEOXYGUANOSINE DERIVATIVE** DEEPMALLI V. PERERA, DEPT OF CHEMISTRY, MUSKINGUM COLLEGE, NEW CONCORD, OH 43762, TOBY M. CHAPMAN, UNIVERSITY OF PITTSBURGH.  
The chemical synthesis of nucleic acid probes requires the protection of reactive sites. If left unprotected, reactive nucleophilic moieties such as 1,4,7,10 - tetrazacyclododecane, N,N’,N” tetraacetic acid (DOTA) will react with the phosphorylating and coupling reagents used in the internucleotide bond formation step, resulting in reduced yield in this reaction. Deoxyguanosine has two such reactive sites on the base pair of the nucleic acid and the amine function on position 1. The usual protecting method used for deoxyguanosine is the isobutyryl moiety for the exocyclic amino function, with the carbonyl function at position 6 left unprotected. In instances where carbonyl protection is used, a group such as p-nitrophenyl is introduced in a separate reaction. Mass spectral data plus proton and C-13 NMR data show that the reaction of 2’-deoxyguanosine with 2-bromo-2 phenylacetophenone produces a cyclic base-protected derivative. This product is formed via the simultaneous reaction at the exocyclic amino group and the amide function at position 1 of the base moiety. In addition, this cyclically-protected compound exhibits fluorescent properties. The observation of fluorescent compounds containing a pyridine nitrogen would make it an attractive probe in various biological systems, such as in the detection of abasic sites.

**9:30 BETACATENIN MEDIATED WNT-SIGNALING AS A MARKER FOR CHARACTERIZATION OF HUMAN BONE MARROW-DERIVED CONNECTIVE TISSUE PROGENITOR CELLS** BA HOVEY, BS (BAH14@CWRU.EDU) ; CA BOEHM (RHOEM@BME.RI.CCF.EDU) ; GF MUSCHLER (MUSCHLG@CCF.ORG) THE CLEVELAND CLINIC FOUNDATION, DEPT OF BIOMEDICAL ENGINEERING ND-20, CLEVELAND, OH 44195.  
This study was designed to determine if Wnt-signaling mediated through betacatenin, plays a role in the early proliferation and differentiation of human connective tissue progenitor cells (CTPs). When the beta-catenin mediated Wnt-signaling pathway is present, beta-catenin accumulates in the cytosol outside the nucleus and
is translocated into the nucleus. As a result, beta-catenin mediated Wnt-signaling can be easily detected using cell specific staining. Beta-catenin can therefore serve as a convenient marker for in vitro evaluation of strategies that can increase or decrease Wnt-signaling events, the effort to manipulate the in vitro behavior of CTPs. Bone Marrow was aspirated from 9 human donors. Marrow was processed to isolate CTPs in vitro using established methods and cells were plated onto 16-well Lab-Tech chamber slides. At day 6, the cells were fixed using 4% Paraformaldehyde in PBS, blocked with goat serum in PBS, and incubated/stained with a monoclonal mouse anti-beta-catenin Ab and then a fluorescein isothiocyanate (FITC)-labeled secondary Ab. Images were taken using an Olympus BX-50 fluorescent microscope and digital camera. Positive cytoplasmic staining was seen, consistent with the expectation that beta-catenin mediated Wnt-signaling is present in the CTP population. This was utilized throughout the experiment. The subcellular localization of beta-catenin varied throughout the cytoplasm in clusters of varying intensities, becoming slightly brighter near the nucleus. These data suggest that beta-catenin provides a convenient and useful marker for early Wnt-signaling in human CTPs, which can be utilized in subsequent studies.

9:45 LEARNING STYLE PREFERENCES OF EXTENSION EDUCATORS IN OHIO, Gregory A. Davis, davisd.1081@aoe.ohio.edu, Ohio State University Extension – West District, 1219 West Main Cross Street, Findlay, Ohio 45840.

The Group Embedded Figures Test (GEFT) examines one’s mode of perception in relation to one’s surroundings, describing learning style preference using a bipolar continuum comprised of two modes of perception: field dependent (or field sensitive) and field independent. Perceptions of learners leaning toward the field independent end of the continuum are influenced by the surrounding field, whereas perceptions of learners leaning toward the field independent end of the continuum are separated from the surrounding field. Research shows that the majority of preservice agricultural educators favor field independence which relates closely with a preference for a subject centered approach to teaching. To determine if these findings would hold true with practicing agricultural Extension educators, the learning style preferences of Ohio Extension educators were measured in Spring, 2004 using the Group Embedded Figures Test. GEFT scores were examined in relation to programmatic area of focus, gender, age, academic background, level of education, and strength of extension. An improved understanding of Extension educators’ learning style and teaching style preferences can improve the extent to which Extension instruction meets the particular needs of learners. Furthermore, this knowledge can be useful in programmatic and organizational team formation and maintenance.

Zoology

9:00AM, Saturday April 7th 2004 DeBartolo Hall Room 358 Dr. Courtenay N. Willis

9:00 NESTLING PROVISIONING BEHAVIOR AND REPRODUCTIVE SUCCESS IN ACADIAN FLYCATCHERS. Courtenay N. Willis cwillis@ysu.edu, Department of Biological Sciences, Youngstown State University, Youngstown OH 44555 and Lashale D. Pugh puphl@geog.umd.edu, Department of Geography, University of Maryland.

Nestling feeding rate is one measure of feeding performance, and may be associated with both the net rate of energy intake by young and the risk of predation at the nest. The central hypothesis of this study is that adult prey choice influences feeding performance, and consequently nestling growth rates. The study of nesting young reflects adaptations for maximizing reproductive success. Acadian Flycatchers (Empidonax virescens) in northeastern Ohio were observed to determine if nestling feeding rates differed between specialists and generalists. Specialists were classified as adult pairs for which greater than 50% of the food fed to nestlings consisted of a particular order of arthropods. Arthropods fed to nestlings by specialist pairs (n=4 nests) and generalist pairs (n=5 nests) were identified using criteria of order, stage, and 9, and 10-day old nestlings. Nestlings were weighed at 10 days of age as a measure of reproductive success. For 3,841 feeding attempts, 2,016 prey were identified to order. Dipterans (45%), Lepidopterans (18%), and Hymenopterans (17%) were predominant arthropods in the nestling diet. In terms of feeding performance, specialist pairs fed young less often than generalist pairs (p<0.05). However, there was no difference in average nesting weight between specialist and generalist nests (p=0.26). Therefore, it appears that nesting provisioning behavior was influenced by adult prey choice since specialists made fewer visits to the nest yet young did not weigh less. These results suggest that a benefit of being selective may be a reduced risk of predation at the nest.

9:15 INSECT SUGAR FORAGERS (HYMENOPTERA:FORMICIDAE) AND THEIR UNIQUE NECTAR SOURCES. Mark E. Headings, headings.1@osu.edu, The Ohio State University Agricultural Technical Institute, 1328 Dover Road, Wooster, OH 44691.

