



**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
crescooper.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

11:15 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	p. 31
Zoology 09:00 AM Saturday, April 17, 2004 DeBartolo Hall Room 358 Dr. Courtenay Willis-Presiding	p. 32
Phycology & Aquatic Ecology 09:00 AM Saturday, April 17, 2004 DeBartolo Hall Room 356 Dr. Robert Heath-Presiding	p. 33
Basic & Applied Microbiology 09:00 AM Saturday, April 17, 2004 DeBartolo Hall Room 346 Dr. Paul Baker-Presiding	p. 35
Earth & Environmental Sciences 09:30 AM Saturday, April 17, 2004 DeBartolo Hall Room 345 Mr. Wilmer Stowe-Presiding	p. 36
Genetics, Biochemistry & Physiology 02:00 PM Saturday, April 17, 2004 DeBartolo Hall Room 358 Dr. Kerry Cheesman-Presiding	p. 38
Plant Ecology/Wetlands 02:00 PM Saturday, April 17, 2004 DeBartolo Hall Room 356 Mr. Tracy Engle-Presiding	p. 39

9:00 am Poster Session De Bartolo Hall

BOARD 01 THE DEVELOPMENT OF A GEOLOGICAL SEQUESTRATION SIMULATION FACILITY (GSSF) TO ADVANCE THE UNDERGROUND STORAGE OF ANTHROPOGENIC CARBON DIOXIDE.

KENNETH A. LASOTA (LASOTA@RMU.EDU) DEPT OF NATURAL SCIENCES, ROBERT MORRIS UNIVERSITY, 600 FIFTH AVE, PITTSBURGH PA 15219-3099.

The production worldwide of more than nine billion tons of carbon dioxide each year by industrial processes is affecting greenhouse gas concentrations in the atmosphere. The injection and sequestration of carbon dioxide scrubbed from the flue gases of coal-fired power plants into brine aquifers 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 meters. The GSSF is envisioned as being instrumented to record real time as well a pre- and post- test data. Data acquisition is envisioned as being generated by instruments such as MRI, CAT scan, temperature and pressure sensors, x-ray diffraction, atomic absorption, and petrographic imaging equipment, among others. This study reports on the initial progress in the development of the GSSF, including estimated cost, proposed instrumentation specifications and timeline for development.

BOARD 02 CHARACTERIZATION OF HYDRIC SOILS IN WETLAND MITIGATION SITES IN CENTRAL OHIO.

KIMBERLY A. PREEST, KPREEST@MUSKINGUM.EDU, (JAMES L. DOOLEY, JDOOLEY@MUSKINGUM.EDU), DEPT OF BIOLOGY, MUSKINGUM COLLEGE, 163 STORMONT ST, NEW CONCORD OH 43762.

This ongoing study will examine the hydric soil characteristics of three central Ohio wetland areas. The first of the three study sites is a natural wetland site located in Pickerington Ponds Metro Park in Fairfield County, a 1200-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 (EPA). Data for this study will consist of six random core samples from all three wetland sites. These samples will be tested for the presence iron or manganese concretions, and organic matter (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 aquic/paraquic moisture regime. The soil will be observed for evidence of reducing conditions, and proper matrix chromas, and mottling.

BOARD 03 TEMPORAL AND SPATIAL PATTERNS OF NITRATE AND PHOSPHATE IN AGRICULTURE AND FOREST SOILS IN SOUTHEASTERN STARK COUNTY.

FRANK MOROCCO, MOROCCF@MUC.EDU, (DR. CHARLES McCLAUGHERTY, MCCLAUCA@MUC.EDU), MOUNT UNION COLLEGE, 1972 CLARK AVE, ALLIANCE OH 44601.

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. Farming, 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 experiment 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 Injection Analyzer and values will be reported on a per gram of dry weight and organic matter basis.

BOARD 04 EVALUATION OF AN *IN VITRO* ASSAY FOR PREDICTING FUNGICIDE EFFICACY AGAINST *SCLEROTINIA HOMOEOCARPA* IN THE FIELD.

AMY L. MIKUSZEWSKI, MIKUSZEWSKI.1@OSU.EDU, YOUNG K. JO, JO.17@OSU.EDU, JOSEPH W. RIMELSPACH, RIMELSPACH.1@OSU.EDU AND MICHAEL J. BOEHM, BOEHM.1@OSU.EDU, DEPT OF PLANT PATHOLOGY, THE OHIO STATE UNIVERSITY, 201 KOTTMAN HALL, 2021 COFFEY RD, COLUMBUS OH 43210-1087.

Dollar spot, caused by the fungus *Sclerotinia homoeocarpa* F.T. Bennett, is one of the most commonly occurring turfgrass diseases in temperate and subtropical regions and the most widespread and chronic disease of golf course turf in Ohio. The disease is typically managed through the combined use of a balanced fertility program, cultural practices aimed at reducing extended periods of leaf wetness and timely applications of fungicides. Resistance in *Sclerotinia homoeocarpa* to various classes of fungicides has been reported. The goal of this work was to determine the ability of a previously described *in vitro* fungicide screening assay to predict fungicide efficacy in the field. *Sclerotinia homoeocarpa* isolates were recovered from 42 golf course fairways throughout Ohio and screened using the *in vitro* assay to determine their relative sensitivities to thiophanate-methyl, propiconazole and iprodione. Each isolate was placed onto potato dextrose agar (PDA) and a series of fungicide-amended PDA plates. Fungicide sensitivities for each isolate were calculated based on relative growth rates of the isolates on PDA versus fungicide-amended PDA. Based on fungicide sensitivity profiles of the 42 isolates, replicated field fungicide efficacy trials were established on fairways at 12 Central Ohio golf courses. Fungicide applications were made and dollar spot severity was rated on a biweekly basis from April to July 2003. The *in vitro* screening assay was an excellent predictor of thiophanate-methyl, iprodione and propiconazole efficacy in the field except for isolates with propiconazole EC₅₀ values ranging between 0.03 and 0.04.

BOARD 05 EFFECTS OF ROUNDUP™ ON DEVELOPING *RANA PIPIENS*

TERA M. ROBINSON (ROBINSON54@HOTMAIL.COM), (DAVID L. REED) DEPT OF NATURAL SCIENCES, THE DEFIANCE COLLEGE, 1774 WHITEHALL DR. LIMA, OH 45805.

Over the last fifty years, many species of amphibians in the United States are experiencing a major decline in their numbers. United States, agriculture is a major employment factor and with agriculture there is runoff and over use of pesticides and fertilizers. Pesticides and fertilizers in the water systems are factors in the abnormalities found in frogs. Pesticides and fertilizers are harming the frogs by adversely affecting their immune system and causing them to be more susceptible to parasites and other infections. These chemicals are also responsible for the decreased rate of growth, for example frogs are being found with missing or retained limbs. In this study, *Rana pipiens* tadpoles in one ten gallon tank will be exposed to a constant 3.4 grams of Roundup and the other ten gallon tank will receive an increasing amount of 0.1 gram a day for four months. The development rate will be measured between the tadpoles by obtaining a mean of the width and length of the tadpoles in different tanks. Also the tadpoles will be monitored daily for developmental deformities and changes in behavior. The tank that received a constant 3.4 grams of Roundup had visual abnormality, one including retained forelimbs, the frogs in this tank also showed a different behaviors, swimming upside down and not being as active as the other tanks. The tank that increased daily had fewer visual abnormality and as the amounts increased the tadpoles' behavior started to change. The tanks that had received the Roundup also developed into frogs at a much slower rate. The initial data shows that Roundup has a direct affect on the development of *Rana pipiens* tadpoles.

BOARD 06 COMMUNITY – LEVEL RESPONSE TO NUTRIENT SUPPLEMENTATION IN OHIO FRESHWATER PLANKTON COMMUNITIES AT THE JAMES H. BARROW FIELD STATION.

RUDY J. WOJTECKI, WORJTECKIRJ@HIRAM.EDU, J.H. BARROW FIELD STATION, DEPT BIOLOGY, HIRAM COLLEGE HIRAM, OH 44234 AND (SAMUEL D. MARSHALL, MARSHALLSD@HIRAM.EDU)

An analysis was conducted of the freshwater plankton community in the Nature Observatory Pond at the James H. Barrow Field Station

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. In the controls total phosphorus measured 2.91 mg/l. The two remaining buckets were not inoculated with pond water as controls for airborne colonization by plankton propagules. Initially, species diversity increased in the nutrient-treatment mesocosms. Both the nutrient-treatment mesocosms and the controls began with communities dominated by desmids and diatoms. Green algae then began increasing in diversity. Within two weeks the diversity in the nutrient-enriched mesocosms diminished, with a preponderance of cyanobacteria. Despite this, the nutrient-enriched environments were the most productive. The final biomass was measured by straining the contents of the mesocosms through a 2l plankton net then dried and weighed. The nutrient enriched and inoculated mesocosms produced an average of 1.5577 grams of biomass where as those only inoculated with pondwater averaged 0.1154 grams. The control mesocosms initially displayed an increase in diversity then stabilized after two weeks. There was a strong influence of nutrient supplementation in mesocosmic 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 (DFRAGA@WOOSTER.EDU), SABRINA BARROS (SBARROS@WOOSTER.EDU) AND WHIT SCHOFIELD (WSCHOFIELD@WOOSTER.EDU) DEPT OF BIOLOGY, 931 COLLEGE MALL, THE COLLEGE OF WOOSTER WOOSTER OH 44691.

Paramecium 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 *Paramecium* escape predators. We used a bacteria-mediated RNA interference (RNAi) protocol to determine if the calcium/calmodulin-dependent protein phosphatase, PP2B, was involved in trichocyst discharge. *Paramecium* cells were fed *Escherichia coli* containing an inducible PP2B dsRNA expressing vector as described previously with minor modifications. After treatment, *Paramecium* 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 in cross section. Normalized values were compared 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 25% in PP2B treated cells (n=190). Cells exhibiting dramatically reduced exocytosis (<50% full discharge) increased from 2% (control treatment) to 41% (PP2B treatment). Treated and control cells had no visible effects upon endocytosis, cell morphology, or cell division. Based upon these results we conclude that PP2B has a role in the regulation of calcium-dependent exocytosis in *Paramecium tetraurelia*.

BOARD 08 P232 AND P258 ARE INVOLVED IN NIFM MEDIATED FOLDING OF THE Fe PROTEIN OF NITROGENASE. SUDHEER TUNGTUR, (STUNGTU@BGNET.BGSU.EDU); LAKSHMI PULAKAT (PULAKAT@BGNET.BGSU.EDU) AND NARA GAVINI (NGAVINI@BGNET.BGSU.EDU); DEPT 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 Molybdenum-Iron (MoFe) protein both of which are extremely oxygen-sensitive. The Fe protein is a 64 kDa γ_2 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 *NifH* mutants were 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 proteins. 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 a *NifM* Δ mutant which has a *nif*⁻ phenotype. One of the *NifH* 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 AND STORAGE CONDITIONS. CHANDA L. KIMES (CHANDA.LYNN@HOTMAIL.COM) 5240-B NORTHTOWNE 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 that will cause the mitochondria alone to pellet in the appropriate fraction and the determination of the best time through 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. The centrifugal speed (of the S534 rotor in the Sorvall RC5B centrifuge) 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 refrigerators. A centrifugal spin at 2000 RPMs produces the most 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 of 2000 RPMs and either 1800 or 2200 RPMs before the storage aspect of the experiment is attempted.

BOARD 10 MUTATIONAL ANALYSIS OF THE LEUCINE-66 AND SERINE-67 MUTATIONS IN THE LACTOSE PERMEASE PROTEIN IN *ESCHERICHIA COLI*. CONSTANCE A. CHANNEL (CNSACHNN@OTTERBEIN.EDU), ERIN N. TRACY (ETRACY@OTTERBEIN.EDU) DR. AMY JESSEN-MARSHALL (AJESSEN-MARSHALL@OTTERBEIN.EDU) OTTERBEIN COLLEGE, LIFE SCIENCE DEPT, 1 OTTERBEIN COLLEGE, WESTERVILLE, OH 43081.

The lactose permease is a symport protein that functions in the inner membrane of *Escherichia coli*. This protein belongs to the USA superfamily, which shares a common 2-D structure with twelve transmembrane domains. In all members of this family, the hydrophilic loop connecting transmembrane domains two and three shows a highly conserved decapeptide motif whose sequence is G-X-X-D/E-R/K-X-G-R/K-R/K. The X represents positions that show variable conservation. However, closer analysis of amino acid chemistry suggests a higher level of specificity than previously predicted. Positions three and four are hypothesized to function as any amino acid despite the evidence that sixty-percent of all members in the family have a leucine or isoleucine in position three and forty-percent show a serine or threonine in the fourth position. To test this, three mutations have been created by PCR site-directed mutagenesis to change leucine to isoleucine, aspartic acid or tyrosine at position 66. Also, serine was mutated to tryptophan at position 67. Qualitative analysis showed the S67W mutation to have a significant loss of transport activity based on white colony phenotype on MacConkey plates. A quantitative analysis of function will be performed through an ONPG bioassay. Initial results show that S67W transports 21% of wild-type levels, which confirmed our hypothesis that a nonspecific X at the fourth position is inaccurate. Work on analysis of position 66 continues. We hypothesize that the isoleucine mutation will have little effect on the function of the protein, whereas the tyrosine and aspartic acid will greatly reduce function based on the results seen with S67W.

BOARD 11 IDENTIFICATION OF SECOND SITE COMPENSATORY MUTATIONS IN THE Fe PROTEIN OF AZOTOBACTER VINELANDII UW97. PADMA KOSARAJU, (PADMAK@BGNET.BGSU.EDU); LAKSHMI PULAKAT, (PULAKAT@BGNET.BGSU.EDU); NARA GAVINI, (NGAVINI@BGNET.BGSU.EDU), DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY; BOWLING GREEN OH 43403.

Azotobacter vinelandii UW97 lacks diazotrophic growth due to a single mutation in the *nifH* gene, which codes for the Fe protein of the nitrogenase. This mutation was identified to be the replacement of serine at position 44 in the *nifH* gene by phenylalanine. This mutation is located in a conserved domain of Fe-protein which links the nucleotide binding site and the MoFe-protein docking

surface of the Fe-protein. It was suggested that the loss of diazotrophic growth in *A. vinelandii* UW97 maybe 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 diazotrophic growth, random 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 was done to ensure 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 (Stratagene) 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 *coIE1* replicon and is unable to replicate in *A. vinelandii*. However, since *A. vinelandii* has highly efficient homologous recombination, the mutated *nifH*₄₅₋₂₈₉ in pBG3205 could recombine with the chromosomal *nifH* of UW97 and lead to the production of *nif*⁺ revertants. A total of 130 *nif*⁺ revertants were isolated by this process. Analysis of these mutants showed a deeper insight into the folding patterns and activity of the Fe protein.

BOARD 12 NIFM INDEPENDENT MUTANTS OF NITROGENASE REDUCTASE OF AZOTOBACTER VINELANDII. BRIDGET K FOSTER (FOSTERB@BGNET.BGSU.EDU), L. PULAKAT (PULAKAT@BGNET.BGSU.EDU) AND N. GAVINI (NGAVINI@BGNET.BGSU.EDU) DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

The nitrogenase reductase (NifH) serves as the electron donor in the nitrogenase complex. The proper folding and maturation of the nitrogenase reductase protein depends on the presence of a functional NifM protein. Gene shuffling was used to generate a pool of *nifH* mutants. In this technique a pool of mutants are digested with DNase I and allowed to recombine randomly through homologous recombination aided by primerless PCR. The resulting DNA fragments are PCR amplified. The library of NifH mutants generated by gene shuffling were screened for their ability to complement a NifM defective strain of *Azotobacter vinelandii*, AV98. Two mutants from the library complemented the AV98 strain. The first mutant strain designated as BG3416 contains the following mutations in the NifH protein: K10E, N107S, I149V, P232A, E266V, and I273V. The mutations E63K, T66A, T226A, and P232G were present in the second AV98 complementing strain, and the strain was designated as BG3463. AV98 transformants from the strain BG3463 failed to show substantial growth during growth curve analysis and this suggests BG3463 is not independent of the NifM protein. Growth curve analysis of AV98 transformants of the strain BG3416 confirmed that this strain complements the NifM defective strain. BG3416, the NifM independent strain, will aid in studying how NifM and NifH interact and will also lead to the design of a NifM independent nitrogenase complex.