Many insect species forage and utilize sugar carbohydrates in their diets. Some insects obtain sugars from inside of plants by using a piercing/sucking mouth, whereas, others obtain them from outside of plants (floral and extrafloral nectaries) and ants (Formicidae) is often seen collecting honeydew from homopteran insects which has initially collected it from plants. The objective of this investigation was to compare specific extrafloral and homopteran sugar sources and ants (Formicidae) associated with them. Observation results were documented, along with supportive photographic evidence, of these nectar sources and their respective foraging ant species. The mound building ant, Formica obscuripes (Forel), was seen collecting honeydew from aphids, Cinara spp., on jack pine trees in Wexford County, Michigan. Other species such as Tapinoma sessile (Say), Leptothorax ambiguus (Emery), Tapinoma emeryana (Forel), and Lasius flavus were seen foraging nectar from extrafloral nectaries of cowhage, Melampyrum lineare (Desr.) in a jack pine forest in Grand Traverse County, Michigan. In 2002, the Allegheny Mound Ant, Formica paranevadensis and two ant species Crematogaster montana and Crematogaster sp. were observed collecting honeydew from black locust, Vanduzea arquata, on black locust trees in Jefferson County, West Virginia. Ant species were also seen feeding at extrafloral nectaries of mung beans in Wayne County, Ohio. The utilization of nectar sources utilized by ants serves as a basis for further investigation into the identification and quantification of sugars in different nectars.

9:30 MORPHOLOGICAL DESCRIPTIONS OF OXYURIDS FROM COCKROACHES. Kathyrn E. Reif, kereif@owu.edu, Ramon A. Carreno, rcarreno@owu.edu, Laura Tuheia, lmtuheia@owu.edu, Department of Zoology, Ohio Wesleyan University, Delaware, OH 43015.

The Oxyurida are a diverse order of parasitic nematodes that inhabit the hindgut of many vertebrates and invertebrates. Morphological information for species that have been described from cockroaches (Order Blattodea) is generally limited to descriptions based on light microscopy and many species have been poorly described. Our current research involves a re-evaluation of the morphology of oxyurid from cockroaches using light and scanning electron microscopy (SEM). Here we report several new morphological characters, including new cephalic and tail papillae, from Leidynema portentosae, a parasite from the Madagascar hissing cockroach (Gromphadorhina portentosa). Live nematodes were fixed in gluteraldehyde and dehydrated using HMDs (hexamethyldisilazane) or critical point drying preparation. Using SEM, several new characters have been observed including unusually wide lateral alae and additional papillae on the posterior end of both the male and female L. portentosae. Cephalic and tail structures are also described. These results indicate external morphological features not previously described or conflicting with the previous published description of L. portentosae.

9:45 THERMOCONFORMERS OR THERMOREGULATORS? THE TUATARA (SPHENODON PUNCTATUS) TRULY A MALADAPTED LIVING FOSSIL OR A RESULT OF NON-SQUAMATE LEPIDOSAURIAN ADAPTATION TO COLD CLIMATES. Christopher K. Carmichael, ccarmichael@malone.edu, and James C. Gillingham, gjilling@malone.edu, College of Natural Sciences, Malone College, Department of Natural Sciences, 515 2nd. St., NW, Canton, OH 44709-3897, and Central Michigan University, Department of Biology.

The tuatara (Sphenodon punctatus) is one of two sole surviving species of sphenodontids that is often viewed as a "living fossil" that has remained unchanged since the Triassic. Although the tuatara possesses 2 of 7 critical characters such as: acrodont dentition, lack of a male copulatory organ, gastralia, a diapsid temporal region and fixed quadrate, a thorough study of the tuatara’s current thermoregulatory regime does not necessarily invalidate these traditional characteristics as being adaptations for a cooler climate nor can we make direct inferences about the climates in the Triassic. We observed adult male and female tuatara continuously during day and night time hours within the two predominant habitats (forest and open paddock habitat) on
Many aquatic crustaceans use water-borne chemical cues in ecologically critical activities such as finding food, mates, suitable habitat, detecting predators, and communicating with conspecifics. These biologically active chemical cues are often present as odor plumes, which consist of fine filaments containing high concentrations of odor molecules interspersed with the surrounding fluid. Several parameters affect the structure of an odor plume and thus, the plume is encountered by navigating animals. These include the size-scale of the bottom relief and flow conditions such as the mean velocity, turbulence level, and the gradient of flow speed above the substratum. Several species of Ohio crayfish (Cambarus cavatus, C. robustus, C. thomai, Orconectes immunis, O. sanbornii and O. virilis) were collected from a variety of flow habitats, including streams with silt, sand, gravel, cobbles, boulders, spring-fed streams, and stagnant lakes. Since odor plume structure varies according to flow habitat, we hypothesized that crayfish antennules from species living in different flow environments would have different patterns of aesthetasc arrangements on their antennules, to best encounter odors in that habitat. Antennules were examined from at least three species of crayfish using electron microscopy, and measured structural parameters at three positions along the antennules from micrographs using Scion Image Software (Scion Corporation). The number of aesthetasc, aesthetasc length, and diameter was tested for the same species, and the ratio of the gap between aesthetasc rows to the aesthetasc diameter (a critical parameter for calculating sample volume) varied with position on the antenna.

10:30 DOES BODY SIZE AND GENDER AFFECT OLFACTION CHEMOSENSORE STRUCTURE IN THE CRAYFISH ORCONECTES IMMUNIS? JAMES K. MCCLOSKEY, mcloskey@denison.edu; KRISTINA S. MEAD, MEAD@DENISON.EDU, DENISON UNIVERSITY, SLAYER BOX 1513, GRANVILLE, OH 43023 KRISTINA MEAD.

Many aquatic crustaceans use water-borne cues to find food, communicate with conspecifics, and avoid predators. In crayfish, cues from these “distant” sources are sampled using olfaction chemosensors called aesthetasc on the antennules. Crayfish sample their olfactory environment by using their antennules in a rapid flick. This motion facilitates odor molecule capture by the chemosensors. The arrangement and shape of chemosensors can affect how much odor-containing fluid is able to penetrate close to the antennules during olfaction sampling. As crayfish grow, their olfactory needs change, reflecting their increased social interactions. There are also gender differences in social behavior and thus olfactory needs. The purpose of this study was to examine the size-related chemical structure may change as a function of animal size and gender. Scanning electron microscopy was performed on antennules from three males and three females in each of four size classes (30-40 mm, 40-50 mm, 50-60 mm, and 65-80 mm rostrum-telson length) of Orconectes immunis, a pond dwelling crayfish species collected from a local fish hatchery. Scion Image software was used to measure several structural parameters, including the number of aesthetasc bearing segments, aesthetasc length, diameter, insertion angle, and the distance between adjacent aesthetasc. These parameters were compared among size classes and gender using one- and two-way ANOVAs (Statview, SAS Institute)
the algal community structure changed in biomass and taxa present. Levels were significantly (p<0.01) lower by 2003, while ammonia levels were significantly (p<0.05) greater. Overall, it appears that biomasses were highest in September in three of the years. Showing marked seasonal periodicity in taxa present and overall biomass. Further, biomass was highest in September in three of the four years (2000-2003) studied. This seasonal variability in biomass may be responsible for the majority of carbon fixation and nutrient removal from these systems. Constructed wetlands are increasingly being utilized as a method of reducing nutrient enrichment to aquatic ecosystems due to anthropogenic effects. The purpose of this research was to document the seasonal and annual metaphyton (algae not directly attached to substrata, but loosely associated) community over a four year period (2000-2003) in a recently constructed wetland in Defiance County, Ohio. Water samples were collected concurrently with algal samples in 2000 and 2003 for further nutrient analysis. Metaphyton were identified, enumerated, and biomass was calculated to determine dominant biomass. In each year, chlorophytes (green algae) and bacillariophytes (diatoms) comprised the majority of biomass showing marked seasonal periodicity in taxa present and overall biomass. Further, biomass was highest in September in three of the four years. Cyanobacteria, common components of constructed wetlands, were not dominant in any samples collected. Whether this is a result of nutrient saturation or extensive zooplankton herbivory remains unclear. A comparison of the inflow and outflow of the wetland showed that biomass was not significantly different (p>0.01). Both nitrate and orthophosphate levels were significantly (p<0.01) lower by 2003, while ammonia levels remained significantly greater. Overall, we found that strains with very similar morphology actually had distinctly different secondary structure in their 16S rDNA ITS regions strongly indicating that cell division in two planes has likely arisen more than once in the Nostocaceae and thus the Stigonematales as currently circumscribed is not a monophyletic group.
considerable discrepancies. Strains were also characterized based on motility and hydrophobicity. About 40% of the strains were motile. Hydrophobicity was determined using the n-octane method (values ranged from 73.38 to 2.51%) and 4 strains were hydrophobic. Only in the API® 20NE method were the isolates identified by each of the three techniques. Four strains matched each other between the API® 20NE and Vitek® GNI+ test card. Only 4 strains were identified by Vitek® GNI+ test card. Based on the three techniques, the following five taxa were found: Arthrobacter sp., Stenotrophomona maltophilia, Raistonia pickettii, Pseudomonas sp. and Chryseobacterium sp. API® 20NE and Vitek® GNI+ test card were similarly able to identify the same microbial isolates and failed to corroborate identifications. Their use for the identification of environmental bacteria is cautioned, but may be acceptable when more environmental bacterial profiles are added to their database.

9:15 MICROBIAL COMMUNITY STRUCTURE IN LEAF LITTER IN A STREAM. Mitali Das, mdas@kent.edu, Laura G. Leff, lleff@kent.edu, Dept of Biological Sciences, Kent State University, Kent, OH 44242.

In woodland streams, leaf litter serves as an important energy source for microorganisms. We hypothesize that the leaf litter serves as a primary source of labile organic carbon to freshwater plankton communities. To test this hypothesis, ambient organic carbon was estimated radiometrically as dissolved organic carbon (DOC). Differences in dissolved organic carbon (DOC) over time and the difference in dissolved oxygen concentration over time was examined. The purpose of this study was to follow the assimilation of carbohydrate-labile organic carbon (LDOC) and dissolved organic phosphorus (DOP) influence phosphate uptake in Lake Erie bacterioplankton. Tracey Trzebuchowski Meilander, trzebuch@kent.edu, Robert T. Heath, rheathe@kent.edu, Department of Biological Sciences, 256 Cunningham Hall, Kent State University, Kent OH 44242.

While phosphorus is the major limiting nutrient in the Great Lakes eutrophic environments, the significance of dissolved organic phosphorus (DOP) as a source of P has largely been ignored. Because recent findings indicate that DOP may significantly influence phosphate uptake by bacterioplankton and because bacterioplankton may not be limited by the dissolved organic fraction of the organic matter, the potential significance of dissolved organic phosphorus compounds in two lakes was examined. The purpose of this study was to determine whether field observations of plankton communities in Lake Erie behaved according to predictions of the Microbial Shunt Hypothesis (MSH). Observations of plankton communities in Lake Erie behaved according to predictions of the MSH. We examined phosphate-uptake velocity, LDOC, and particulate P at seven stations on Lake Erie in August 2003. Phosphate-uptake velocity was determined using radiometrically. LDOC was determined from the difference in dissolved oxygen concentration over time and converted to available carbon dioxide, a labile carbon compound. Ambient phosphate-uptake velocity was estimated by bioassay (determined from P-uptake rate constant, bacterial cell growth rate, and bacterial cellular phosphorus content). Bacterioplankton in nearshore relatively eutrophic sites with higher LDOC assimilated phosphate more slowly than bacterioplankton in offshore mesotrophic sites, with lower LDOC quantities. These results are consistent with the MSH and indicate that bacterial P-metabolism in nearshore environments may differ from those offshore. This research was funded by Ohio Sea Grant (R/ER-6).

10:15 DISSOLVED ORGANIC PHOSPHORUS (DOP) COMPOUNDS AS A SOURCE OF PHOSPHORUS AND CARBON TO FRESHWATER PLANKTON COMMUNITIES, EAST TWIN LAKE, PORTAGE COUNTY. Bo Song, bsong@kent.edu, Laura G. Leff, lleff@kent.edu, Dept of Biological Sciences, Kent State University, Kent, OH 44242-0001.

Although dissolved organic phosphorus compounds (DOP) have traditionally been thought of as a source of P for bacteria and algae in freshwater environments, the significance of DOP as a C-source has largely been ignored. Because recent findings indicate that DOP may significantly influence phosphate uptake by bacterioplankton and because bacterioplankton may not be limited by the dissolved organic fraction of the organic matter, the potential significance of dissolved organic phosphorus compounds in two lakes was examined. The purpose of this study was to determine whether field observations of plankton communities in Lake Erie behaved according to predictions of the Microbial Shunt Hypothesis (MSH). Observations of plankton communities in Lake Erie behaved according to predictions of the MSH. We examined phosphate-uptake velocity, LDOC, and particulate P at seven stations on Lake Erie in August 2003. Phosphate-uptake velocity was determined using radiometrically. LDOC was determined from the difference in dissolved oxygen concentration over time and converted to available carbon dioxide, a labile carbon compound. Ambient phosphate-uptake velocity was estimated by bioassay (determined from P-uptake rate constant, bacterial cell growth rate, and bacterial cellular phosphorus content). Bacterioplankton in nearshore relatively eutrophic sites with higher LDOC assimilated phosphate more slowly than bacterioplankton in offshore mesotrophic sites, with lower LDOC quantities. These results are consistent with the MSH and indicate that bacterial P-metabolism in nearshore environments may differ from those offshore. This research was funded by Ohio Sea Grant (R/ER-60).
Aeromonas hydrophila is a motile, aquatic bacterium with a single polar flagellum and has been reported as a pathogen to numerous aquatic animals and humans. To study the chemotactic abilities and flagellar structure of Aeromonas spp., bacterial isolates were obtained from water samples from the Krueger Preserve, Delaware, OH. The 60 bacterial isolates were screened for characteristics of Aeromonas spp. including oxidase and catalase positive, Gram negative, motile bacilli. Of the 11 isolates presumptively identified as positive, Gram negative, motile bacilli. Of the 11 isolates of bacteria in the water system aboard the Mir space station may microgravity compared to normal gravity. The community structure examined, planktonic cells were often more abundant under a G-force of 82 mg. Quadruplicate experiments under simulated geostationary orbit that is similar to a microgravity environment. Clino-rotation enables the bacteria to remain in a stationary position, whereas in normal gravity their motility is dispersed. The bacteria were incubated in high and low nutrient medium under microorganisms have proliferated by forming biofilms. These environments and are involved in biofouling and degradation. This work yields evidence for the first time that the hydrophobic character of some amino acids play a critical role in structural and functional activity in the lactose permease in Escherichia coli have to a model of twelve transmembrane domains in a helical conformations, with eight amphipathic helices responsible for solute transport, and four hydrophobic helices, which were involved in protein-protein interaction in the studies of the lac permease. To test functional significance of these stabilizing helices, helix III and VI have been studied using site-directed mutagenesis by placing charged amino acids into both hydrophobic helices. From previous and present research, mutations at positions V85K, M86K, F87E (helix III), and I179K, L180R, and A181R (helix VI), have shown the importance in function of helix III and VI, with a decrease in lactose activity to 6.53% of wild type activity (W.T.) in the mutants. Two opposite orientations of these helices play an important role in structural and functional activity in the lactose permease.