BOARD 13 DIRECT INTERACTION BETWEEN THE ANGIOTENSIN II TYPE 2 RECEPTOR AND THE TRANSMEMBRANE 9 SUPERFAMILY 3 PROTEIN. VIKAS KUMAR, VIKASVK@BGNET.BGSU.EDU; NARA GAVINI, NGAVINI@BGNET.BGSU.EDU; AND LAKSHMI PULAKAT, PULAKAT@BGNET.BGSU.EDU. DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

The yeast Two-Hybrid system is a genetic approach for detection of protein-protein interaction *in vivo* in *Saccharomyces cerevisiae*. To identify the proteins that interact with and mediate angiotensin II receptor AT2-specific signaling, a mouse 17-day embryo Clontech's Matchmaker cDNA library was screened by yeast-based Two-Hybrid protein-protein interaction assay technique. A rat AT2 receptor peptide that spans the amino acids 226-363 was used as the 'bait'. A peptide that shared 99% homology with a protein belonging to mouse transmembrane protein (TM9SF3) and 97% homology with corresponding human SM-11044 binding protein (SMBP) was identified to be interacting with the AT2 receptor peptide. The extent of interaction was reduced when the third intracellular loop (ICL) of the AT2 was replaced with the third ICL of the AT1. Moreover, the C-terminal deleted mutant of AT2 exhibited weak interaction with the mouse TM9SF3 protein. Thus, the interaction between the AT2 receptor and the TM9SF3 protein seems to require the region spanning the third ICL and carboxy terminus of the AT2 receptor. SMBP is a cleavage product of the 70 kDa precursor TM9SF3 protein. Though biochemical mechanisms leading to the cleavage of TM9SF3 have not been identified so far, the 34 kDa active peptide was shown to have anti-inflammatory effects such as inhibiting leukotriene B4 induced eosinophil chemotaxis. Since the AT2 receptor is also known to have anti-inflammatory property, we hypothesize that its direct interaction with the TM9SF3 may aid in the cleavage of the precursor protein to give rise to an active peptide.

BOARD 14 FUNCTIONAL AND STRUCTURAL SIMILARITY OF CHL, CHLAMYDOMONAS REINHARDTII AND NIFH, AZOTOBACTER VINELANDII. SINNY DELACROIX, SINNYD@BGNET.BGSU.EDU; LAKSHMI PULAKAT PULAKAT@BGNET.BGSU.EDU; NARA GAVINI, NGAVINI@BGNET.BGSU.EDU DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

Nitrogenase is an enzyme complex consisting of two oxygen-sensitive protein components, the Fe-protein and the MoFe-protein. The Iron-protein (Fe-protein) is a homodimer (encoded by *nifH*) which contains a single Iron-Sulphur (Fe₄S₄) cluster whereas Iron-Molybdenum protein (MoFe-protein) is an 2 α 2 β heterotetramer (encoded by *nifDK*) containing 2 Mo atoms and 30 Fe atoms organized in two pairs of novel metalloclusters which are called P clusters and FeMo-co. *In vitro* assays have identified that *nifH* is necessary for FeMo-co biosynthesis and the *nifM* 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 Fe₄S₄ cluster in Fe-protein are conserved in CHL. Therefore, it could be presumed that the *chl* might complement *nifH*-minus strain such as *Azotobacter vinelandii* DJ54. To test this idea we introduced *chl* into *A. vinelandii* strains of different genetic backgrounds. For this purpose, the *chl* gene from *Chlamydomonas reinhardtii* was PCR amplified and the product was cloned into an expression vector pBG1380 and the resultant construct was designated as pBG2400. When pBG2400 was introduced into *A. vinelandii* strains of various genetic backgrounds, it was capable of rendering *nif*-minus strains with *nif*⁺ phenotype. Growth curve analysis and protein profiles of these recombinant *A. vinelandii* strains not only confirmed the complementation but also suggested a role for *nifM* in the biogenesis of *chl*. Further using DNA shuffling technique we generated a *nifM* independent *nifH* mutant capable of nitrogen fixation.

BOARD 15 MET225 AND TYR230 ARE INVOLVED IN THE NIFM INDEPENDENT FOLDING OF THE FE PROTEIN. PREETI KAPOOR, PREETIK@BGNET.BGSU.EDU; PULAKAT LAKSHMI, PULAKAT@BGNET.BGSU.EDU; GAVINI NARA, NGAVINI@BGNET.BGSU.EDU. DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

Nitrogenase is composed of two separately purified components, the Fe-protein and the Molybdenum-Iron-protein. The Fe-protein is encoded by *nifH* and serves as the physiological donor to the dinitrogenase enzyme. The Fe-protein is a dimer of subunit with a molecular weight of approximately 60,000 daltons. The *nifM* is an accessory gene of *nif*-gene cluster required for the accumulation of active Fe-protein. The *nifM* gene product has been suggested to be involved in the biosynthesis or insertion of the 4Fe4S 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 this reasoning, we have been able to isolate an *Azotobacter. vinelandii* strain BG1158, which codes for a Fe-protein containing the mutations M225T and Y230H, which could functionally complement a *NifM* deletion strain. Methionine residue 225 is located in a non-conserved domain of the *NifH* and is known to link the alpha-7 and alpha-8 helices of the Fe-protein. By contrast, Tyrosine at position 230 is located in the alpha-10 helix. In order to facilitate purification of the Fe-protein containing these two mutations, we cloned the *nifH* from *A. vinelandii* BG1158 into the his-tag bearing vector, pBG1380, and designated the resultant plasmid as pBG2476. On transforming *A. vinelandii* AV98 strain (which does not synthesize *NifM* polypeptide) with pBG2476, we obtained a *Nif*⁺ strain, designated as *A. vinelandii* BG2478. Growth curve analysis for comparison of growth pattern of *A. vinelandii* wild type and BG2478 confirmed the complementation that was allowing the activity of a functional nitrogenase.

BOARD 16 NIFM MEDIATED FOLDING OF THE FE-PROTEIN OF NITROGENASE: ISOLATION AND MOLECULAR MODELING OF A NIFM INDEPENDENT MUTANT FE-PROTEIN. GIRISH JAMNEKAR, GIRISHJ@BGNET.BGSU.EDU NARA GAVINI NGAVINI@BGNET.BGSU.EDU AND LAKSHMI PULAKAT PULAKAT@BGNET.BGSU.EDU. DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

Nitrogenase is composed of two separately purified components, the Fe-protein and the MoFe-protein. The Fe-protein, encoded by the gene *nifH* is a dimer a subunit with a molecular weight of approximately 60,000 daltons. The *nifM* is an accessory gene of *nif*-gene cluster required for accumulation of active Fe-protein. Previous results suggested that the *nifM* 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 NifH polypeptides necessary to accept the [4Fe-4S] cluster is particularly attractive. Since isolated Fe-protein does not contain any NifM protein, it is unlikely that the NifM is a subunit of the Fe-protein complex. Therefore, the role of the NifM protein 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* strain in which the NifM-protein is no longer required for nitrogenase activity. Further analysis showed that the nifH gene from this mutant strain contained multiple mutations spanning three easily recognizable regions in the Fe-protein. We constructed mutations in all three regions, one region at a time and performed genetic complementation experiments using growth curve analysis. Growth curve patterns showed that the mutants were able to grow independent of NifM. These analyses, combined with molecular modeling analysis showed that the region spanning amino acids 220 to 240 is involved in the NifM-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 BACTERIOMATCH™ TWO-HYBRID SYSTEM.

SUROBHI.D.LAHIRI, SLAHIRI@BGNET.BGSU.EDU, LAKSHMI PULAKAT, PULAKAT@BGNET.BGSU.EDU, GAVINI NARA, NGAVINI@BGNET.BGSU.EDU . DEPT 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 the nifK genes respectively. The functional expression of a fusion NifD-K 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 Bacteriomatch™ Two Hybrid System, fused constructs of NifD-K(fusion) with the full-length λ CI of the pBT bait vector 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 fused NifD-K proteins to that of the β - β interactions in the native MoFe protein, we proceeded to generate fused constructs of NifK with the β -RNAP of the pTRG vector and λ CI protein of the pBT vector. The strength of the interaction between the proteins in study was determined by measuring the λ -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 they exist as 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 native MoFe protein in BacterioMatch Two-Hybrid System 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, RAJAKG@BGNET.BGSU.EDU LAKSHMI PULAKAT PULAKAT@BGNET.BGSU.EDU AND NARA GAVINI NGAVINI@BGNET.BGSU.EDU DEPT 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 and belongs to the PPIC/Parvulin family of rotamases. Pin1 is an essential prolyl isomerase that is specifically required for proper progression of mitosis in humans. It has very high similarity to the NifM 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 nifM gene. The human pin1 gene was cloned into pBG1380 that has a nifH promoter, histidine tag and chloramphenicol resistance marker. The resultant plasmid constructed was designated as pBG1551. The 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 might require a recognition sequence from NifM to recognize NifH 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 generating functional Fe-protein the renders the *A. vinelandii* BG98 with nif⁺ phenotype.

BOARD 19 SUBSTRATE RECOGNITION DOMAINS OF PPIASES: GENETIC COMPLEMENTATION OF S. CEREVISIAE ESS1^{TS} BY THE SINGLE DOMAIN PPIC OF E. COLI.

VANDANA CHATURVEDI, VCHATUR@BGNET.BGSU.EDU LAKSHMI PULAKAT PULAKAT@BGNET.BGSU.EDU AND NARA GAVINI NGAVINI@BGNET.BGSU.EDU DEPT 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'mRNA processing. Temperature sensitive *S. cerevisiae* ESS1^{TS} 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^{TS} in *S. cerevisiae*. The multiple alignment of amino acid sequences revealed that the *Escherichia coli* PpiC has considerable homology with PPIase domains of human Pin1 and ESS1, and is devoid of WW domain as well as the four conserved amino acids. Therefore, it was of interest to see whether the *E. coli* PpiC, a prototype member of the parvulin family, could rescue the ESS1^{TS} mutations in *S. cerevisiae*. The *E. coli* PpiC is 92 amino acids long and the entire protein represents the PPIase domain. The DNA corresponding to the PpiC 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 whereas the mutants failed to grow. 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 not 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. DEPT 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 second conserved domain on the Iron-protein. This disruption impairs the protein in attaining the proper conformation to interact with the Molybdenum-Iron protein and other accessory proteins. 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 molecular modeling programs and found that these mutant 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 suppressor mutation involving conformational changes during the nitrogenase complex formation.

BOARD 21 ORF9 FUNCTIONS AS NITROGENASE-SPECIFIC CLPX DURING THE BIOGENESIS OF THE MOFE PROTEIN. PREETI.H.PATIL, PPATIL@BGNET.BGSU.EDU, PULAKAT LAKSHMI, PULAKAT@BGNET.BGSU.EDU, GAVINI NARA, NGAVINI@BGNET.BGSU.EDU, DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

Nitrogenase, which catalyzes the biological reduction of atmospheric nitrogen, consists of the Iron (Fe) and Iron-molybdenum (MoFe) protein encoded by nifH and nifDK respectively. The orf9 in the nif-complex of *Azotobacter vinelandii* showed about 53% identity and 75% similarity with clpX of *A. vinelandii*. ClpX is an ATPase involved in substrate recognition. It interacts with ClpP to form ClpXP, an ATP-dependent protease complex found in

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 *nifHDK*, by utilizing BacterioMatch™ Two Hybrid system. The DNA corresponding to *orf9* was PCR amplified and cloned in pBT and *nifD*, *nifH*, and *nifK* were cloned in pTRG. The interaction of Orf9 with *nif* genes was detected by analyzing the expression of the reporter genes, the *lacZ* and *amp^r* marker. The Orf9 showed positive interaction with *NifK* whereas no detectable interaction was observed with *NifD* and *NifH*. Amino acid sequence comparisons of the *NifK* revealed that it shares an 11-amino acid homology in its carboxyl terminal region with the *ssrA*-tag, a recognition sequence necessary for the ClpX interaction. A deletion in carboxyl terminal of *nifK* abolished its interaction with Orf9. Furthermore based on an analysis of interactions of ClpP with ClpX and Orf9, no interaction was detected with Orf9. Thus indicating that the putative role of Orf9 might be in protein unfolding. Based on interaction of ClpX 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 MAIL. SHANNON L. HELFINSTINE, SLMILLE2@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 prepared, dried on membrane filters (0.22 µm), and irradiated with a 5 MeV electron beam accelerator at doses ranging from 0-40 kGy, in 5 kGy increments. In other experiments, doses were focused between 10-15 kGy, in 1 kGy increments. Irradiated membranes were incubated in nutrient broth to determine culturability, via turbidity. Once the lethal dose was determined, additional experiments were performed with irradiated membranes vortexed in 10 ml water to release the endospores. Released endospores were serially diluted and allowed to develop into colonies within agar, to determine the D_{10} value for this species. A culture of 1.0×10^7 CFU survived 0, 5, & 10 kGy, while endospores did not survive doses of 15-40 kGy. Furthermore, endospores (1.0×10^7 CFU) were killed completely with 13 kGy, and a resulting D_{10} value of 2.09 ± 0.03 kGy was determined. To achieve 7 logs of kill, one would need to need to use a theoretical dose of 14.63 kGy, a difference of 1.63 kGy as compared with the observed dose of 13 kGy. A much reduced e-beam irradiation dose, versus the present use of 56 kGy, could thus be used to sanitize mail.

BOARD 23 BACTERIAL MOTILITY OF FRESHWATER ISOLATES FROM THE KRAUS WILDERNESS PRESERVE. AMANDA R. ROBINSON, ARROBINS@OWU.EDU, (LAURA TUHELA-REUNING, LMTUHELA@OWU.EDU), OHIO WESLEYAN UNIVERSITY, HWCC Box 2056, DELAWARE OH 43015.

The low nutrient conditions of freshwater systems require bacteria to express 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. Because these bacteria 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 this motility. Five water samples were collected from The Kraus Wilderness Preserve in Delaware, OH. Bacteria were isolated from these water samples using modified W-R media containing either sodium citrate, mannitol, L-alanine, or glucose as the sole carbon source. Once siderophore-producing, motile bacteria were isolated, oxidase tests, catalase tests, and Gram stains were done. These tests were used to separate potential *Pseudomonas* spp. and *Burkholderia* spp. from other isolates. Further identification of the five most motile isolates, as determined by microscopy, was performed using the Biolog GN2 MicroPlates™ and BBL® Enterotube™ II systems. Growth curves were made of the two most motile isolates indicating a doubling time of 2727 minutes for isolate MBP2 and 1667 minutes for isolate SWC1 in W-R medium. Capillary tube chemotaxis assays were performed with the SWC1 isolates using sodium citrate, L-alanine, or a blue siderophore as possible chemoattractants. The blue siderophore elicited a chemotactic response as indicated by a relative response ratio of 2.236 for a 0.01 mM attractant concentration, while the remaining two substances were not chemoattractants. This blue siderophore will be identified using spectrometry while other chemoattractants are tested with isolate SWC1.

BOARD 24 KERATINASE-PRODUCING FUNGI ISOLATED FROM THE PLUMAGE OF WILD SONGBIRDS AND SOIL. HEATHER M. COSTELLO, HMCOSTEL@OWU.EDU, AND JANN M. ICHIDA, JMICHIDA@OWU.EDU, DEPT OF BOTANY AND MICROBIOLOGY, OHIO WESLEYAN UNIVERSITY, DELAWARE, OH 43015.

The management of ten thousand pounds of feather waste produced every hour at a typical poultry processing plant presents a current environmental problem. *Bacillus licheniformis* and *Streptomyces* spp., isolated from the plumage of birds, have been used as an aid in poultry waste composting because they completely hydrolyze α-keratin, the recalcitrant protein of feathers. Keratinase-producing fungi have been reported. This study focused on isolation of fungi from avian sources, their keratin-degrading ability and interactions with bacteria. Seven genera of fungi were isolated from bird contact plates and soil collected from five sites at Ohio Wesleyan University Kraus Wilderness Preserve. Feather degradation in defined basal media was tested for ten isolates. Keratinase activity of crude fungal extracts was also examined. Strong keratinase-producing fungi included *Fusarium* and *Acremonium* spp. Microbes compete for substrates in the same environment, so the antibacterial properties of these fungi were tested. Usnic acid, a compound from lichen material commonly used in nests, was examined for possible fungal inhibition using wells in agar plates. *Fusarium sporotrichioides*, identified by Microbial ID®, was the strongest keratinase producer and inhibited *Escherichia coli*, but not Gram-positive bacteria. Four of the ten fungal isolates tested were slightly susceptible to the usnic acid. The fungi tested in this study had exceptional ability in degrading feather barbs from the rachises. Because this can be difficult and costly to do mechanically, fungi may more efficiently reduce feather waste by utilizing the end product for livestock feed, paper, plastic replacements, and lighter, more conductive computer chips.

BOARD 25 BIRDS, HERBS AND BACTERIA: THE EFFECTS OF ANTIMICROBIAL PLANT NESTING MATERIAL ON FEATHER-DEGRADING BACTERIA. NICOLE-MARIE K. COTTON, NMCOTTON@OWU.EDU AND JANN M. ICHIDA, JMICHIDA@OWU.EDU, BOTANY AND MICROBIOLOGY DEPT OHIO WESLEYAN UNIVERSITY, DELAWARE OH 43015.

Bacillus licheniformis, a feather-degrading bacterium, occurs in the plumage of 11% of birds. It degrades β-keratin, the recalcitrant protein in feathers. Birds are highly selective when choosing foliage they bring to and use in their nests. We explored what birds might do to protect themselves against these bacilli and investigated whether plants brought to the nest might have an inhibitory effect on *B. licheniformis* and other harmful bacteria such as *Streptomyces*, *Staphylococci aureus* or *Escherichia coli*. Many natural organic materials have antimicrobial properties. *Parmelia*, a lichen commonly used in nest, produces usnic acid which has strong antimicrobial 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 "chimney-plate" method. Half-strength Mueller Hinton agar was poured into the tops of microcentrifuge tube boxes and lawns of bacteria were made. The microcentrifuge tubes were filled with fresh foliage and water then slightly smashed to help release volatile compounds prior to incubation at 37°C. 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 protect the nestlings from harmful bacteria.

BOARD 26 THE PRESENCE OF ANTIBIOTIC RESISTANCE IN COLIFORMS IN LAKES WITHIN THE MAUMEE VALLEY WATERSHED AREA OF OHIO. TIFFANY N. CAUDILL, TIFFANY_CAUDILL@HOTMAIL.COM (HEATHER HUG, HHUG@DEFIANCE.EDU) THE DEFIANCE 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 worldwide problem of drug resistance. The objective of this study was to determine the extent of antibiotic resistance within lakes in the Maumee 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, triplicate samples were taken at each site. Two lakes having drainage ditches that carry run off from farms were

compared to two lakes of isolated ecosystems. Undiluted water samples were plated on LB agar with ampicillin as an initial test for resistance, while diluted water samples were plated on LB without ampicillin to determine the percent of resistant bacteria. To further test for resistance, bacteria from the LB-ampicillin plates were isolated and plated on Mueller-Hinton agar with 5 different antibiotic discs, which includes amoxicillin, ciprofloxacin, streptomycin, tetracycline, and vancomycin. The most probable number (MPN) assay was used to test for the presence of coliforms. Initial results according to the MPN test, Lake 1 (isolated lake ecosystem) had 0.49 coliforms per ml. Of the coliforms present none were resistant to ampicillin. From the finished research, the community can be informed of the extent of antibiotic resistance in the area and can be educated on how not to contribute to this growing problem.

BOARD 27 PRODUCTION OF ANTIBODIES DIRECTED AGAINST STAPHYLOCOCCUS AUREUS SEROTYPE 8 CAPSULAR POLYSACCHARIDE.

CHRISTOPHER M. CALDWELL, CMCALDWELL22@HOTMAIL.COM, JEFFREY A. SMILEY, DEPT OF CHEMISTRY (DIANA L. FAGAN, DLFAGAN@YSU.EDU), YOUNGSTOWN STATE UNIVERSITY, DEPT OF BIOLOGICAL SCIENCES, ONE UNIVERSITY PLAZA, YOUNGSTOWN, OH 44555.

The goal of this study was to isolate the capsular polysaccharide (CP) of *Staphylococcus aureus* serotype 8 (SA8) and to produce monoclonal antibodies directed against it by the use of hybridomas. Columbia broth supplemented with sodium chloride (2%) was used to grow approximately 60 grams of the SA8 bacteria. The cells were treated with lysostaphin, DNase, RNase, and Proteinase K to remove the majority the cellular components. Then ethanol precipitations (25% and 75%) and ion-exchange chromatography were used to obtain fractions containing CP8. Pools of fractions, as determined by absorbance readings (213 nm), that tested positive for reducing sugars and negative for phosphorus were lyophilized and considered to be pure CP8 samples based on previous studies. Purified CP8 was used in an indirect enzyme-linked immunosorbent assay (ELISA) to test for the presence of antibodies in the serum of mice immunized with formalin-killed SA8. In addition, hybridomas were constructed by the fusion of immunized mouse splenocytes with myeloma cells. One subclone was detected by ELISA with antibodies directed against CP8.

BOARD 29 A REAL-TIME PCR-BASED SYSTEM FOR RAPID AND SPECIFIC DETECTION OF SPOILAGE YEASTS AND MOLDS IN FOODS. KAI WAN¹ AND HUA WANG^{1,2}. ¹DEPT OF FOOD SCIENCE, 2015 FYFFE RD., COLUMBUS, OH43210, ²DEPT OF MICROBIOLOGY, COLUMBUS, OH 43210. WAN_31@OSU.EDU.

Every year about 10% of food supplies are lost due to spoilage. Spore-forming, thermophilic and acidophilic bacteria, molds and yeasts are the leading responsible microbial agents. Proper and rapid detection of the presence of these agents in raw materials and final products are critical for quality control. The objective for this study was to develop a detection platform enabling rapid, specific and sensitive detection for spoilage molds and yeasts in foods using the real-time Taqman PCR-based approach. Two pairs of universal primers (5' TGCATGGCCGTCTTAGTTGG 3' and 5' GTGTGTACAAAGGGCAGGG 3') for 18S rDNA was derived based on DNA sequence comparison. The primer pair was used to amplify the 370 bp 18S rDNA fragments from representative molds and yeasts. The sequences of the newly obtained fragments were further aligned with other 18S rDNA sequences available from the database. Yeast-specific and mold-specific primer-and-probe pairs suitable for the Taqman assay were developed*. Specificity studies indicate that these primer-and-probe pairs do not cross react with common food-borne bacteria and food ingredients. Further, the presence of molds and yeasts was detected from industry environmental samples, apple juice and juice concentrate spiked with target organisms using the newly developed real-time PCR system. The detection procedures can be completed within a working day. This is a significant improvement compared to the current industry practices that take from 48 hr to weeks to identify and characterize these organisms. Implementation of such a system can greatly benefit the food industry by saving time and money, and maintaining brand image and quality. * Details of this detection system can be found in US patent application Attorney Docket Number (CALFEE HALTER & GRISWOLD LLP) 22727/04148 (Wang et al., 2003).

BOARD 30 CHANGES IN BACTERIAL COMMUNITIES IN A NORTHEAST OHIO STREAM IN THREE DISTINCT HABITATS: LEAVES, WATER AND SEDIMENTS. BY JUDY A. SANTMIRE, JSANTMIR@KENT.EDU, AND LAURA G. LEFF, LLEFF@KENT.EDU,, DEPT OF BIOLOGICAL SCIENCES, KENT STATE UNIVERSITY, BOX 5190, KENT OH 44242.

Few studies have simultaneously documented seasonal changes in multiple habitats in streams. In this study, seasonal changes (October 2000 to 2001) in bacterial communities in three habitats: sediments, leaves, and water, in the West Branch of the Mahoning River, were examined. Nitrate, phosphate, pH, temperature, conductivity, and turbidity were monitored. Total bacterial counts were done via epifluorescent microscopy using 3,6-diamidino-2-phenylindole (DAPI). Fluorescent *in situ* hybridization was done using taxon-specific probes (Domain Bacteria and *Burkholderia cepacia*). On leaves, bacterial abundance peaked in January (1.00E +07 per cm²) then declined through April with a June peak (6.74E +06 per cm²). Abundance in water peaked during October 2000 (8.39E +05 per ml) and in July (9.71E +05 per ml). Sediments peaked during October 2000 (9.86E +07 per g dry weight). Trends were similar with the Domain Bacteria probe. An autumn peak on leaves (1.82E +05 per cm²) for *Burkholderia cepacia* was followed by a second peak in July (1.82E +05 per cm²). In contrast, two peaks occurred with *Burkholderia cepacia* in water in February (1.32E +04 per ml) and September (1.92E +04 per ml). *Burkholderia cepacia* also peaked in autumn 2000 (1.94E +06 per g dry weight) on sediments. Domain Bacteria and DAPI counts reflected abiotic factors; conversely, *Burkholderia cepacia* exhibited different seasonal patterns.

BOARD 31 CORRELATION OF MULTIPLE PRIMER T-RFLP PROFILES WITH *IN SILICO* AMPLIFICATION AND DIGESTIONS OF CONSERVED RIBOSOMAL GENE SEQUENCES TO CHARACTERIZE COMPLEX MICROBIAL COMMUNITIES. FREDERICK C. MICHEL, JR. (MICHEL_36@OSU.EDU) AND STEPHEN SCIARINI (SCIARINI_3@OSU.EDU), DEPT OF FOOD, AGRICULTURAL AND BIOLOGICAL ENGINEERING, 1680 MADISON AVE., THE OHIO STATE UNIVERSITY-OARDC, WOOSTER, OH 44691.

Terminal restriction fragment length polymorphism analysis of 16S rRNA genes (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 phylogenetic information can be obtained without direct sequencing of 16S rRNA gene fragments. However, few methods exist to compare TRFs from multiple digestions to the TRFs expected based on computer modeled amplification and digestions of ribosomal 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 (8F, 907R, 11F, 226F, 1111R) and restriction enzymes (*Msp1*, *Hha1*, *Rsa1*, *HaeIII*, and *Bfa1*) 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 multiple experimental T-RFLP profiles in descending 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. Analysis of samples from twelve agricultural soils showed that a majority of the TRF sizes corresponded to sizes predicted by *in silico* digestion. However, the TRF areas corresponding to three different digestions comprised less than 40% of the total PCR product. In conclusion, FRAGSORT is a useful tool for rapidly analyzing microbial community composition based on multiple digestion T-RFLP data.

BOARD 32 THE USE OF QUEEN ANNE'S LACE (DAUCUS CAROTA) IN AN ANALYSIS OF ROOT TO SHOOT RATIO TO DETERMINE THE EFFECTS OF WHITE-TAILED DEER (ODOCOILEUS VIRGINIANUS) HERBIVORY. ADAM L. HARTLEY ALHART31081@AOL.COM, (JAMES L. DOOLEY, JDOOLEY@MUSKINGUM.EDU), DEPT OF BIOLOGY, MUSKINGUM COLLEGE, 163 STORMONT STREET, NEW CONCORD OH 43762.

During the last century increasing numbers of white-tailed deer (*Odocoileus virginianus*), and expansion of their range has increased concern for damage to plant populations in the eastern United States. The use of herbaceous plants to determine the effects of white-tailed deer on plants and plant populations also is increasing. This study focuses on the morphology of Queen Anne's Lace (*Daucus carota*) to monitor the effects of herbivory. Fieldwork was done during the months of October and November of 2003 at Salt Fork State Park in Guernsey County, Ohio. The sample sites chosen are in two areas designated as hunting, with an assumed lower deer density compared to two areas designated as non-hunting, with an assumed higher deer density. From each site 50 plants were collected. The number of browsed stems versus flowering stems will be used to determine the intensity of herbivory between sites. Root to shoot mass ratios will be used as an indicator of growth investment under various levels of herbivory pressure. Areas of

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 lower 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 NICKELL, PNICKELL.3@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 effect 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 silviculture. 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 budscars 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/mi²). The ages of all 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 sugar maple age classes correlated 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. BRADFORD S. SLAUGHTER, SLAUGHBS@MUOHIO.EDU, DAVID L. GORCHOV, GORCHODL@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 herbs in the eastern United States. We assessed the effects of herbicide (Roundup®) on *A. petiolata* density and native species richness in an old-growth and 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 we determined density of *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 ($X^2= 12.1$, $df= 1$, $P< 0.001$) and second-growth ($X^2= 4.2$, $P= 0.040$) 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. The lack of a treatment effect on 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 AMYGARCHAR@YAHOO.COM, COURTENAY N. WILLIS CNWILLIS@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 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 (e"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/Springfield Fen, Kiser Lake Wetlands, and Prairie 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 *Pychatherium tenuifolium* Schrad. (Lamiaceae), *Lythrum salicaria* L. (Lythraceae), *Andropogon gerardi* Vitman (Poaceae), *Phlox maculata* L. (Polemoniaceae), *Steironema quadriflora* Sims (Primulaceae), *Potentilla fruticosa* L. (Rosaceae), *Galium aparine* L. (Rubiaceae), and *Thelypteris palustris* Schott (Thelypteridaceae).

BOARD 36 LDH/ADH ACTIVITY IN VASCULAR AQUATIC PLANTS IN RESPONSE TO HYPOXIC STRESS. JORDAN R. BEACH BEACHJR@MUC.EDU JORDAN BEACH, BOX #186 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 an increase of end products, primarily lactate and ethanol. The amount of fermentative glycolysis occurring and the relative increase under hypoxic conditions can be found through the enzyme activity of lactate dehydrogenase (LDH), which along with NADH reduces pyruvate into 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 nmol) oxidized per second. Despite the number of studies involving 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 NO₂. The extraction will done using a KPi buffer and the amount of enzyme present will be found using assays of NADH and pyruvate. The plants include *Saururus cernuus*, *Pontederia cordata*, *Polygonum amphibium*, and *Mentha arvensis*.

BOARD 37 SURVEY OF OHIO'S NURSERIES FOR THE SUDDEN OAK DEATH PATHOGEN, *PHYTOPHTHORA RAMORUM*, AND RELATED PATHOGENIC *PHYTOPHTHORA* SPP. OF RHODODENDRON (ERICACEAE). MIKAEL P. SCHILB¹ (M_SCHILBY18@HOTMAIL.COM), JEFFREY S. LEHMAN¹ (JLEHMAN@OTTERBEIN.EDU), MARIA BELLIZZI (BELLIZZI.1@OSU.EDU)², AND PIERLUIGI BONELLO² (BONELLO.2@OSU.EDU), ¹155 MAIN ST DEPT OF LIFE SCIENCE, OTTERBEIN COLLEGE, WESTERVILLE, OH 43081, ²DEPT OF PLANT PATHOLOGY, OHIO STATE UNIVERSITY, COLUMBUS OH.