Earth & Environmental Sciences

9:30 AM Saturday April 17th 2004
DeBartolo Hall Room 345
Mr. Wilmer Stowe, President

Doan Brook flows through several communities (Shaker Heights, Cleveland Heights, and Cleveland) from near the mouth of the Cuyahoga River into Lake Erie. These communities have been involved in restoration and beautification programs of the Doan Brook watershed. A black bituminous shale 20-60 ft. thick was identified at the type section of the "Cleveland Shale" in Doan Brook by Newberry in 1871. From many other Cleveland shale exposures around Greater Cleveland, a variety of plant fossils have been discovered and described by Chitaley (1982, 1988, 1991). Because many studies of the Cleveland Shale have been conducted from other sites we decided to examine the type locality. Initially a sample of Cleveland Shale was collected from the east and west banks of Doan Brook in Ambler Park. A single sample of Chagrin Shale was also collected. The samples were examined for macrofossils when none were found 50 grams of each collection were macerated using standard palynological techniques. The cleaned residue was mounted on 1 x 3 inch microscope slides with glycerin jelly. Contrasted samples from other Cleveland shale locations three points are most obvious: (1) the absence of large algal cysts, (2) the lower frequency of spores, and (3) the lack of spores larger than 100 micrometers in diameter. The Chagrin Shale collection was much more abundant and diverse than those from the two Cleveland Shale collections.
Recent advances in computer applications for mapping, especially in Geographic Information Systems (GIS), have resulted in a much reduced change of data and interpretation during emergency situations. Despite these, during the September 11, 2001 event a significant lack of standardized emergency symbols on emergency maps was revealed. First Responders created their own symbols for various features they needed to display on emergency maps. Emergency managers from different governmental and private agencies that were responding to the disaster, experienced confusion due to the lack of standardized symbols for the hazards they were facing. The Homeland Security Working Group of the Federal Geographic Data Committee's (FGDC) joined FEMA's efforts to develop and support the development of National Standards for Emergency Symbology. In an attempt to standardize the symbols, various sources were searched in order to collect as many existing symbols as possible. The first step required the identification of existing emergency and hazard mapping symbols. The second step included the preparation of a matrix listing the hazards and the symbols for which information for which symbology was used, b) to identify the agencies that currently use hazard and emergency symbology, c) to identify hazard mapping symbols embedded in commercial software, d) to compare the information was prepared in order to eliminate repetitive symbols currently in use. Some of the sources included the plethora of maps exhibited on the internet and map products from local, state, federal agencies and international organizations and e) to identify the need for commercial symbology development. Information on hazard and emergency symbology was not readily available. The preliminary results indicate that most of the information on symbology is geared toward specific hazards such as hurricanes, tornadoes, and earthquakes. Symbols for evacuation during terrorist activities are almost non-existent. Another problem is that of conflicting symbols in all types of styles and formats between agencies which make standardization very problematic.

10:00 ASSESSMENT OF THE HYDROLOGICAL EFFECTS OF URBANIZATION ON THE LOWER ALUM CREEK WATERSHED WITHIN THE DELAWARE AND FRANKLIN COUNTIES OF OHIO. Jack S. Byrom, rhoujack@ix.netcom.com, (Terry Lahm, tlahm@capital.edu), Capital University, 2199 E Main St, Columbus OH 43209.

The lower Alum Creek watershed encompasses portions of the Delaware and Franklin counties of central Ohio. This area is experiencing rapid population growth and concomitant changes in land use. Previous researchers have documented that the process of urbanization alters the hydrology of a watershed by short-circuiting the hydrologic cycle. Our hypothesis was that the Alum Creek watershed would exhibit similar hydrologic changes. The study used Ohio Department of Natural Resources GIS data from aerial photography surveys and Landsat imagery to quantify the extent of urbanization of the Alum Creek watershed basin for the years 1976, 1979, 1994, and 1998. Water discharge data from U.S. Geological Survey gaging stations were analyzed to determine the hydrologic impact of urbanization. Urbanized land use increased from 66% to 80% in the Franklin County portion of the watershed between 1976 and 1998. Examination of hydrologic data included analysis of percent exceedance, seven-day low flow, and peak discharge data from 1942-2000. Results of these analyses showed decreased flow events and shorter lag times between precipitation and surface discharge events often associated with urbanization. This is supported by decreasing seven-day low flows and decreasing percent exceedance. However, the Spearman and Spearman- Conley serial correlation tests provided no evidence to support a trend indicating increased discharge and shorter lag times (at 95% CI). Additional analysis utilizing climatologic data such as hourly rainfall records may be necessary to offer evidence of the impact of urbanization within the Alum Creek watershed.

10:15 THE POTENTIAL FOR NITRATE REMOVAL IN AGRICULTURAL DRAINAGE DITCHES DURING LOW FLOW EVENTS. Kelly L. Powell, k.powell1@att.net, Virginie L. Bouchard, bouchard.8@osu.edu, The Ohio State University, 2021 Coffey Rd., Columbus OH 43210.

Agricultural drainage in the upper Midwest has been recognized as a major source of excess nitrogen in aquatic ecosystems. This research investigates the potential for nitrogen removal in one-stage and two-stage agricultural drainage ditches. Our hypothesis was that naturalized two-stage ditches would be more favorable for denitrification than traditional one-stage ditches. To achieve the objective, rate of denitrification, denitrification potential, plant nitrogen uptake, and water quality parameters were measured in 10 one-stage and 10 two-stage ditches throughout Hancock County in the Portage River watershed in Northwest Ohio during the summer of 2003. Rate of denitrification was estimated by measuring in-situ denitrification in sediment cores (N=480). Denitrification potential was determined by incubating sediment slurries (N=1440) under three different conditions (addition of nitrate, glucose, and glucose + nitrate). Peak rates of denitrification were 1.73 ± 0.17 mg N2O g−1 DW hr−1 and 0.54 ± 0.08 mg N2O g−1 DW hr−1 in one-stage and two-stage ditches, respectively. In presence of glucose and nitrate, denitrification potential was 0.45 ± 0.12 mg N2O g−1 DW hr−1 in one-stage and two-stage ditches, respectively. The rate of denitrification was significantly higher (p<0.001) in one-stage ditches, whereas the denitrification potential was significantly higher (p<0.001) in two-stage ditches. Our data suggest that differences in denitrification rate and potential in the one-stage and two-stage ditches may be more dependent on the amount of organic C and N2O concentration present, as well as the type of sediment.
Genetics, Biochemistry & Physiology
2:00 PM Saturday April 17th 2004
DeBartolo Hall Room 358
Dr. Kerry Cheesman - Presiding