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* found on leaves and shoots of rhododendrons growing in Ohio nurseries and 2) determine whether *P. ramorum* is present in Ohio. Rhododendrons in 15 nurseries throughout Ohio were sampled for foliar/shoot diseases. Fifty-five cultures were isolated on *Phytophthora*-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 concurring 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. Based on the sequence data, *P. citricola*, *P. cactorum*, 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 *PLATYGERIUM BIFURCATUM* IN THE PRESENCE OF POTASSIUM ARSENATE. SARAH M. JURAK AND JEFFREY S. LEHMAN, 155 WEST MAIN ST, DEPT OF

LIFE SCIENCES, OTTERBEIN COLLEGE, WESTERVILLE, OHIO 43081.
JURAKSA@YAHOO.COM, JLEHMAN@OTTERBEIN.EDU

Ferns differ in their ability to tolerate arsenic, a widespread environmental contaminant. This study describes gametophyte development of *Pteris vittata* (an arsenic hyperaccumulator) and *Platyserium 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 *Platyserium 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 (\pm SD) of prothallia 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 *Platyserium 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 ± 0.3 and 19.5 ± 0.7 days, respectively. Percentage formation of *Pteris vittata* prothallia was $63.6\% \pm 4.1$, $64.2\% \pm 6.9$, $61.0\% \pm 4.2$, and $60.4\% \pm 3.0$ at 0, 100, 500, and 1000 ppm arsenic, respectively; all values were statistically the same. Values for percentage formation of prothallia of *Platyserium bifurcatum* were $59.1\% \pm 20.1$, $45.1\% \pm 26.6$, $2.4\% \pm 2.8$, and $0.4\% \pm 0.5$ at 0, 100, 500, and 1000 ppm arsenic, 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* are unaffected by high levels arsenic while prothallia of *Platyserium bifurcatum* are greatly inhibited and exhibit delayed development by arsenic levels ≥ 100 ppm.

BOARD 39 EFFECTS OF NITROGEN FERTILIZER ON PEPPER PLANT GROWTH RESPONSES MEASURED AT SOIL MOISTURE FIELD CAPACITY. HIRUY SOLOMON, HSOLOMON@STUDENT.CSCC.EDU, AND MORTEZA JAVADI, MJAVADI@CSCC.EDU, COLUMBUS STATE COMMUNITY COLLEGE, BIOLOGICAL AND PHYSICAL SCIENCES DEPT, 550 EAST SPRING ST., COLUMBUS OH 43216.

Hydroponics and seed germination methods are routinely utilized to study plant growth responses to nutrient regimes. These methods require several weeks to produce well-established plants. As an alternative, commercially obtained mature plants can be used in order to conduct nutrient experiments. However, various soil moisture contents in different pots, presents a source of experimental error when measuring plant growth responses to a nutrient regime. Effects of varying rates of nitrogen fertilizer on the growth responses of ten week old pepper plants (Capsicum chinense) were determined. In a three week Completely Randomized Design Experiment, containing 5 replications and 4 treatments (N=20), plants of various mass, height, and leaf size received 25 ppm, 75 ppm, and 225 ppm of nitrogen fertilizer, in the form of ammonium sulfate (21-0-0). Nitrogen fertilizer was dissolved in distilled water, and nitrogen stock solution was prepared to deliver an equivalent of 25ppm, 75 ppm, and 225 ppm of nitrogen to the plants. A control group of plants received distilled water only. Each pot contained its individual retaining tray. Plants were irrigated by capillary method, and trays were replenished with the nitrogen stock solution every three days. The plants receiving 225 ppm nitrogen showed the greatest percent gain in mass, height, and leaf size. Regression analysis showed a positive cause and effect between the nitrogen levels and the plant growth responses, with correlation coefficient values of 0.22, 0.16, and 0.52 for the plant height, the plant mass, and the leaf size respectively. Measuring plant growth responses at soil moisture field capacity for established plants can be successfully used when seed germination and hydroponics methods, due to lengthy time requirements to produce mature plants, are not feasible.

Poster Session 10:00-11:00 am

BOARD 01 ANALYSIS OF N-CADHERIN FUNCTION IN DEVELOPING ZEBRAFISH (*DANIO RERIO*) RETINAL GANGLION CELLS. ELAHEH AZODI, ELAHEH@UAKRON.EDU, QIN LIU, QLIU@UAKRON.EDU, DEPT OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3908.

Cadherins are homophilic Ca²⁺ K-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 (RGCs). In this study, N-cadherin function in zebrafish RGC development was analyzed using a zebrafish N-cadherin dominant negative construct (Ncad^C). The Ncad^C was generated using standard RT-PCR and ligation techniques. This Ncad^C construct contains 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 1-4 cell stage zebrafish embryos (n=80) resulted in transfected cells, detected by immunocytochemistry using an anti-myc antibody, throughout the embryos, including the retina. The preliminary data showed that Ncad^C transfected RGCs (n=10) had no processes or 1-2 short processes, whereas RGCs transfected with a control construct (n=41) had several processes (4-6), suggesting that N-cadherin plays an important role in the differentiation of zebrafish retinal ganglion cells.

BOARD 02 HOW DOES ODOR SAMPLING CHANGE AS CRAYFISH GROW: HIGH-SPEED VIDEO STUDIES OF *ORCONECTES IMMUNIS*. JULIE A.E. HUFNAGEL, HUFNAG_J@DENISON.EDU, (KRISTINA S. MEAD, MEADK@DENISON.EDU), DENISON UNIVERSITY, SLAYTER BOX 1107, GRANVILLE OH 43023.

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 chemicals in the surrounding fluid. The size, shape, and arrangement of the sensors on antennules, and their speed relative to the surrounding fluid, all affect the odor sampling. Specimens (N=25) of the local crayfish species *Orconectes immunis* were collected from Hebron Hatchery, a low-flow habitat of artificial muddy lake bottoms. Crayfish were collected over a large size range 28-78mm, rostrum to telson length. As crayfish grow, they participate in more social encounters (mating, burrow defense, and other antagonistic interactions). To see if antennular flicking reflected these size-dependent needs, antennular flicking in four different size classes was observed. Crayfish were stimulated to flick using cat food pellet extract, and were filmed flicking in a special filming chamber using a high-speed digital video camera. The videos were captured using the Dazzle[®] MovieStar[™] 5 program. The chamber's mirrored walls will allow 3-D image analysis using ImageJ 1.29x software. The variables that will be analyzed are: antennule velocity, flick angle, and antennule structural parameters. These measurements will be used to calculate the Re (Reynolds number) describing the flick and also the volume of fluid sampled per flick. The hypothesis of this study is that antennular flicking will be faster, will sample a greater volume, and will have a larger Re in the large size classes than in the small size classes.

BOARD 03 MALE BIASED SEX RATIO IN YOUNG OF EASTERN BLUEBIRDS (*SIALIA SIALIS*). LAUREN L. KORDONOWY, KORDONOWYL@KENYON.EDU, R. A. MAUCK, AND E. R. HEITHAUS, KENYON COLLEGE, DEPT OF BIOLOGY, GAMBIER OH 43022.

Eastern bluebirds (*Sialia sialis*) were studied in nest boxes to determine if environmental conditions influenced the sex ratios of young. According to sex ratio theory, a male biased sex ratio is favored under conditions of resource richness and high variance in male reproductive success because healthy males are more reproductively successful than healthy females. In 2003, unusually high levels of rainfall should have promoted resource richness in our study site. Twenty-seven nest boxes were monitored daily at the Brown Family Environmental Center at Kenyon College, Knox County, Ohio. Growth rates of chicks were determined and feeding rates observed. The sex of young was determined just prior to fledging. Sex ratios were skewed towards the production of male young; in 11 nests there were on average 2.8 ± 0.33 (sd) male chicks born per nest and only 1.3 ± 0.20 (sd) females (One-sample t test, $t=3.14$, $P=0.011$). The mechanism for a male-biased sex ratio occurred prior to egg-laying; fatalities among hatchlings were minimal, and weights were similar in males and females. The results of this study would predict high levels of extrapair paternity in this bluebird population because extrapair paternity would provide the variation in reproductive success that drives male biased sex ratios in this socially monogamous species.

BOARD 04 SPIDER MITE CONTROL IN RELATION TO DEHYDRATION TOLERANCE OF THE LADYBIRD BEETLE, *STETHORUS NIGRIPES* (COLEOPTERA: COCCINELLIDEA) JOSHUA B. BENOIT¹, S05.JBENOIT@WITTENBERG.EDU, JAY A. YODER¹, JYODER@WITTENBERG.EDU, DARREN A. POLLOCK², DARREN.POLLOCK@ENMU.EDU, ¹WITTENBERG UNIVERSITY, DEPT OF BIOLOGY, SPRINGFIELD, OH 45501 and ²EASTERN NEW MEXICO UNIVERSITY, DEPT OF BIOLOGY, PORTALES, NM 88130.

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, *Stethorus nigripes* Kapur, a spider mite predator imported into New Mexico, for potential use in soybean fields in the midwestern United States. Typically water balance profiles match moisture requirements for life in a given environment and are derived mostly from analyzing water loss rates. Beetles were placed at varying relative humidities (0%, 85%, 93% and 98%) and body water levels were monitored with an electrobalance. Observations were conducted at 14h:10h 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 of water is their food, the blood and tissue fluids from spider mite prey. Beetle pupae had low water loss rates (0.4%/h). In general, the water balance strategies throughout the life history of *S. nigripes* compare favorably to patterns observed in other insects, including a 64% water content and accompanied by a modest 25% loss before succumbing to desiccation. The only distinctive feature was the fast water loss rate of the adult, indicating a preference for a moisture-rich environment. This hydrophilic water balance characterization of *S. nigripes* agrees with their tropical origin and occurrence in hot, humid habitats. The high moisture requirement of *S. nigripes* may be one of the drawbacks when using this particular beetle species broadly for controlling mites. Our conclusion is that *S. nigripes* would be a poor choice of beetle for spider mite control in the temperate zone.

BOARD 05 HATCHING VIABILITY OF LONE STAR TICK EGGS (*AMBLIOMMA AMERICANUM*) AS AN INDICATION OF SPECIES RANGE AMANDA M. OPALUCH, s05.AOPALUCH@WITTENBERG.EDU, JOSHUA B. BENOIT, s05.JBENOIT@WITTENBERG.EDU, JAY A. YODER, JYODER@WITTENBERG.EDU, WITTENBERG UNIVERSITY, DEPT OF BIOLOGY, SPRINGFIELD, OH 45501.

A new disease vector, the lone star tick, *Amblyomma americanum* (L.), carrier of tularemia, babesiosis and Lyme-like rash, has expanded its range from Texas and Louisiana into certain parts of Ohio (Clark Co.), Indiana (Brown Co.) and Illinois (Morgan Co.) based upon field sweeps. Increased spread of ticks is linked closely with successful hatching of larvae because the egg is the most susceptible stage to dehydration during the tick's lifecycle. This study reports water balance characteristics of tick eggs from field-collected fed females to help better understand this northern expansion. Eggs were held at different relative humidities and were monitored singly by weighing with an electrobalance; test conditions were 14h:10h, L:D, 22-24°C, and each determination represents 3 replicates of 12 eggs each. Eggs failed to maintain an equilibrium water content in subsaturated air. Therefore, gain does not equal loss and net water losses of up to 2%/d were observed at relative humidities near saturation. Water stress is not countered in eggs using water vapor. The greatest number of viable eggs occurred at 100% RH (87% hatching rate) with a drop (32% hatching rate) at near-saturated 93% RH. This classifies *A. americanum* as stenohydric, thus implying a specific ecological restriction and suggesting a role for liquid water as a developmental cue to trigger hatching. The tick eggs displayed common water conservation features, a low 58% water content, slow water losses < 1%/h, and an impermeable chorion wherein the Arrhenius activation energy, $E_a = -66\text{J/K}$, was suppressed. Thus, enhancement of water retention, not water vapor absorption, permits eggs to resist desiccation, and this has likely played a key role in promoting the northern expansion and establishment of *A. americanum* into cold and dry temperate regions.

BOARD 06 URIC ACID AS A HOST CUE (KAIROMONE) FOR BIRD DETECTION BY IMMATURE LONE STAR TICKS, *AMBLIOMMA AMERICANUM*, WITH POSSIBILITIES FOR ENHANCING CONTROL. GREGORY C. LUERMAN, s04.GLUERMAN@WITTENBERG.EDU, JEFF L. DOMINGUS, s04.JDOMINGUS@WITTENBERG.EDU & JAY A. YODER, JYODER@WITTENBERG.EDU, DEPT OF BIOLOGY, WITTENBERG UNIVERSITY, SPRINGFIELD OH 45501.

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 standard short-range, 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. Arrestment was not as pronounced with other uric acid concentrations (7 total test concentrations ranging from 0.001-1.0M). Ticks that came in contact with uric acid-treated surfaces ceased ambulatory activity (3-5 sec), curled legs under their body, and remained akinetic for 2-4h. No attraction response to uric acid was noted, nor any attraction or arrestment responses to acetone alone or untreated filter paper discs were noted (10 per replicate each; N=10; χ^2 , P<0.05). As a negative control, nymphs and adults of the American dog tick, *Dermacentor variabilis* (Say) did not register a positive response (0% arrestment; 10per replicate; N=10; χ^2 , P>0.05), consistent with their preference for mammalian hosts rather than birds. Our conclusion is that uric acid 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 ticks crawling away from acaricide-treated surfaces if applied with acaricide simultaneously.

BOARD 07 PHYLLOXERA SURVEY OF ELEVEN GRAPE CULTIVARS AT KINGSVILLE, OHIO. ROGER N. WILLIAMS, WILLIAMS.14@OSU.EDU, SANDRA GARCÉS, IMED DAMI, KEVIN MCCLURE, GREG JOHNS, DEPT OF ENTOMOLOGY AND HORTICULTURE, OARDC, THE OHIO STATE UNIVERSITY, WOOSTER OH 44691.

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 Ohio since the industry began in the mid-1800's. Since the mid-1900's French-American hybrids and Vinifera grape cultivars susceptible to the leaf form of phylloxera have been planted throughout the state. Due to the economic importance of the wine industry in Ohio, a survey of infestation levels of the leaf form of the phylloxera was conducted in October, 2003 at the Grape Branch of the Ohio State University at Kingsville, Ohio. The survey was carried out on eleven cultivars (Traminette, Bianca, Frontenac, Chardonnay C.L.76, Regent, Kozma 55, Kozma 525, Pinot Noir CL. 777, Seyval, Concord, and Pinot-Gris). Sixteen vines of each cultivar were evaluated. The cultivars Kozma 525, Frontenac and Bianca had the highest percentage of infested shoots with 77%, 75% and 73%, respectively, and Traminette had the lowest infestation with 35%. The Concord 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. Traminette had more when adjacent to Frontenac, while Pinot Noir CL.777 was least affected by proximity to heavily infested cultivars.

BOARD 08 CONTROL OF MULTICOLORED ASIAN LADY BEETLES ON GRAPES, WOOSTER, OHIO. ROGER N. WILLIAMS, WILLIAMS.14@OSU.EDU, DAN S. FICKLE, KEVIN B. MCCLURE, MARK E. HEADINGS, OARDC AND ATI, THE OHIO STATE UNIVERSITY, WOOSTER OH 44691.

The Multicolored Asian lady beetle (MALB), *Harmonia axyridis* (Pallas), has become a major pest in wine 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 begin to senesce, some MALB ultimately move on to damaged 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 detrimentally affect the taste of the wine produced. MALB contamination of 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 (attractance), absence from grapes (repellence), and knockdown (debilitation). The resultant recovery or mortality of the MALB after knockdown was also noted. Consequently, we found several products with potential for control of MALB in grapes. Of products tested, Aza-Direct had the greatest repellent properties while Provado and a mixture: Rotenone/Pyrethrins showed knockdown of MALB with subsequent recovery. Assail showed knockdown and complete mortality of beetles. All of these products have potential for use in field trials for MALB control on grapes.

BOARD 09 NEUROTROPHIN-3 IMPROVES RECOVERY TIME FOLLOWING NOISE-INDUCED

SENSORINEURAL HEARING LOSS AND CAUSES HAIR CELL GROWTH IN THE *COLOURLESS* MUTANT OF ZEBRAFISH. PATRICK MCKENZIE (PMCKENZIE@WOOSTER.EDU), RICHARD LEHTINEN (RLEHTINEN@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 Shah-Waardenburg Syndrome in humans have significant correlations to defects in zebrafish, namely the *colourless* mutation. Using the information obtained from the response of zebrafish to a neural growth factor, Neurotrophin-3 (NT-3), therefore, could allow new therapies to be developed to combat human deafness. 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 (n=62) had a recovery time of 8.9 ± 1.0 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. Furthermore, 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 WRENS (*TROGLODYTES AEDON*). JESSE R. LASKY, LASKYJ@KENYON.EDU; ROBERT A. MAUCK, MAUCKR@KENYON.EDU. DEPT OF BIOLOGY, KENYON COLLEGE, GAMBIER, OH 43022.

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 the doubly-labeled water technique. Provisioning was measured by the number of feeding visits by adults to the nest and mass of nestlings in the five days after treatment. Compared to nestlings of control mothers (N=9), nestlings of treatment mothers (N=6) were not significantly different in mass (Mann-Whitney U-test, $p=0.7983$) nor were they fed significantly less often (Mann-Whitney U-test, $p=0.4060$). FMR data are not yet available. Greater sample size is needed to confirm the result of no difference between control and treatment groups.

BOARD 11 THE EFFECTS OF PP1 α , PP1 γ , AND PP1 ω IN THE *PARAMECIUM* CELLULAR DIVISION. SABRINA BARROS (SBARROS@WOOSTER.EDU). DR. DEAN FRAGA (DFRAGA@WOOSTER.EDU). DR. WILLIAM MORGAN (WMORGAN@WOOSTER.EDU). DEPT OF BIOLOGY, 931 COLLEGE MALL, THE COLLEGE OF WOOSTER, 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 PP1 α , PP1 γ , and PP1 ω . This study will determine if those isoforms have an effect on the cell 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 the effect of RNAi, 1-5 *Paramecium* is/are fed bacteria expressing PP1 α , PP1 γ , or PP1 ω 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 α or γ vectors divide slower, especially the cells containing the α vector. In addition, cells fed PP1 α 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 VALPROIC ACID ON LIMB DEVELOPMENT IN CHICKEN EMBRYOS. DENISE M. POST, D-POST@ONU.EDU, (AMY L. AULHOUSE, A-AULHOUSE@ONU.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 doubled stained using Hanken and Wasserug (1981) protocol. Cartilage will be detected using alcian 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 skeletal abnormalities by measuring the amount of 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 CHRIONOMID *TELMATOGETON TORRENTICOLA* (DIPTERA). MARINA STANBERY STANBEME@NOTES.UDAYTON.EDU, (MARK G. NIELSEN, MARK.NIELSEN@NOTES.UDAYTON.EDU) DEPT OF BIOLOGY, UNIVERSITY OF DAYTON, DAYTON, OH 45469-2320.

The Hawaiian Islands provide an exceptional opportunity to address evolutionary hypotheses because of their geographic isolation and known age. Chironomids (midges) colonized the oldest island, Kaua'i, 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 panmictic marine population or 2) the terrestrial form evolved only once, and was carried to the different islands by storm. To resolve these hypotheses, the population structure and evolutionary history of the chironomid *Telmatogeton torrenticola* is determined using the mitochondrial gene cytochrome oxidase as a molecular clock. Cytochrome oxidase has been cloned and sequenced from ten individuals representing three different streams on Maui. Sequence comparisons resolve these insects into two groups, those individuals from Hanavi and Kehoma streams, and those from Iao stream. There is no geographical feature that easily explains this result, but as 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 *ODONTOTAENIUS DISJUNCTUS* (COLEOPTERA: PASSALIDAE). MICHELLE K. COLE, 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 (*Odontotaenius 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 (new moon, half moon and full moon) at the appropriate time of the 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 and compared to determine if time spent feeding, walking, and burrowing differed between the three light treatments. Total amount of time spent feeding, walking, and burrowing differed significantly between the high 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 LAND AND WATER. KATHRYN E. CAMERON, CAMERONK@KENYON.EDU, HEIDI E. SCHERMER, SCHERMERH@KENYON.EDU, (CHRIS GILLEN, GILLENL@KENYON.EDU) P.O. Box 1247, KENYON COLLEGE, GAMBIER OH 43022.

Sand fiddler crabs (*Uca pugilator*) are sexually 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. 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, $p=0.001$). Gender effected movement in starved crabs but not in fed crabs. Starved males moved 2.2 ± 0.6 times while starved females moved 1.0 ± 0.4 times (ANOVA, $p=0.00$). During the one-hour test 44% of the starved animals foraged, while only 6% of the fed animals foraged (chi-square, $p=0.00$, $n=96$). Burrows were dug by 67% of the fed animals, but by only 23% of the starved animals (chi-square, $p=0.00$, $n=96$). In conclusion, starved crabs moved and foraged more than fed crabs. Furthermore, starved males moved more than starved females.

BOARD 16 MECHANICALLY EFFECTIVE AGENTS IN THE MUTABLE COLLAGENOUS TISSUES OF THE CLASS HOLOTHUROIDEA ALSO AFFECT THE TISSUES OF THE CLASS ASTEROIDEA. MONICA L. DURBIN, DURBINML@HIRAM.EDU, LAURA T. MOLE, MOLELT@HIRAM.EDU, AND GREG K. SZULGIT, SZULGITGK@HIRAM.EDU, HIRAM COLLEGE, DEPT OF BIOLOGY, POB 67, HIRAM, OH 44234.

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 using 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 the hypothesis by cutting frozen arms of the sea stars *Echinaster (Othilia)* sp. and *Astropecten articulatus* into rings, which were placed in extracts from the inner and outer dermis of *C. frondosa*. We then hung a 350g weight on each ring-shaped specimen and measured the time that it took for that specimen to break. *Echinaster (Othilia)* sp. tissues bathed in inner-dermis extract took significantly longer to break than those bathed in outer-dermis extract (1982 ± 611.5 s at $1.7 \pm .46$ MPa vs. 182.3 ± 139.6 s at $2.0 \pm .43$ MPa; $p \leq 0.05$). The same was true of *A. articulatus* tissues (116.2 ± 80.4 s at $1.5 \pm .29$ MPa vs. 33.7 ± 39.5 s at $1.1 \pm .32$ MPa; $p \leq 0.05$). This suggests that the chemical mechanisms that cause stiffness changes in the classes Holothuroidea and Asteroidea might be similar.

BOARD 17 THE MECHANICALLY EFFECTIVE AGENTS IN MUTABLE COLLAGENOUS TISSUES OF CUCUMARIA FRONDOSA AFFECT THE TISSUES OF ISOSTICHOPUS BADIONOTUS. 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.

Sea cucumbers can rapidly and reversibly alter the stiffness of their connective tissues in response to a number of stimuli. Two distinct extract solutions can be made from the inner and outer regions of the body wall of the sea cucumber *Cucumaria frondosa*, and these extracts have either a stiffening or a softening effect on tissues of the same species. These same extracts affect tissues of another species suggesting that chemical mechanisms causing changes in tissue stiffness are somewhat conserved at the family level in the case of Cucumariidae. Previous experiments showed that extracts from *C. frondosa* also affected *Isostichopus badionotus* (Selenka) (Family: Stichopodidae). Using creep (a measure of

stiffness), we tested the hypothesis that extracts of diminishing concentrations would have diminishing effects on the tissues. Relative stiffness (measured as time until breaking occurs) decreased with increasing extract concentrations, $F(2,18)=30.88$, $p < 0.05$. There was no significant effect of solution type on time to breakage when concentration was not taken into consideration, $F(1,18)=1.086$, $p > 0.05$. An interaction effect of extract type and concentration was found. As expected, tissues in concentrated outer dermis extract were less stiff (97 ± 48 sec. at 0.3MPa) than those in concentrated inner dermis extract (939 ± 201 sec. at 0.3MPa), $t(4)=-7.55$, $p < 0.05$. Tissues in outer dermis extract solution were less stiff than those in artificial seawater (3754 ± 1299 sec. at 0.4MPa), $t(3)=-4.87$, $p < 0.05$. Unexpectedly, tissues in inner dermis solution were also less stiff than those in artificial seawater, $t(3)=-5.89$, $p < 0.05$.

BOARD 18 THE FUNNEL-WEB SPIDERS AGELENOPSIS PENNSYLVANICA AND A. UTAHENSIS DIFFER IN WEB DISCRIMINATION ABILITY (ARANEAE: AGELENIDAE). KENDALL ESHLEMAN, ESHLEMAN@HIRAM.EDU, J. H. BARROW FIELD STATION, DEPT OF BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234, KEELY DAVIDSON, DAVIDSONK@HIRAM.EDU, AND SAMUEL MARSHALL, MARSHALLSD@HIRAM.EDU.

Two web choice tests were conducted on *Agenopsis pennsylvanica* and *Agenopsis utahana*: 1. own web vs. conspecific web, and 2. own web vs. heterospecific web. In the conspecific web choice test, eight *A. pennsylvanica* spiders chose their own web, two chose the other web, five did not choose, and two escaped. Based on the results a binomial test of an *a priori* expectation of random settlement (i.e. 50/50 own web versus strange web) *A. pennsylvanica* chose their own webs significantly more often than the strange web ($P = 0.0440$). Of the *A. utahana* spiders tested, seven chose their own web, six chose the other web, and six did not choose. Based on a binomial probability, *A. utahana* did not discriminate between web types ($P = 0.2095$). For the own web vs. 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 as noticeable trend, $P = 0.1093$). *A. utahana* spiders were tested: four chose their own web, six chose the heterospecific web and two made no choice. Based on the binomial 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. utahana* settled randomly with respect to web identity.

BOARD 19 DIEL VERTICAL MIGRATION IN LAKE ERIE: IMPORTANT PELAGIC-BENTHIC LINKAGE? HEATHER M. HICKEY, HHICKEY@BGNET.BGSU.EDU, TODD A. HAYDEN, AND JEFFERY G. MINER, PROGRAM IN ECOLOGY, EVOLUTION, AND CONSERVATION BIOLOGY, DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

Vertical migration of zooplankton is generally acknowledged but has not been well addressed in Lake Erie. However, in Lake Erie, the reduction in loading of phosphorus and the presence of dreissenid mussels have caused water clarity to increase and thus may have a strong influence on the extent of vertical migration. Additionally, linkages between the pelagia and benthos can provide important nutrient mixing. In order to determine the extent of zooplankton vertical migration in the shallow waters of western Lake Erie, replicate horizontal tows (500 μ m mesh net) were taken on three dates in summer 2002 at three depths (2, 5, and 8m) in water ≥ 10 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 THE POPULATION DEMOGRAPHICS OF MEADOW VOLES (*MICROTUS PENNSYLVANICUS*) AND WHITE-FOOTED MICE (*PEROMYSCUS LEUCOPUS*) AT THE WILDS. ELI B. HACKER, EHACKER@MUSKINGUM.EDU, (JAMES L. DOOLEY,

JDOOLEY@MUSKINGUM.EDU), DEPT OF BIOLOGY, MUSKINGUM COLLEGE, 163 STORMONT ST, NEW CONCORD, OH 43762.

The purpose of this research was to examine the degree to which habitat isolation affected sex ratios and age ratios of meadow voles (*M. pennsylvanicus*) and white-footed mice (*P. leucopus*) within the boundaries of The Wilds, which is located near Cumberland, OH 43732. Differences in population parameters were among habitat patches compared across six plots representing two treatments (small isolated grassland patches and larger grassland isolated patches) and one control (large contiguous grassland). Isolation was defined as the property of a given patch to remain connected 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. pennsylvanicus* 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@ONU.EDU, OHIO NORTHERN UNIVERSITY, DEPT OF BIOLOGICAL SCIENCES, ADA OH 45810.

Ohio Northern University and the Ohio Department of Natural Resources are working together to establish a wetland complex 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. Eight walking 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 (*Poocetes 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 HABITS OF THE EASTERN COYOTE (*CANIS LATRANS*) IN SOUTHEASTERN OHIO. CHARLOTTE A. WORSTALL, WORSTALL@MUSKINGUM.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, Chandlersville/Salt Creek, and the Wilds reclamation area, all located in Muskingum County, Ohio, have been identified as areas supporting coyote activity. 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 sites consist of prairie-like habitat with limited deciduous forest cover. The Chandlersville 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 Chandlersville 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, AARONB@MUSKINGUM.EDU 1648 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 Wilds, a 3,700 hectare reclaimed stripmine located at the juncture of Guernsey, Muskingum, and Noble counties, Ohio, provides a unique opportunity to compare the herpetofaunal species richness and diversity between local stands of remnant forest and reclaimed grasslands. The herpetofauna on both unmined remnant forests and reclaimed grasslands on the Wilds were surveyed. I hypothesized that reclaimed grasslands would have reduced reptile and amphibian diversity when compared to the remnant forests. Four sites (two grassland and two remnant forest plots) were examined. On each plot, two randomly placed 30 m drift fences with four pitfall traps and four shelter boards per fence were constructed. Four funnel traps were placed in the adjacent water source of each site. Traps were checked approximately three times a week during June, July, and mid-September through mid-October 2003, recording various weather parameters (daily average temperature, daily precipitation, and percentage of cloud cover) and the number of individuals of species captured during each visit. Initial observations suggest that terrestrial amphibian species richness and abundance were notably lower on the grassland versus the forest plots, as individuals were captured far less frequently in the grassland plots (N grassland= 9, N forest= 71). However, individuals of certain snake species such as the eastern garter snake (*Thamnophis sirtalis sirtalis*) were captured more frequently on the reclaimed plots (N grassland= 32, N forest= 5).

BOARD 24 THE DEVELOPMENT OF A STREAM MACROINVERTEBRATE FUNCTIONAL GROUP BIOASSESSMENT PROTOCOL FOR THE REPUBLIC OF PALAU ARCHIPELAGO. ALBERT J. BURKY¹ ALBERT.BURKY@NOTES.UJDAYTON.EDU, M. ERIC BENBOW², LISA M. KAISER¹, KATIE A. MEIER¹, TARITA HOLM³, ¹DEPT OF BIOLOGY, UNIVERSITY OF DAYTON, DAYTON OH 45469-2320; ²DEPT OF ENTOMOLOGY, MICHIGAN STATE UNIVERSITY, MI; ³OFFICE OF ENVIRONMENTAL RESPONSE AND COORDINATION, KOROR, REPUBLIC OF PALAU.