2:00 REGULATION OF THE P GENE IN ZEA MAYS. Anthony J. Studer, astuderd@defiance.edu, 17231 Pratt Le Grand Rd, Defiance, Ohio 43512 (Dr. Bernard Mikula) Professor Emeritus, Defiance College.
The P gene controls the pigment expressed in the roots of Zea mays and is phenotypically evident only after the roots have been exposed to light. This implies that light has a regulatory role on the expression of the P gene. It is hypothesized that the P gene expression is suppressed by DNA methylation, and that light has a signal transduction pathway that results in demethylation. The project goals are to regulate the P gene using 1) cold treatments and 2) chemical treatments, both without the presence of light, and then to quantify the P gene expression under each treatment condition. Both experiments will be carried out in a temperature and light controlled chamber. Cold treatments (4-8°C) will be administered to the plants with the hypothesis that this will demethylate the P gene and activate pigmentation. In a separate experiment 5-azacytidine, a substrate for DNA methylation, will be applied to the P gene with the hypothesis that it will turn on the P gene. Then methylating and ethylating agents, with different substrates, will be tested for efficiency of methylation and ethylation of the P gene after environmental or chemical demethylation. The amount of methylation at the P gene will be observed and compared between the two treatments, using restriction endonucleases that cut at the sites of cytosine methylation. The expression of the P gene will be monitored using RT-PCR, electrophoresis and Northern blot analysis. This will provide a quantification of the P gene’s transcription of mRNA in relation to the treatments.

2:15 IDENTIFYING NOVEL GENE INTERACTION NETWORKS IN THE BRAIN BASED ON MICROARRAY GENE EXPRESSION PROFILE MODIFICATION BY QUANTITATIVE TRAIT LOCI (QTL). Akwasi A. Asabere1, aaasabere@muskogum.edu, Bruce J. Aronow2, brucearonow@ccmhc.org, ’K-307 Knox College, Galesburg IL 61401 and 2Cincinnati Children’s Hospital Medical Center, 3333 Burnet Ave, Cincinnati OH 45229
Quantitative Trait Loci (QTLs) are chromosomal regions whose inheritance influences the expression of measurable phenotypes. A novel genomic approach uses gene expression microarrays to measure expression of QTLs on the chromosome in trans. To identify tissue specific QTL trans-modifiers, mouse and human gene expression databases were used to identify a set of genes strongly expressed in just the brain of both species. Differentially expressed genes in two inbred mouse strains that are also in trans will be used to construct a QTL trans. The amount of methylation at the P gene will be observed and compared between the two treatments, using restriction endonucleases that cut at the sites of cytosine methylation. The expression of the P gene will be monitored using RT-PCR, electrophoresis and Northern blot analysis. This will provide a quantification of the P gene’s transcription of mRNA in relation to the treatments.

2:45 EXPERIMENTAL STUDIES OF SIGNAL NOISE IN GENE REGULATORY SYSTEMS IN THE INDUCIBLE ANTI-BACTERIAL RESISTANCE PATHWAY OF E. coli.
Katherine E. Frato, kfrato@wooster.edu, (Teresa Johnson, AQJohnson2@wooster.edu, John Lindner, jlindner@wooster.edu, Dean Fraga, dfrag@wooster.edu) Dept. of Biology and Chemistry, Physics, The College of Wooster, Wooster OH 44691.
Since the behavior gene regulatory systems are governed by nonlinear dynamical equations, the chemical noise in the environmental chemicals that interact with the regulatory region may enhance signal detection. In this experiment the Mar pathway, which detects environmental signals such as sodium salicylate and induces a multiple antibiotic resistant phenotype, is used as a model gene regulatory pathway. In order to measure the response of a gene regulatory pathway to environmental noise, E. coli strains with the green fluorescent protein (GFP) under the control of two separate promoters from different steps of the Mar regulatory pathway were constructed. The constructs are transferred from plasmids to the E. coli chromosome to ensure only a single copy of the sequence is present. The variation in the amount of fluorescence in individual bacterial cells when subjected to different concentrations of sodium salicylate inducer will then be quantified by analysis of fluorescence microscopy images.

3:00 INDUCIBLE ANTI-BACTERIAL RESISTANCE IN ESCHERICHIA COLI, Katherine C. Ritchey, kritchev@wooster.edu, Peter Kolbaka, p kolbaka@wooster.edu, Blanche Mwilambwe, bmwilambwe@wooster.edu, (Teresa Johnson, AQJohnson2@wooster.edu, Dean Fraga, dfrag@wooster.edu). Biology Dept, The College of Wooster, 1189 Bell Ave, Wooster OH 44691.
Studies have attributed inducible antibiotic resistance to chemorepellents that differ chemically from the antibiotics tested. Further studies by College of Wooster students have attempted to specifically define the interaction of chemorepellents and chemoattractants with inducible antibiotic resistance. A chemotaxis receptor signaling pathway and associated gene regulatory systems are unique to bacteria and have been studied extensively. The expression of chemotaxis receptors may influence the antibiotic resistance phenotype. Additional experiments will confirm the inducible antibiotic resistance response in E. coli and study specific interactions between the Tar signaling pathway and key proteins involved in cross inducible antibiotic resistance. P1 phage transduction will create tar mutant in a wild-type E. coli strain, W3102. Plate assays combining different concentrations of ampicillin or chloramphenicol with either a chemorepellent (sodium acetate, 0-10mM) or chemoattractant (L-aspartic acid 0-10mM) will test wild-type and tar-mutant strains. The results from these experiments will be combined with the genetic analysis to determine the effect of aspartic acid and sodium acetate on antibiotic resistance in E. coli. Further investigation into the Tar will test the hypothesis that the Tar chemoreceptor signaling pathway is linked to the inducible antibiotic resistance phenotype.

3:15 A FLUORESCENT PROBE FOR THE DETECTION OF MALTOSE UTILIZATION IN BACILLUS SUBTILIS. Sarah K. McBeth, smcBeth@muskingum.edu, (Deepamali Perera,
exposure to ultraviolet light. The metabolism of sugars is an important characteristic for differentiating between species of bacteria and is often used in clinical medicine to determine the species responsible for an infection. Fluorescent probes are molecules designed to localize within a biological specimen and respond spectroscopically to a specific stimulus. In this study attempts to create a probe that will only fluoresce in the presence of maltose-metabolizing bacteria such as Bacillus subtilis. Organic syntheses will be used to make these different fluorescein-labeled maltose molecules which will be introduced into the media of B. subtilis colonies. Maltose metabolism will be detected after exposure to ultraviolet light.

3:30 AN EXAMINATION OF ADJUVANT ADDITION AND ADMINISTRATION ROUTE ON VACCINE EFFECTIVENESS. LAUREN A. ASHWORTH, LASHWORTH@ONU.EDU, 415 E. UNIVERSITY AVE, ADA, OH 43510.

Humoral response to immunization can be maximized by antigen conjugation to an adjuvant and/or proper route of vaccine administration. Reduced mannann conjugated to the antigen of Salmonella typhimurium, was hypothesized to enhance immunoglobulin production in test mice. Additionally, intranasal and subcutaneous routes of administration were examined to determine which route would induce the most effective humoral response. A vaccine was produced using heat-killed Salmonella typhimurium cells. A portion of the vaccine was reductively conjugated to a mannan adjuvant. Saline, vaccine without adjuvant, and vaccine with adjuvant were administered via subcutaneous injection or intranasal inhalation to specific groups of mice. On Day 18 of the immunization schedule, blood samples were collected from each mouse through intracardial bleeds. Electrophoresis was performed on the serum samples and humoral immune response was indicated based on the relative total immunoglobulin portion of the sample. The antibody fraction was expressed as a percentage of the serum proteins and relative immunoglobulin percentages were compared. A greater percentage would indicate a greater immune response. No significant difference was found between the control, the vaccine, and the vaccine with adjuvant for either administration route based on One-Way ANOVA tests. Additionally, differences could not be observed between the two administration routes. The lack of significant differences between the control, vaccine, and vaccine with adjuvant may reflect experimental error due to small sample sizes (5-7 mice/group).

3:45 EFFECTS OF A MIXTURE OF A NON-ORTHO-SUBSTITUTED AND AN ORTHO-SUBSTITUTED PCB CONGENER ON BRAIN CHOLINE ACETYLTRANSFERASE (CHAT) ACTIVITY AND THYROID STATUS. DOUGHERTY@BSU.EDU, EDWARD J. DOUGHERTY (EDEWARD@BSU.EDU), AND LEE A. MESERVE (LMESERVE@BSU.EDU), DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403-0121.

Polychlorinated biphenyls (PCB) are environmental contaminants that have been a problem since 1960s because they are very persistent, lipophilic, and bioaccumulate through food webs concentrating in adipose tissue. Placental and lactational PCB exposure of offspring causes metabolic and endocrine disruptions including hypothyroxinemia, spatial learning and memory deficits, neurochemical and neurobehavioral alterations, and reproductive problems. Previous studies in our lab using the individual congeners PCB 47 (2,2',4,4'-tetrachlorinated biphenyl, non-ortho-substituted) and PCB 77 (3,3',4,4'-tetrachlorinated biphenyl, non-ortho-substituted) have shown alterations in Chat activity, and alterations in thyroid hormone levels. In the present study pregnant Sprague-Dawley rats were fed a diet with or without a mixture of PCB 47/77 at 1:2.5, 12.5, or 25 ppm. Rat pups (n=32) were decapitated on postnatal day 30. Hippocampus and basal forebrain were rapidly removed for radiometrical measurement of Chat activity. Blood serum was collected for measurement of thyroid hormones. The present study found that Chat activity was depressed by PCB 47 in the hippocampus regardless of dose, and in the basal forebrain except at 25 ppm. PCB also depressed both triiodothyronine (T3) and thyroxine (T4) levels. Thus, the depressed Chat activity caused by a mixture of two PCB congeners may be the result of depressed thyroid hormone levels. Reported learning and memory deficits in PCB-exposed animals (including humans) may result from neurological deficits (e.g., depressed Chat activity) that follow depressed thyroid status.

4:00 K+ CURRENT ACTIVATION BY THE ANTI-EPILEPTIC DRUG RETIGABINE. MARK D. WOMBLE, MWDOMBLE@YSU.EDU, REBECCA S. LIFTIK, YOUNGSTOWN STATE UNIVERSITY, DEPT OF BIOLOGICAL SCIENCE, YOUNGSTOWN OH 44555.

Traditional anti-epileptic drugs control seizures by dampening neuronal activity, either by enhancing inhibitory neurotransmission or reducing excitatory transmission. Retigabine, a new drug currently in clinical trials, has been identified as having a different mode of action. It appears to directly activate the M-current (IM), a voltage-gated K+ current that plays an important role in the regulation of neuronal resting potential, excitability, and firing patterns. We have examined the actions of retigabine on IM using whole-cell patch-clamp recordings obtained from acutely isolated bullfrog (Rana catesbeiana) sympathetic neurons. Retigabine (10 µM) was applied directly to the cell via single cell superfusion. Immediately following the onset of retigabine application, the resting potential was seen to be hyperpolarized by approximately 5-8 mV. This was accompanied by a reduction in action potential firing during direct injection of depolarizing current, indicating a dampening of neuronal excitability. The M-current was identified by voltage-clamping neurons to a holding potential of ~30 mV, a level at which IM is persistently active. Application of retigabine produced a large and rapid elevation in holding current amplitude, indicating a substantial increase in IM. A continuous ramp voltage-clamp protocol (~100 to 0 mV) was used to identify the IM activation threshold. Retigabine shifted this threshold approximately 20 mV more negative, from the normal threshold of ~60 mV. This shift results in a substantial increase in IM activation at the normal rest potential, producing neuronal hyperpolarization and greatly dampened neuronal excitability.

Plant Ecology/Wetlands 2:00 PM Saturday April 17th 2004 DeBartolo Hall Room 356 Mr Tracy Engle – Presiding 2:00 VEGETATIVE PATTERNS ALONG AN ELEVATION GRADIENT IN THE WHITE MOUNTAIN NATIONAL FOREST, NEW HAMPSHIRE. JESSICA M. WILSON (JWILSON@ONU.EDU) 402 W. COLLEGE AVE. UNIT 1941 ADA OH 45810.

In 1956, Whitaker concluded that his study in the Great Smoky Mountains supported the individualistic distribution of species and communities. That is, each species grows where it can, under the influence of biotic and abiotic factors and does not depend upon the presence of other species as Clements’ organismic hypothesis of community structure suggests. To test this idea in the White Mountain National Forest of New Hampshire, a study was conducted along the Pine Link Trail from the base of the trail to treeline on Mount Madison. Trees were identified and their diameter at breast height measured in 23 evenly spaced sample units along the elevation gradient. The number of individuals of each species counted in these sample units was graphed against elevation with one line representing each species. The graph gave no indication of species groups along the gradient. The sum of each species’ diameter at breast height was almost identical for each even elevation band, with no apparent grouping. Two species in particular, Betula papyrifera and Picea mariana exemplify the individualistic nature of the communities along this transect. B. papyrifera grew consistently along the elevation gradient despite disturbance in the middle elevations. P. mariana was present within the hardwoods in mixed forest, in coniferous forests with other evergreens, and in single-species stands. Thus, neither of these species was dependent upon a particular group of other species. Individualistic distribution of species and communities appears to be the organization of this New England transect as well as Whitaker’s Great Smoky Mountain transects.

2:15 RECENTLY DOCUMENTED OLD-GROWTH RIPARIAN FOREST IN ZOAR VALLEY, NEW YORK. THOMAS P. DIGGINS, TDIGGINS@YSU.EDU, ADAM DRAA, KENT LURTON, ERIN FEEL, GREG SHOCK, DEPT OF BIOLOGICAL SCIENCES, YOUNGSTOWN STATE UNIVERSITY, ONE UNIVERSITY PLAZA, YOUNGSTOWN OH 44555.