Many archipelagoes of Pacific Oceania are on the brink of commercial development. This is especially true of island nations dependent on tourism for economic stability. The Republic of Palau is one such nation located 885 km west of the Philippines, where coral reefs and mangroves are threatened by stream silt load and sedimentation. We collected macroinvertebrate functional feeding group data for development of a rapid bioassessment protocol for Palauan streams. One reference stream was selected to test functional group ratios and associated ecosystem attributes against five streams of variable impact from road construction. In two habitats corresponding to different flow velocity ranges (riffles vs pools), 2 – 3 standardized, 30s dip net samples were collected and composited to represent the community. In the reference stream riffle habitat, the community was dominated by filtering-gatherers (87%) compared to all other functional groups. Among the impacted streams (N = 5), riffle functional group composition was variable compared to the reference stream. In reference pool habitats, gathering collectors were dominant, and all other functional groups were represented from 6 – 15%. Pool habitats of impacted streams were dominated by gathering-collectors, with some functional groups (e.g., filtering-collectors and predators) missing or reduced. Changes in ecosystem attributes followed functional group variability depending on degree of impact. Overall, functional group ratios indicated that channel stability ([filtering-collectors + scrapers]/[shredders + gathering-collectors]) was lowered with increasing impact, while food quality for filtering-collectors was degraded in riffle habitats. In pool habitats, degree of impact was associated with shifts from autotrophic to heterotrophic production.

BOARD 25 RESPONSES OF WETLAND MACROINVERTEBRATE ABUNDANCE AND COMPOSITION TO FLOOD-PULSING IN A HEADWATER FLOODPLAIN. ANGELA M. ROMITO AMROMITO@UGA.EDU AND FERENC A. DE SZALAY, DEPT OF BIOLOGICAL SCIENCES, KENT STATE UNIVERSITY, KENT OH 44242-0001.

While the importance of flood-pulsing (i.e., water movement between streams/rivers and adjacent floodplains) has been well-documented in large-river ecosystems (e.g. Amazon and Mississippi Rivers), few studies have applied the flood-pulse concept to headwater ecosystems. Understanding the impact of flood-pulsing on invertebrate communities in headwater streams will provide valuable insight into the functioning of this critical component of the watershed. In 2002, Kent State University constructed a 6100m²

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 (flood-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 flood-pulsed wetlands rose from baseline levels (80 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. Macroinvertebrates were sampled from June - October 2003 with sweep nets to test effects of flood-pulsing on invertebrate communities. A paired t-test detected that macroinvertebrate abundance was greater in flood-pulse wetlands than in stable wetlands ($p < 0.01$), while invertebrate 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. BARROW FIELD STATION: TURTLES AND SNAKES.
TIMOTHY GUIHER, GUIHERTJ@HIRAM.EDU, J. H. BARROW FIELD STATION, DEPT OF BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234, (SAMUEL MARSHALL, MARSHALLSD@HIRAM.EDU, AND WALTER MESHAKA,) THE STATE MUSEUM OF PENNSYLVANIA.

We report on two ongoing reptile population monitoring studies at the J. H. Barrow Field Station in Hiram Township, Portage County. The first is a cover board study of snake populations 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 and immediately released them where they were captured. Species captured were eastern garter snake (*Thamnophis s. sirtalis*), northern brown snake (*Storeria d. dekayi*), northern redbelly snake (*Storeria o. occipitomaculata*), black rat snake (*Pantherophis spiloides*), northern water snake (*Nerodia s. sipedon*), and eastern milk snake (*Lampropeltis t. triangulum*). Snakes greater than 20.0cm snout-vent length were also PIT (passive integrated transponder) tagged using AVID Music Chip Identification System Tags (AVID Identification Systems Inc., Norco, CA). We tagged 65 garter snakes, 10 milk snakes, 8 water snakes, 1 brown snake, and 2 black rat snakes. We used two types of turtle traps: hoop-net traps baited with sardines in late summer, and passive basking traps in the early summer and fall. We captured both midland painted turtles (*Chrysemys picta marginata*) and common snapping turtle (*Chelydra s. serpentina*) using both methods. We tagged a total of 84 painted turtles and 7 snapping turtles.

BOARD 27 EFFECTS OF TEMPERATURE LEVELS AND FLUCTUATIONS ON THE GROWTH AND DEVELOPMENT OF RANA PIPIENS. JENNIFER M. KAROW, JKAROW@MUSKINGUM.EDU (JAMES L. DOOLEY, JDOOLEY@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 in recent years and declining populations have become 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 degrees Fahrenheit, while some larvae will be exposed to fluctuating temperatures. It is expected that hatching success will be greatly decreased while mortality and deformities are increased at higher temperatures and in fluctuating environments. Results will be compared against these expectations using a regression-level analysis.

BOARD 28 GIVING-UP DENSITY VARIATION IN THE EASTERN CHIPMUNK, TAMIAS STRAITUS: THE

IMPORTANCE OF DISTANCE FROM THE BURROW.
JENNIFER B. WILSON, JBWILSON@MUSKINGUM.EDU, (JAMES L. DOOLEY, JDOOLEY@MUSKINGUM.EDU) DEPT OF BIOLOGY, MUSKINGUM COLLEGE, 163 STORMONT STREET, NEW CONCORD, OH 43762.

This study examined the influence of distance on the foraging of the eastern chipmunk (*Tamias Straitus*). Giving-up densities (GUD) will be used as the indicator in this study in order to draw conclusions about the impact of this factor on patch-use. The study area was Muskingum College located in Guernsey County, Ohio. The individual sites, or chipmunk burrows, were located mostly on the east side of campus ranging from residential to wooded areas. The diverse environment is an ideal habitat for chipmunks. The study was performed during months September, October and November of 2003. Artificial patches were made using pans holding fifty grams of sunflower seeds and three liters of sand to ensure the chipmunk experienced diminishing returns relative to its harvest effort as it exploited the patch. Pans were placed at various distances (0-20m) from eight burrows. It is predicted that GUD will decrease as distance from the burrow increases.

BOARD 29 GEOLOGIC MATERIALS USED IN CADDISFLY (TRICHOPTERA) CASES: PRELIMINARY RESULTS ON CADDISFLY SELECTIVITY IN NORTHEASTERN OHIO. DAVID B. SAJA, DSAJA@CMNH.ORG, CLEVELAND MUSEUM OF NATURAL HISTORY, 1 WADE OVAL DRIVE, CLEVELAND, OHIO 44106.

Many genera of caddisfly larvae (Trichoptera) construct cases from available materials, such as leaf fragments and sand grains. These cases provide protective shelter, and help weigh them down in the stream where they hatch. Previous workers have shown that caddisfly larvae can build cases out of unusual materials, like gold, given only gold sand for construction. The purpose of this study was to determine whether caddisfly larvae case building in nature is selective in the geologic materials (preferably choosing heavy minerals), or completely random. To test this, the genera *Neophylax* and *Helicopsyche*, which construct cases predominantly of sand grains, were collected from two Northeastern Ohio rivers: West Branch Mahoning River, Portage Co., dominated by glacial sediment, and Ashtabula Creek, Ashtabula Co., dominated by weathering shale bedrock. One-liter sediment samples were collected on one-meter intervals along two traverses crossing each stream through a riffle. Each sample was sieved through 4, 2, 1, 0.5, 0.125, 0.063 mm screens, and weight proportions and bulk compositions determined for each sieve. From each traverse, a dozen caddisfly cases were collected, disaggregated, and the material optically analyzed for size, shape, and mineral composition. *Helicopsyche* in both rivers constructed their cases almost entirely out of rounded quartz grains (~0.7 mm avg. dia.), despite the scarcity of quartz in the Ashtabula Creek sediments. *Neophylax*, similarly constructed its cases out of rounded quartz grains (~0.8 mm avg. dia.), but attached "ballast stones", of average river-sediment composition, that are 4x larger than the case-building grains (~3.3 mm avg. dia.).

BOARD 30 CHELATING LIGAND EXTRACTION OF HEAVY METALS FROM CHROMATED COPPER ARSENATE TREATED LUMBER. NICOLE M. DICKSON, NDICKSON@MUSKINGUM.EDU, (RAYMOND RATAJCZAK, RAY@MUSKINGUM.EDU), MUSKINGUM COLLEGE, NEW CONCORD OH 43762.

The process to phase out chromated copper arsenate (CCA) from the treated lumber market began on February 12, 2002 in response to a request by the Environmental Protection Agency to ban the use of CCA treated lumber for residential uses by January 1, 2004. CCA treated lumber is known to leach heavy metals into soil and water. The heavy metals in the soil and water may possibly cause adverse health and environmental effects. Proper disposal of CCA treated lumber in the coming years may prove to be a significant environmental challenge due to the possibilities of heavy metal leaching. The removal of heavy metals from the lumber should allow the safe disposal of the wood. The relative effectiveness of chelating ligands, such as ethylenediaminetetraacetic acid (EDTA), cyclohexanediaminetetraacetic acid (CyDTA) and diethylenetriamine-pentaacetic acid (DTPA) via Soxhlet extraction and pressure assisted extraction will be compared. In pressure assisted extraction, a sawdust sample is placed in an oxygen bomb 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 samples using Soxhlet extraction. 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 will thus allow for the

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@MUSKINGUM.EDU), 163 STORMONT 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 homoleptic complexes composed of low-valent transition metals and lanthanides with the cyanide anion. These compounds' inner spheres are comprised 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 gadolinium (III) nitrate and tetrabutylammonium octachlorodihydroxenate. The resulting coordination complexes' structures and physical properties will be elucidated using UV-Visible spectroscopy, infrared spectroscopy, 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 NMR signals 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 or strong gradients of the magnetic field are required. With 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. Improved spatial resolution is a result of considerable 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 DETERMINE THE SURFACE COMPOSITION USING ATOMIC ABSORPTION SPECTROSCOPY. ERICA J. NEWBOULD, ENEWBOULD05@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%: $\text{CuO}_{(s)} + 2\text{HNO}_{3(aq)} \rightarrow \text{Cu}(\text{NO}_3)_2(aq) + \text{H}_2\text{O}_{(l)}$. It was hypothesized that the powder would dissolve in the acidic solution and the amount of dissolution could be monitored by atomic absorption spectroscopy (AA). Pre-weighed samples of copper(II) oxide powder were added to the nitric acid solutions. Small volume aliquots of the resulting mixtures were passed through a 0.1 μm 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 greater than 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 relationship predicted that the powder would not dissolve in solution 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 ASEQUAL AND SEXUAL REPRODUCTIVE STAGES OF THE PATHOGEN GNOMONIA LEPTOSTYLA (FR.) CES. & DE NOT., ON IT'S HOST JUGLANS NIGRA L. AND 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 ascospores were studied primarily by light microscopy. The results from observations on histological sections revealed that the fungus formed acervuli bearing curved, two-celled conidia on necrotic 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 trichogynes were observed. Developing perithecia containing asexual hyphae were detected during late fall, and in November and December on old partially decayed leaves, asci bearing two-celled ascospores were observed. Cultures started from conidia and ascospores were induced to produce conidia, spermogonia, ascogonial coils with trichogynes and developing perithecia. Successful inoculations were carried out on healthy leaves from conidia produced in acervuli on infected leaves and from those produced *in vitro*.

BOARD 35 ADDITIONS TO THE MOSS FLORA OF WEST VIRGINIA BASED ON THE HOLDINGS OF THE HERBARIUM OF YOUNGSTOWN STATE UNIVERSITY. JOHN J. ATWOOD, S0184779@CC.YSU.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 list the known taxa for the state, based on the holdings of specimens at the Herbarium of West Virginia University (WVU). Supplementing this checklist, 399 moss specimens from the Herbarium of Youngstown State University (YUO) 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 YUO are plotted on county dot maps for the state. Mapping bryophyte distribution at the county level serves as an indicator to where the greatest 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 of taxa 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, THOMASD6@MUOHIO.EDU, M. HENRY H. STEVENS, STEVENMH@MUOHIO.EDU, CAROLYN HOWES KEIFFER, KEIFFECH@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 American chestnut, red oak (*Quercus rubra*), tulip poplar (*Liriodendron tulipifera*) and bitternut hickory (*Carya cordiformis*) were grown individually in soilless potting mix in tall one gallon pots. To simulate different overstory and edaphic conditions, seedlings were grown in three different light and nutrient levels resulting in a two-way factorial experiment with three levels of each factor. Thirty seedlings of each species were grown under shade cloth of three densities (5, 15 and 27% of ambient sunlight) and within each light treatment, slow-release fertilizer (13-13-13 NPK) was applied at three levels for a total of 90 individuals of each species. After four months of growth, we measured specific leaf area, foliar nitrogen content and

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 MINED AND UNDISTURBED AREAS. SARAH K. McBETH, SMCBETH@MUSKINGUM.EDU, (DANNY INGOLD), 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 with an 80µ 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 Eucoppeoda were found on both sites. Additionally, individuals in the order Anostraca occurred only at the strip-mined site. A contingency table χ^2 revealed significant differences in the frequencies of the orders at the two sites ($\mu^2 = 15.38$, df = 4, $p < 0.01$).

BOARD 02 ASSESSMENT OF SOIL MOISTURE CONTENT BELOW SOYBEANS GROWN WITH DIFFERENT [OZONE], [CARBON DIOXIDE] AND RAINFALL INPUTS CHALANCE WILLIAMS

CHALANCEW@HOTMAIL.COM, ¹DEPT OF NATURAL SCIENCES, MATHEMATICS & COMPUTER SCIENCE, CENTRAL STATE UNIVERSITY, PO BOX 1004, WILBERFORCE, OH 45384 (ANDREW LEAKEY², ANDREW@LIFE.UUC.EDU, STEPHEN LONG², STEVEL@LIFE.UUC.EDU, CADANCE LOWELL¹, CLOWELL@CSU.CES.EDU), ¹UNIVERSITY 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 CO₂ and O₃, 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 soybean crops grown at different concentrations of CO₂ and O₃, 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 CO₂/~60 ppb O₃), elevated CO₂ (550 ppm), elevated O₃ (~90 ppb) and elevated CO₂/O₃ combined (550 ppm CO₂/~90 ppb O₃). Elevated CO₂ and/or O₃ levels were generated by rings of pipes surrounding the plots at canopy level and releasing CO₂ or O₃. Natural wind flow mixed and carried the gases through the canopy. A gutter system also was installed to a section of all ambient and elevated CO₂ plots to catch 50% of the rainfall. A Sentek soil moisture probe was used to measure the amount of water in the soil at 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 no significant differences in soil moisture caused by growing plants at elevated concentrations of CO₂ or O₃. However during a two-week period of low rainfall in August, soil moisture averaged 30% lower under ambient conditions than the combined elevated CO₂/O₃. 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, AZITO@WITTENBERG.EDU, JAMES M. WELCH¹, WILLIAM W. KIRBY-SMITH. ¹DEPT OF BIOLOGY, WITTENBERG UNIVERSITY, PO BOX 720, 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. We hypothesized that gull predation would have a significant effect on the population of *A. punctulata* living on the seawall at the Duke Marine Laboratory in Beaufort, NC. To test this hypothesis, dead urchin remains (overturned tests pecked clean from the bottom) were counted daily along 450m of seawall from January 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 urchins killed during the study (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. Cloud cover was an important abiotic which may effect gull predation upon urchins; higher cloud cover correlated with greater predation. This study supports the hypothesis that gulls prey upon sea urchins on seawalls. 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 SURVEY OF BAT ACTIVITY PATTERNS AT A SUMMER ROOSTING SITE AT OHIO NORTHERN UNIVERSITY'S CAMPUS, ADA, OHIO. LAUREL B. HRICIK, L-HRICIK@ONU.EDU, 312 SOUTH SIMON STREET, ADA OH 45810.

A barn on the Ohio Northern University campus in Ada houses a summer colony of big brown bats (*Eptesicus fuscus*). Their numbers and activity patterns were studied by counting bats as they departed from the barn for evening foraging. Counts were taken at least 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. 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 = 6.6, 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, SHAWN@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 below 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 NATALIE K. ANDERSON ANDERSNK@MUC.EDU (L.EPP, EPLPG@MUC.EDU) MOUNT UNION COLLEGE, 1972 CLARK AVENUE, ALLIANCE, OH, 44601.