Previous qualitative surveys have suggested the Zoar Valley Canyon of western New York State contains a diverse tract of old-growth riparian forest. In this first quantitative study of the site, canopy trees >20 cm diameter at breast height (DBH) were surveyed from 30-30 m quadrats on five prominent streamside terraces. Understory trees 1 – 20 cm DBH were catalogued in 10-m quadrats located within the 30-m plots. Nineteen broadleaf and two coniferous species exceed 20 cm DBH, and form a multi-layered canopy. Four more broadleaf species
(striped maple – Acer pensylvanicum L., flowering dogwood – Cornus florida L., witch hazel – Hamamelis virginiana L., and American hornbeam – Carpinus caroliniana Walt.) occur only in the understory. Thirteen species reach 80 – 126 cm DBH. Sugar maple (Acer saccharum Marsh.) accounts for 38.6% of the canopy numerically (27.3% of basal area) and also dominates the understory. Size distributions of all trees together, and of shade-tolerant species individually, are uneven and negatively log-logistic. Shade-intolerant species reach 40–47 cm DBH classes, and are rare in the understory. Fourteen species reach 35 – 47 m in height in this tallest broadleaf forest yet described in the northeastern United States. Increments cores from seven canopy species reveal ages of 170 to 305 years. The diverse woodlands within the study area meet all criteria for eastern old growth.

2:30 THE COMMUNITY STRUCTURE OF ECMOTYCORRIZA FUNGI IN OAK-HICKORY FORESTS OF SOUTHEASTERN OHIO. DAWN R. BLACK @OHIO.EDU, KIM J. BROWN @OHIO.EDU, DEPT OF ENVIRONMENTAL & PLANT BIOL, OHIO UNIVERSITY, ATHENS OH 45701.

Oaks (Quercus) depend on an obligate symbiosis with ectomycorrhizal fungi for survival. However, management strategies that are being evaluated for their ability to facilitate oak regeneration in eastern deciduous forests have largely ignored the effect of thinning and burning on the diversity and abundance of ectomycorrhizal fungi. Consequently, this study addresses the following questions in oak-hickory forests of Vinton County, Ohio: (i) what is the species richness and abundance of ectomycorrhizal fungi in disturbed and undisturbed oak forests, and (ii) how do thinning and burning practices affect the ectomycorrhizal fungal (EMF) community structure within a given landscape position? Our hypotheses include that a) species diversity will be greatest in control plots; b) thinning will increase spatial heterogeneity of EMF species composition; c) thinning will result in a species shift, depending upon life-history traits of EMF; and (d) burning will decrease species abundance and diversity of EMF and found predominantly in litter and organic layers. Methods used to address EMF diversity include collection and identification of fruiting bodies and morphological typing and molecular analysis of ectomycorrhizal root tips. EMF abundance was measured by percent root tip colonization and soil hyphal biomass. To date, fruiting bodies of 34 EMF species have been identified in the study area, which are mainly associated with oaks. Amanita and Russula are the best represented fungal genera aboveground, with six and nine species, respectively.

2:45 EFFECT OF WEEPING WILLOW (SALIX ALBA) ON MICROBIAL POPULATIONS IN CONTAMINATED SOILS. ROBERT J. STUCK, @MUOHIO.EDU, CAROLYN H. KELLER, JEFF G. STEVENS, DEPT OF BOTANY, MIAMI UNIVERSITY, OXON OH 45056.

Phytoremediation is the use of plants and their associated microorganisms to remove pollutants from the environment. The pollutant is rendered harmless. The increased use of phytoremediation is being driven by the high cost of alternative methods, as well as the desire to use an environmentally friendly, sustainable process. This project takes places in the recent advances in the use of the 16s RNA gene to identify soil bacteria and estimate diversity and the presence ofтяжелыми металлами in styrene contaminated soils. It is expected that in the presence of a disturbance such as contamination there would be a decrease in microbial diversity, and bacterial strains with degradative capacities would dominate the population. Samples were collected from inside and outside the rhizosphere in an ongoing phytoremediation project at Dow Chemical in Sarnia, Ontario, Canada. The experiments consisted of control (salix alba) or various amendments. An advanced molecular technique (TRFLP - terminal restriction fragment length polymorphism) is being used to assess bacterial community structure. TRFLP is a PCR-based technique that allows environmental samples to be processed by amplifying a portion of the 16s RNA gene and acquire a unique marker for most unknown bacteria. The results provide estimates of the number of different species or ribotypes and can assess changes in community composition. Recently developed software (http://www.aocrd-ohio-state.edu/trfplf) will be used to obtain putative phylogenetic identification. The number of distinct ribotypes in a sample ranged from 40-154, and did not show substantial differences among soil amendments.

3:00 INVERTEBRATE COMMUNITY RESPONSES TO A NEW HERBICIDE, ISOXAFLUTOLE: A MICROCOSM STUDY. JEFF G. MINER, @BGSU.EDU, PROGRAM IN ECOL, EVOLUTION, AND CONSERVATION BIOL, DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN OH 43402.

Balance® Pro herbicide is a relatively new chemical with only minimal toxicity tests conducted on plants and some animals. The main ingredient, isoxaflutole, can persist in the environment and its degradation products are toxic to plants and aquatic organisms. The purpose of this experiment was to determine the effect of isoxaflutole and its derivative, diketonitrile, on new aquatic organisms and quantify resultant community responses. One goal of this study was to determine if isoxaflutole remains stable in aquatic drainage ditch water, which is the main ingredient, isoxaflutole, can persist in the environment and its degradation products are toxic to plants and aquatic organisms. The community of organisms treated was composed of copepods, cladocerans, rotifers, algae, crayfish, insects, and nematodes. Treatment levels consisted of 0.5, 0.05, 0.005 and 0 mg/L (n=7 replicates per treatment), which mimic concentrations measured and projected near fields where Balance® Pro has been applied. Results indicate that bioassays for aquatic organisms were taken throughout the 28-day experiment. Results indicate significant differences in populations of crustacean zooplankton. The macroinvertebrates were minimally affected taking into account the small amounts of herbicide and the adsorptive properties observed in isoxaflutole. More studies over a larger range of isoxaflutole concentrations are necessary to further address the effect of this herbicide on aquatic sediments and communities of organisms.

3:15 CELLULAR SLIME MOLDS IN FOREST DISTURBANCE AT THE WILDS, SOUTHEASTERN OHIO. NICOLE D. CAVENDER, @OHIO.EDU, THE WILDS, 14000 INTERNATIONAL RD. CUMBERLAND, OH 43732. JAMES C. CAVENDER, DEPT OF ENVIRONMENTAL & PLANT BIOL, OHIO UNIVERSITY.

The Wilds, a large-scale international conservation institution located in the Appalachian region of Southeastern Ohio, has experienced disturbance from agriculture, surface mining for coal, and other development. The populations of soil dwelling cellular slime molds (CSM) in several remnant woodland habitats at the Wilds, which vary in size and degree of past disturbance. Because CSM appear to be extremely sensitive to environmental changes, we are examining them as bio-indicators. To date, results have been obtained from five forest remnant patches at the Wilds ranging in area from 7,330 m² - 59,670 m² and from adjacent, relatively undisturbed woodlands including Bryan's State Park and Gorge State Park and Dysart Woods in Belmont County. Soils were processed for cellular slime molds at Ohio University using a soil dilution-bacterial enrichment technique. Their occurrence, species richness, and relative abundance were compared. Three CSM species were found to occur in the two woodland patches at the Wilds with the most severe disturbance, six species from the two moderately disturbed patches, and fifteen species from the forest remnants. There had the least disturbance. A. tomentosa Woods, a virgin forest with relatively little disturbance, had a total of twelve species. These results indicate that some past disturbance, such as minor selective cutting and mild grazing, may actually increase richness, but severe disturbance, such as heavy cutting followed by horizontal shaft mining underneath site and subsequent soil erosion, may sharply decrease richness.

3:30 A SURVEY OF FRESHWATER SNAILS INFECTED WITH VARIOUS CERCARiae SPECIES IN METZGER RESERVOIR, ALLEN COUNTY, OHIO. TIFFANY L. LANGENDERFER, t-langenderfer@onu.edu, 3591 CO. RD. 44 APARTMENT 8 ADA, OH 43581.

There has been little research on cercariae prevalence and patterns from snails in man-made reservoirs. The purpose of this research is to determine the impacts of different species or ribotypes and can assess changes in community composition. Recently developed software (TRFLP FRAGSORT, http://www.aocrd-ohio-state.edu/trfplf) will be used to obtain putative phylogenetic identification. The number of distinct ribotypes in a sample ranged from 40-154, and did not show substantial differences among soil amendments.

3:45 THE SUSTAINABILITY OF CAGING MEANS FOR-articulate and aquatic organisms. The purpose of this experiment was to determine the impacts of different species or ribotypes and can assess changes in community composition. Recently developed software (TRFLP FRAGSORT, http://www.aocrd-ohio-state.edu/trfplf) will be used to obtain putative phylogenetic identification. The number of distinct ribotypes in a sample ranged from 40-154, and did not show substantial differences among soil amendments.

4:15 THE EFFECT OF WEEPING WILLOW (SALIX ALBA) ON MICROBIAL POPULATIONS IN CONTAMINATED SOILS. ROBERT J. STUCK, @MUOHIO.EDU, GRADUATE PROGRAM IN SOILS. ROBERT J. STUCK, STUCKRJ @MUOHIO.EDU.
gyrina and the prevalence of cercariae. There was a significant (p<0.05) difference in length between uninfected and infected snails in the June 19th collection. This may be due to a condition of gigantism in snails caused by the cercarial infections. Although there has been little research on cercarial prevalence and patterns from snails in man-made reservoirs, the results of this research suggests many similarities with studies on naturally occurring bodies of water.

3:45 FROG AND TOAD CALLS AS CORRELATED TO TEMPERATURE FOR A GEauga COUNTY, OHIO WATHer COMPLEX. Tracy L. Engle, t Len g le@ trans systems. com, TransSystems Corporation, 55 Public Square, Ste 1650, Cleveland, OH 44113.

The calls of frogs and toads were surveyed at a small pond/wetland complex in Geauga County, Ohio over a period of seventy-seven nights from 15 April 2003 to 03 July 2003. This survey was conducted to test the hypothesis that amphibian vocalization can be influenced by temperature. Air temperature readings were collected from an indoor/outdoor Radio Shack® thermometer and also a cross comparison of the National Weather Service air temperature records for the Cleveland International Airport was recorded for verification purposes. The amphibian call survey was completed between 11:00 p.m. and 12:00 a.m. when species were most active. For this project the sample size analyzed occurred as 76 survey nights. Five species of frogs and toads occurred within this complex; American toad (Bufo americanus), bullfrog (Rana catesbeiana), gray treefrog (Hyla versicolor), green frog (Rana clamitans melanota), and spring peeper (Pseudacris crucifer). During the sampling period a negative correlation between lower than average temperature and the frequency of amphibian calling seems to exist, while a positive correlation between the air temperature and species type vocalization seems to exist.

4:00 VEGETATION DEVELOPMENT IN CREATED, RESTORED, AND ENHANCED WETLAND MITIGATION BANKS OF THE UNITED STATES. Douglas J. Spieles, spieles@denison.edu, McPhail Center for Environmental Studies, Denison University, Granville, OH 43023.

Wetland mitigation banking is the practice of creating, restoring, enhancing, or preserving large, off-site wetlands to compensate for authorized construction impacts to natural wetlands. By 2002 there were 219 active mitigation banks in the United States, encompassing 50,000 hectares in 29 states. This study is the first systematic analysis of the ecological quality of these ecosystems. The objective is to determine if mitigation banks are successfully supporting native wetland vegetation and if success differs by age, area, or mitigation method (creating or restoring wetlands versus enhancing existing wetlands). Monitoring reports were obtained from 45 randomly selected mitigation bank wetlands in 21 states to evaluate three measures of ecological status: the prevalence of wetland vegetation, the pervasiveness of nonnative species, and plant species richness. Prevalence Index scores (PI; 1.0 for obligate wetland vegetation to 5.0 for upland vegetation) do not differ by wetland area but are lower in created wetlands (PI=2.0±0.16; mean±SE) than in restored (2.49±0.09) or enhanced (2.26±0.13; p=0.01, F=4.7, n=45). Created and restored wetlands support 12.4 and 12.2 species per 10 m² respectively, nearly four times more than the 3.2 species in 10 m² of enhanced wetland. This is largely attributable to a greater incidence of nonnative species in created and restored wetlands. The vegetation cover in created mitigation banks is 18.9±3.2 percent nonnative—statistically similar to that of restored (16.3±3.2) but significantly greater than that of enhanced systems (4.2±1.0; p=0.02, F=4.3, n=45). In created and restored mitigation banks both the prevalence of wetland vegetation and the representation of native species increase with age, indicating a trend toward functional equivalency with natural wetlands.

4:15 GERMINATION SUCCESS IN LONICERA MAACKII SEEDS FROM CONTRASTING DEVELOPMENTAL LIGHT ENVIRONMENTS. Jasmine Bascomb, bascomb@ohio.edu, Dean Lieurance, lieurance@ohio.edu, Kim J. Brown, kim.brown@ohio.edu, Dept of Environmental & Plant Biology, Ohio University, Athens OH 45701.

Lonicera maackii is an aggressive, invasive woody shrub. It is mainly propagated by seed, and is a prolific seed producer. We need to understand factors controlling seed production in order to control this plant. The purpose of this research is to investigate the germination success of L. maackii seeds produced by open-grown, edge, and forest interior shrubs. We are also investigating the interaction between seed origin and light levels present during germination, to explore the relationship between the environment in which the seeds develop and germination success in a given light environment. This research will add to the understanding of the population dynamics of L. maackii, and is part of a larger study investigating biomass allocation and fecundity of L. maackii. Results from both projects will determine the quality and quantity of fruits produced in contrasting light environments. Evaluating differences in fruit production will be useful for managers to target the removal of this invasive shrub from the landscape. It is predicted that germination success will be greatest in seeds from open-grown shrubs, followed by edge shrubs, with interior shrubs showing the least success. Seeds were collected from East Fork State Park in Clermont County, Ohio. Samples were stratified at 5°C for ten weeks. Seeds were placed in sterile Petri dishes on 20g of autoclaved sand moistened with 5ml of distilled water. After 12 days, percent germination at incubation thermoperiod of 20/10°C was determined at 100%, 20%, and 0% light in seeds from open, edge, and interior environments.