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 feeding influences the rate of gland cell proliferation more dramatically than 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, GORDONJL@MUC.EDU, (L.EPP, EPLG@MUC.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, pedibin, 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 tested in 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 in this regard will then be tested to determine their effect in lateral transplantation (grafting) experiments. These test for a change in positional values of hydra tissue; 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. BRINSON**
MATTLEE01@MSN.COM 216 CENTER ROAD APT. 312 BEDFORD, OHIO 44146 CUYAHOGA COMMUNITY COLLEGE (STANLEY HAZEN HAZEN@CCF.ORG) CLEVELAND CLINIC FOUNDATION.

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 suspected biomarker for asthma. Quantitation of bromotyrosine 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, and equivalent bromotyrosine levels when the serums of patients receiving montelukast or theophylline are compared.

BOARD 09 ANALYSIS OF THE KERATINASE GENE FROM FEATHER DEGRADING BACILLUS LICHENIFORMIS. **PATRICIA B.S. CELESTINO,**
PBCELEST@OWU.EDU, ALLISON K. MORRELL, AKMORREL@OWU.EDU, AND GERALD GOLDSTEIN, JEGOLDST@OWU.EDU. PATRICIA B.S. CELESTINO, 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-keratin that can be degraded by the keratinase enzyme produced by several strains of bacteria such as *Bacillus licheniformis* and *Streptomyces*, that are commonly isolated from the plumage of birds. Once feathers are degraded, the products of degradation can be used to enrich animal feed and soils as fertilizers. Using polymerase chain reaction (PCR), sections of the *Bacillus licheniformis* chromosome containing the keratinase gene were amplified and cloned into TA plasmid cloning vectors and transformed into *E. coli*. The DNA sequences of the cloned genes were obtained and compared to each other and to 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* degraders. This study focused 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 promoters are composed of -10 and -35 sequences where RNA polymerase binds to DNA to initiate transcription. 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 AN ENZYME-COUPLED FLUORESCENT METHOD. **KATHERINE E. MILLER – KMILLER@MUSKINGUM.EDU, 163 STORMONT ST. NEW CONCORD, OH 43762 (DR. DEEPMALI PERERA).**

The fluorogenic probe, Amplex red, N-Acetyl-3,7-dihydroxyphenoxazine, 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 food, environmental waters, and consumer 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 an emission maximum at 587 nm, both of which occur 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 oxidase activity in crude biological samples.

BOARD 11 LIVER PROTEOME OF MICE WITH ALTERED GROWTH HORMONE PHYSIOLOGIES. **JOSEPH A. RIEMAN JRIEMAN@CAPITAL.EDU (KERRY L. CHEESMAN KCHEESMA@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 in determining a cell or tissue's genetic potential. 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@CAPITAL.EDU (KERRY L. CHEESMAN KCHEESMA@CAPITAL.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 (BDDTF) 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 will provide the means to detect small concentrations of specific amino acids.

BOARD 13 EVIDENCE FOR RNA INTERFERENCE IN THE PLANT PATHOGEN *PHYTOPHTHORA INFESTANS*. MARK L. HANKE Mhanke@wooster.edu C-1778, 1189 BEALL AVE, WOOSTER OHIO 44691. NICOLAS CHAMPOURET champouret_1@osu.edu, SOPHIE KAMOUN kamoun_1@osu.edu, (WILLIAM MORGAN wmorgan@wooster.edu).

Potato late Blight, caused by a fungus-like organism *Phytophthora infestans*, is one of the most devastating plant diseases. Responsible for the Irish Potato Famine, Potato blight still causes 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 genomic sequencing project nearly complete it is necessary to now phenotypically 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 electroporation parameters that produce high uptake of siRNA with reasonable viability. RNAi in *P. infestans* will be measured through the Green fluorescent protein (GFP). GFP will be measured prior to electroporation and again after electroporation. Additionally a time-course experiment may be run in order to determine the onset and continued effects of the RNAi after electroporation.

BOARD 14 STUDIES REVEALING CELLULAR AND SUBCELLULAR FEATURES HELPFUL FOR THE IDENTIFICATION OF SELECTED HUMAN SARCOMAS. KRISTY J. ARNO CZKY, 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, OH, over a twenty-year period, 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, immunofluorescence, 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, pinocytotic vesicles along the cytoplasmic membrane and immunoidentification of desmin), Haemangiosarcoma (Weibel-Pallade bodies and immunoidentification of Ulex European Agglutinin), Kaposi's sarcoma (distorted dermal capillaries with blood cells and fibroblasts), 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 distorted 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. DOUGHERTY, 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. Leakage during the production, 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 bioconcentrate in adipose tissue of aquatic animals initially, and has 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 group consisting of 8 litters (8 pups per litter) and 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. Beginning on day 20, learning and memory for the rats was assessed using the Morris Water-maze technique. On day 24 and day 29, a standard probe analysis was performed to examine short-term and long-term memory respectively. On day 29, rats were euthanized and Choline Acetyltransferase (ChAT) activity was also examined, as acetylcholine is suspected to play a role in learning and memory. Rats receiving PCB showed an initial increase in short-term memory on day 24 and a decrease in long-term memory on day 29 when compared to the controls. While these increases and decreases were not statistically significant, observational results showed behavioral differences between the PCB and control rats during probe analysis. Though it has been shown that PCB may impair cognitive ability, these results suggest that PCB may affect short-term and long-term memory as well and may do so in a differential manner; increasing short-term, while decreasing implicit long-term memory.

BOARD 16 IDENTIFICATION OF IMMUNOREACTIVE AUTOANTIGENS PRESENT IN SEROPOSITIVE AND SERONEGATIVE MYASTHENIA GRAVIS. MATTHEW J. KESIC, pushcar13@hotmail.com, (CHESTER R. COOPER, rcrooper01@ysu.edu, GARY R. WALKER, grwalker@ysu.edu, THOMAS C. WATKINS, tcwatkins@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 best understood as one of the few conditions in which the effector 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 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 rippling muscle disease (ARMD), which has been reported to appear prior to the onset of (MG). 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 performed in the lab has shown that the ARMD patients' sera also bound to titin-isoform(N2A). The Western blots of both the ARMD and the SPMG sera showed a unique doublet at about 123k.d. and 140k.d. The significance of this study is that the SPMG titin sequence fell in the Main Immunogenic Region (MIR) of the muscle protein. This region is believed to play a possible role in myasthenia gravis. Future studies are aimed at 2DE proteomic comparative analysis to help understand the connection or the link between ARMD and SPMG.

BOARD 17 THE INFLUENCE OF TIA-1 ON HSV-1 REPLICATION. RAJASEKHAR SINGAVARAPU, rsingava@neoucom.edu, THOMAS A ROSE trose@neoucom.edu, JULIE R JEYARATNAM jrjeaya_76@hotmail.com, KEN S ROSENTHAL krsr@neoucom.edu, NORTHEASTERN OHIO UNIVERSITIES COLLEGE OF MEDICINE, DEPARTMENT OF MICROBIOLOGY AND IMMUNOLOGY, 4209 SR 44 P O Box 95, ROOTSTOWN OH 44272-0095.

Eukaryotic initiation factor 2 α (eIF2 α) is phosphorylated by PKR or PERK when stimulated by endoplasmic reticulum stress or Type 1 IFN and dsRNA that prevent incorporation into a preinitiation complex (PIC). TIA-1, an RNA binding protein, binds and directs the incomplete PIC to stress granules. The ICP34.5 protein of HSV-1 binds protein phosphatase 1 (PP1) and promotes the removal of phosphate from eIF2 α . Strain variation of the ICP34.5 protein determines the neuroinvasive disease potential and tissue culture behavior of HSV. The influence of TIA-1 on the replication of HSV-1 strains encoding different variants of ICP34.5 is not known. Mouse embryonic fibroblast cells of the wild type (WT) and those without the TIA-1 protein (TIA-1 k/o) were infected with HSV-1 strains containing different variants of ICP 34.5 or incapable of expressing ICP 34.5. Virus titers were determined on Vero cells. Virus production increased 25-1000 fold in TIA-1 k/o cells

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 ribosomes. 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. UMUT AYPAR, UMUTAYPAR@HOTMAIL.COM, (LAURA TUHELA, LMTUHELA@OWU.EDU), HWCC Box# 1447, OHIO WESLEYAN UNIVERSITY, DELAWARE OH 43015.

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 usage – daily to once a week; moderate levels of usage – 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 2 hours after collection, samples were inoculated 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 identified. The absence of *S. salivarius* was observed in 66.7% 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 *Neisseria* sp. are not significantly affected by alcohol consumption and tobacco use.

BOARD 19 INVESTIGATING THE ROLE OF DSBR PROTEINS IN ADENOVIRUS REPLICATION. SHOMITA S. MATHEW – MATHEWSS@MUOHIO.EDU, DEPT OF MICROBIOLOGY, PEARSON HALL, MIAMI UNIVERSITY, OXFORD, OH 45056. EILEEN BRIDGE BRIDGE@MUOHIO.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 virus defends itself against this "repair" by producing regulatory proteins of 11kDa and 34kDa from the early region 4 (E4), which relocalize 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 directly inhibit viral DNA replication in addition to contributing to concatemerization 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 viral replication by immunofluorescence and immunoprecipitation.

BOARD 20 PRODUCTION OF MONOCLONAL ANTIBODIES AGAINST THE CAPSULAR POLYSACCHARIDE OF STAPHYLOCOCCUS AUREUS TYPE 8. JEREMY J. MASHBURN, JEREMYMASHBURN@YAHOO.COM, CHRIS M CALDWELL, CMCALDWELL22@HOTMAIL.COM, (DIANA L FAGAN, DLFAGAN@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 Lysozyme, DNase, RNase, and proteinase K, followed by DEAE column chromatography. A Bradford protein assay was performed with 5 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) with 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 supernatant of the primary subclones to isotype the antibodies. All six supernatants tested were 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 PACER grant.

BOARD 21 BONE MARROW RECONSTITUTION OF AN IMMUNODEFICIENT MOUSE MODEL. NICOLE R. TOTH, TALLSRX@AOL.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 condition remains uncertain. Interestingly, lymphocytes that contain cytoplasmic granules become prevalent in the uteri of several mammalian species during pregnancy. Previous studies have not only determined this lymphocyte population to be uterine natural killer (uNK) cells, but have also shown that mice deficient in NK cells demonstrate symptoms, which parallel those found in preeclampsia. This suggests a role for uNK cells in the prevention of this disease. RAG2-/- is an immunodeficient mouse strain lacking NK cells, T cells and B cells. This study uses this mouse strain to observe the specific trafficking of transplanted NK cells. In our studies, RAG2-/- immunodeficient females were engrafted with bone marrow from normal, immunocompetent BalbC (n = 5) and C57/BL6 mice (n = 3). All bone marrow recipients were mated to RAG2-/- males and sacrificed at day 10.5 of gestation. Serum from both recipient and control mice were tested for antibody production using a sandwich ELISA against either mouse IgG or IgM. Four of five mice injected with BalbC cells (with or without T cell depletion) had IgG levels similar to normal mice. Mice (n=3) injected with C57/BL6 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, JMARCINK@KENT.EDU; ANDREA E. SCHWARZBACH, ASCHWARZ@KENT.EDU), KENT STATE UNIVERSITY, DEPT OF BIOLOGICAL SCIENCES, PO Box 5190, KENT OH 44242-0001.

Polynesians use kava in elaborate rituals involving extracting a drink from the root of the *Piper methysticum* plant for its relaxing properties. In America, kava is an herbal supplement available over-the-counter and is sold for its anti-anxiety properties. The active ingredients are lipid soluble chemicals called kava-lactones. According to many women in Polynesia, kava has a contraceptive effect and is given to women who have just given birth to prevent another immediate pregnancy. This effect has not been systematically studied and evidence is only anecdotal. A rat model is ideal for evaluating kava's effects because the rat reproductive system mimics humans, but the estrous cycle is 4-5 days long. It is hypothesized that the kava will alter the estrous cycle, and higher doses should exhibit a greater change in the estrous cycle producing more of a contraceptive action than lower doses. Estrous cycles can be monitored by viewing the cells of the vagina daily under a microscope. One group of ten rats will receive plain water; the next group of ten rats will receive a moderate dose (10mg/kg body weight) of kava, and the third group of ten rats will receive a large dose (50mg/kg body weight) of kava, administered daily by a gavage tube directly into the rat's stomach. The length of each phase of the estrous cycles will be examined for 30 days prior to the kava administration, 60 days during the kava administration, and 60 days after the administration has ended. The rat receiving the water by gavage will serve as a control, and also monitoring the cycles prior to the dosage will eliminate rats with an unusual cycle.

BOARD 23 PLANT LIGNAN INDUCTION OF APOPTOSIS IN CERVICAL CARCINOMA CELLS CONTAINING INTEGRATED HUMAN

PAPILLOMAVIRUS DNA. DEIDRA R. TSCHANTZ, DRTSCHAN@NEOUCOM.EDU, KRISTI L. ALLEN, KALLEN@NEOUCOM.EDU, ANGELO L. DELUCIA, ALD@NEOUCOM.EDU. DEPT OF MICROBIOLOGY AND IMMUNOLOGY, NORTHEASTERN OHIO UNIVERSITIES COLLEGE OF MEDICINE, 4209 SR 44, ROOTSTOWN OH 44272.

Human papillomavirus (HPV) infections are the cause of several diseases including cervical cancer. Integration of viral DNA into the host cell genome permits continuous expression of viral E6/E7 genes. The E6 and E7 proteins interfere with functions of the tumor suppressor proteins, p53 and retinoblastoma protein. E6 protein binds to p53 protein to accelerate its degradation thus 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 E6 gene expression. Cell lines containing HPV DNA (HeLa 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 analysis of annexin V binding to phosphatidyl serine. 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 RBKOLHE@BGNET.BGSU.EDU, RAM SATEESH VEERAPANENI RAMV@BGNET.BGSU.EDU, CHIRAG MANDAVIA, LAKSHMI@BGNET.BGSU.EDU, PULAKAT LPULAKAT@BGNET.BGSU.EDU, NARA 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 complex with six-fold symmetry. Though this molecule 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 EPE induced changes in the gene expression profiles of the cells. It was found that the EPE treated cells do not have PCNA RNA. Western blot analysis showed the PCNA protein was diminished in EPE treated cells. To determine the role of PCNA promoter in this regulation, the B16 cells were transfected with PCNA promoter attached to Luciferase gene. EPE treatment of these cells resulted in ore than 60% decrease in Luciferase gene, implying that the EPE treatment directly affected the promoter function. We also analyzed the effect of the EPE-treatment on PCNA of human breast cancer cell line MCF-7. The untreated cells showed two forms of PCNA, the non-phosphorylated, less active form and the phosphorylated form of PCNA, which is expressed in G1-S phase and plays a role in eitopathogenesis of cancer. The treated cells showed only the non-phosphorylated form, implying that the EPE treatment might have a role in de-phosphorylating the phosphorylated form on PCNA.

BOARD 25 A NEWSUBSTRATE FOR PERTUSSIS TOXIN. NITIN WARIER (NITINW@BGNET.BGSU.EDU), DIETER KNOWLE, NARA GAVINI (NGAVINI@BGNET.BGSU.EDU) AND LAKSHMI PULAKAT (PULAKAT@BGNET.BGSU.EDU) DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

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 $G_{i\alpha}$ protein. Since PTX ADP-ribosylates $G_{i\alpha}$, this molecule is used extensively to determine the involvement of $G_{i\alpha}$ 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 many of its functions including activation of phospholipase A2 and inhibition of cell growth are inhibited by PTX. However the extent of the involvement of the $G_{i\alpha}$ 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 MCF-7 cells. Our experiments imply that sterical hindrance of the 3rd ICL of the AT2 may be the mechanism though which the PTX inhibit AT2 signaling.

BOARD 26 REGULATION OF CYCLIN DEPENDANT KINASE INHIBITOR CdkN2b DURING GROWTH-ARREST IN MELANOMA B16 CG CELLS. RAM SATISH VEERAPANENI, RAMV@BGNET.BGSU.EDU, CHIRAG MANDAVIA, CMANDAVIA@BGNET.BGSU.EDU, LAKSHMI PULAKAT, PULAKAT@BGNET.BGSU.EDU, NARA GAVINI, NGAVINI@BGNET.BGSU.EDU, DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403.

Cyclin dependent kinase inhibitors (CKIs), play important roles in regulation of cell growth by causing G1/S phase arrest. CdkN2b (p15) gene 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 CdkN2b 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 CdkN2b, high level expression of CdkN2b was observed when these cells were exposed to 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 the EPE. Tumors generated in C57-Bl/6 mouse by subcutaneous injection of B16CG cells also had highly reduced growth when treated externally with the EPE, and showed increased expression of CdkN2b. In cancers including melanomas, p15 expression is normally down-regulated by Myc or hypermethylation. The microarray analyses indicated that Myc levels remained unaltered in B16CG cells before or after exposure to EPE. Since hypermethylation of the CdkN2b promoter region is a reversible process, and increased transcription of CdkN2b in B16CG cells exposed to EPE resulted in increased protein levels, we presume that EPE exposure might have caused de-methylation of the CdkN2b promoter.

BOARD 27 REGULATION OF THE GROWTH OF HUMAN BREAST CANCER CELLS BY THE ANGIOTENSIN II RECEPTOR AT2. SUCHARITHA BALASUBRAMANIAM, SUCHARB@BGNET.BGSU.EDU, CHIRAG MANDAVIA, CHIRAGM@BGNET.BGSU.EDU, NARASIAH GAVINI, NGAVINI@BGNET.BGSU.EDU, LAKSHMI DEVI PULAKAT, PULAKAT@BGNET.BGSU.EDU, BOWLING GREEN STATE UNIVERSITY, DEPT. OF BIOLOGICAL SCIENCES, BOWLING GREEN OH 43403.

The Angiotensin II (Ang II) receptor subtype AT2 is a 7-transmembrane domain protein. Our laboratory has identified the existence of a protein-protein interaction between the ATP binding domain of the ErbB2/ErbB3 receptors and the 3rd ICL and C-terminal cytoplasmic domain of the AT2 in yeast two-hybrid assay (Knowle et al., Regulatory Peptide, 87, pp73-82, 2000). The ErbB2 and ErbB3 are overexpressed and constitutively phosphorylated in many breast cancer cells and such overexpression suggests poor prognosis. Since 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 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 transfected with the AT2 for only 3 days, the phosphorylation levels 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 inhibiting the phosphorylation of the ErbB2 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-1 MRNA USING QUANTITATIVE REVERSE TRANSCRIPTASE POLYMERASE CHAIN REACTION. ANJALI NAIR

ANAIR@WOOSTER.EDU, DEAN FRAGA DFRAGA@WOOSTER.EDU, WILLIAM MORGAN WMORGAN@WOOSTER.EDU. DEPT OF BIOLOGY, 931 COLLEGE MALL, THE COLLEGE OF WOOSTER, WOOSTER OH 44691.

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 this 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 Paramecium cells. Quantitative PCR will help determine that in such a gene family, if just one isoform is silenced, does it have an effect on the other isoforms, thereby 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 this purpose the focus of this study is on the PP-1 genes which are very similar to each other. As these sequences are so similar to each other, this will stringently test RNAi specification. RNAi experiments targeting the 3 PP-1 isoform 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 PKOBALKA@WOOSTER.EDU; MWILAMBWE, KABULO B. KMWILAMBWE@WOOSTER.EDU; RITCHEY, KATHERINE KRITCHEY@WOOSTER.EDU; (JOHNSON, TERESA A. TJOHNSON2@WOOSTER.EDU, PH.D.; FRAGA, DEAN, DFRAGA@WOOSTER.EDU, PH.D.) DEPT OF BIOLOGY, THE COLLEGE OF WOOSTER, 1189 BEALL AVENUE, WOOSTER, OH 44691.

This study attempts to elucidate the relationship between chemotaxis and inducible antibiotic resistance in *Escherichia coli* (*E. coli*) strains at the molecular level. Previous research indicate that pathways linking the two may exist, but these pathways have not been fully explored. Several strains of *E. coli* will be used in this study. These strains will be exposed to both chemoattractants and chemorepellents. Chemotaxis can be defined as the movement of an organism in the direction of a favorable environment, created by a chemoattractant, or away from an unfavorable environment, produced by a chemorepellent. The effects of exposure to both chemotactic chemicals on antibiotic resistance will be noted. This procedure will be repeated with the same experimental strains of *E. coli*, that have subsequently been rendered Che A⁻ and tsr⁻ via transduction. The tsr gene is responsible for sensing chemorepellents. Knocking out this gene would hypothetically render the strains more susceptible to antibiotics. The Che A gene regulates the outer membrane porin proteins. The knockout of Che A would remove a pathway through which the cell regulates permeability to antibiotic; therefore, the cells would be expected to have increased resistance in the presence of chemoattractants and decreased resistance in the presence of chemorepellents. The effects of knocking out these two genes on inducible antibiotic resistance level will be observed.

BOARD 30 IDENTIFICATION OF SALMONELLA GENES THAT ARE EXPRESSED IN RESPONSE TO THE PRESENCE OF OTHER BACTERIAL SPECIES. JESSICA L. DYSZEL; DYSZEL.1@OSU.EDU, HEATHER D. CARTER;

CARTER.323@OSU.EDU, JONATHAN G. FRYE; JFRYE@SAA.ARS.USDA.GOV, MICHAEL MCCLELLAND; MMCLELLAND@SKCC.ORG, BRIAN M. AHMER; AHMER.1@OSU.EDU. THE OHIO STATE UNIVERSITY DEPARTMENT OF MICROBIOLOGY 944 RIFFE BUILDING 484 W 12TH AVENUE COLUMBUS, OH 43210.

SdiA is a LuxR homolog in *Salmonella enterica* that detects and responds to *N*-acylhomoserine 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. Two loci already 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 16 additional genes were also identified. Chromosomal *lacZY* fusions are 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 confirmed to be a new member of the SdiA regulon. This fusion becomes active in the presence of *Yersinia enterocolitica* but not in the presence of an isogenic *yenI* mutant that cannot synthesize AHL. Many of the 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 E. LORIMER, HELORIME@CC.YSU.EDU, AND IAN J

HOLT*†, IH@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.

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 archaeobacteria anaerobes. Mitochondria still retain a small amount of DNA (mtDNA), encoding RNAs 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 neuropathies, as well as free radical oxidative damage, cancer, and even the degenerative processes of ageing. The mechanisms by which most organism's mtDNA replicates are not well understood. The mtDNA of simple eukaryote *Schizosaccharomyces 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 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 modified method 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 32 A COMPARISON OF THE INTERACTIONS BETWEEN TWO ADOPTED GORILLAS (*GORILLA GORILLA GORILLA*) AND THEIR SURROGATE MOTHERS, LIA JANEL SPRAGUE,

LIA_SPRAGUE@YAHOO.COM, OHIO NORTHERN UNIVERSITY, 10463 EAST RIVER ROAD, ELYRIA, OHIO 44035.

The relationships between two adopted gorillas and their surrogate mothers were studied at the Columbus Ohio Zoo. One of the gorillas was a four-year-old female whose surrogate mother was thirty-seven years old. The other adopted gorilla was a five-year-old male whose surrogate mother was thirty-nine. Both surrogate mothers were born in the wild. It was hypothesized that both juveniles would spend an equal amount of time with their respective surrogate mothers because, although the female is a year younger, males mature more slowly than females. An ethogram was constructed of numerous social behaviors, and forty hours of observation were performed using the ethogram categories and focal animal sampling. Behaviors of primary interest were eating, playing, walking, sitting, lying, embracing and touching. Using chi-square analysis, there were several significant differences between the female juvenile's interactions with her surrogate and the male's interactions with his surrogate. The female showed significantly great ($p > .05$) frequencies of walking with, sitting with, embracing and touching her surrogate than did the male.

BOARD 33 EFFECT OF LENGTH OF DURATION OF A COMMITTED RELATIONSHIP ON TESTOSTERONE LEVELS IN HEALTHY, COLLEGE-AGED MEN. AMY M TAUSHANOFF A-TAUSHANOFF@ONU.EDU

(NANCY WOODLEY N-WOODLEY@ONU.EDU) OHIO NORTHERN

UNIVERSITY, 402 W. COLLEGE AVE UNIT 2921 ADA OH 45810.

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 successful, stable marriages. Therefore, this study will examine 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 asked to give a sample of passive drool (6 ml). A standards curve will be obtained, using the testosterone standard provided in the purchased kit (Salimetrics, PA) and diluents thereof. Participant samples will be mixed with a diluted conjugate solution of testosterone and peroxidase; followed by tetramethylbenzidine, a coloring agent, and then a stop solution, according to kit directions for sample preparation. The samples will then be read in an optical density reader at 490 nm and the corresponding testosterone levels will be determined. The testosterone levels corresponding to the two samples from each participant will be averaged and all testosterone levels will be expressed as mean values and the standard error of the mean. The testosterone levels of the two groups will then be compared using a Student's T-test ($\alpha = 0.05$) to determine if there is any significant difference in the levels of testosterone between males in a committed relationship and single, uncommitted males.

BOARD 34 THE EFFECT OF CHILD ABUSE ON THE CORPUS CALLOSUM IN ADULT WOMEN. LISA S. STEWART, s04.LSTEWART@WITTENBERG.EDU, (CATHY L. PEDERSON, CPEDERSON@WITTENBERG.EDU,) WITTENBERG UNIVERSITY, PO Box 720, OH 45501.

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 preliminary. The purpose of this study is to determine a definitive connection between childhood abuse victims and the reduction of their corpus callosum. Twenty-two women in the age range between 20-40 participated in the study. Women who used illicit drugs, suffered major depression, or used marijuana or alcohol excessively were excluded. Based upon Childhood Trauma Questionnaire scores, the women were divided into either an abused or non-abused group. The 22 participants had a magnetic resonance imaging brain scan performed, and each corpus callosum was traced 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 ($p=.000$). Currently with three measurements of the corpus callosum in each group, there is a significant difference with $p=.000$, thus supporting the hypothesis that childhood victimization results in a smaller corpus callosum.

BOARD 35 PERFORMANCE OF NR2B TRANSGENIC MICE IN TRADITIONAL AND NON-TRADITIONAL VERSIONS OF THE HEBB-WILLIAMS MAZE. ANJULIE, ARORA AARORA@WOOSTER.EDU (AMY JO STAVNEZER AJSTAVNEZER@WOOSTER.EDU) 1189 BEALL AVENUE, C1117-COLLEGE OF WOOSTER, WOOSTER OH 44691.

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, cued 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 from all sides. This forces 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).

BOARD 36 SCANNING ELECTRON MICROSCOPY: PAST, PRESENT, AND FUTURE VALERIE A. SOLOMON, VASOLOMO@OWU.EDU, OHIO WESLEYAN UNIVERSITY, HWCC BOX #3361, DELAWARE, OH 43015 (LAURA TUHELA, LMTUHELA@OWU.EDU).

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 described in the primary literature, such as the Everhart-Thornley detector, have been recreated using a LEO 435VP SEM with an Oxford CT1500 cryo preparation system and an Oxford ISIS System for energy dispersive spectrometry. These recreated images were compared to images taken with contemporary technology 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 data collecting, 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.

BOARD 37 MATTEL PATENT PROTECTION AFFECTS CREATIVE USE OF MATTEL PRODUCTS. F. JOHN KLUTH, FJK@FJKLUTH.COM, ERIN BOGUSKI, EBOGUSKI@KENT.EDU, ERIN KRAY, EKRAY@KENT.EDU, OPEN SPACE ART GALLERY, 612 N. MANTUA ST. KENT, OH 44240-2318.

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 thirteen persons 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. The persons were recruited locally in Kent and were either 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 as in a social context, none were considered significantly objective. This was determined by applying a t test to each mean and standard deviation determined on an n of 13. This result is consistent with the conclusion that the respondents failed to identify the images as fair use even though they were in a social context. The result supports 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.

BOARD 38 GREENHOUSE AND LANDSCAPE GROWTH MEDIA CREATED BY MIXING COAL COMBUSTION PRODUCTS WITH COMPOSTED ORGANIC MATTER. SOUGATA BARDHAN, BARDHAN.2@OSU.EDU AND WARREN A. DICK, DICK.5@OSU.EDU, 1680 MADISON AVENUE, THE OHIO STATE UNIVERSITY-OARDC, WOOSTER, OH 44691.

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. However, other physico-chemical properties of CCPs such as texture, high B and As, negatively influence plant growth, thus restricting their horticultural uses. Organic materials like animal manures, yard-trimmings and biosolids are produced in large quantities and some are composted. Our objective was to produce greenhouse and landscape media containing CCPs mixed with composted organic matter (COM) that maximized use of CCPs while maintaining economic plant growth. Mixes were formulated by adding CCPs to COM in ratios ranging from 7:3 to 3:7 (v/v),

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 using 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 (*Lycopersicon esculentum*) and marigold (*Tagetes patula*), by weighing the biomass produced at the end of experiment. Our results showed that significantly ($p < 0.0001$) higher growth (7-130%) was achieved with experimental mixes containing CCPs (as high as 60%, v/v) compared to a commercial mix MetroMix 360 (control). However there wasn't one mix suitable for all plants. We conclude that CCPs can be used as a readily available raw material for creation of plant growth mixes that can be beneficially used by the greenhouse and landscape industries.

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@HB.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, which in turn causes the path of light from a source, such as a quasar, 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 equation is 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^{10} - 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 better fits the flat rotation curves that have been observed. 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, DANCINGQTE@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-rotary nystagmus is the 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 with the children with autism having significantly less post-rotary nystagmus response than children without autism. Seven children were tested with the diagnosis of Autism and seven children without the diagnosis of Autism. The procedure involved a licensed 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-rotary nystagmus. Results were visually recorded using a video camera. Results showed that all seven children with Autism have little or no post-rotary 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@2ACCESS.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 bind 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) go through x-ray diffraction which will 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 pH7 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, TSINGH06@HB.EDU, 25405 BRYDEN ROAD, BEACHWOOD OH 44122. (HATHAWAY BROWN SCHOOL) DAVID G. KEHRES, DGK2@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 phosphatases. Two approaches are being pursued to analyze the Salmonella "phosphoproteom." One approach entails for the overall surveillance in phosphoprotein patterns in mutants that lack kinases or phosphatases. The second approach is to study specific phosphoproteins that we have identified in surveys using the prpA prpB double mutant. This study seeks to characterize one such candidate, 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 expected that 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 PrpA and PrpB, two Mn²⁺ dependent phosphoprotein phosphatases, 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 are 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. MADELINE M. COQUILLETTE, COQUILLM@BME.RI.CCF.ORG, (2185 HARCOURT DR. CLEVELAND HTS. OH 44106) LISA A. FERRARA, SPINE RESEARCH LABORATORY, RICHARD SCHLENK, EDWARD BENZEL, CLEVELAND CLINIC SPINE INSTITUTE, AARON FLEISCHMAN, SHUVO ROY, ILLYA GORDON, BIOMEMS LABORATORY, DEPT OF BIOMEDICAL ENGINEERING.

The goal of this study was to investigate pressure fluctuations within bone grafts during vertebral fusion after spine stabilization surgery. Current methods based on external 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 to 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 within the bone graft for 4 months post surgery. Pressure data was analyzed to determine pressure ranges and fluctuation patterns. The pressure at top of the bone graft increased after a surgery to a maximum of 99 mmHg just after 1 week post-surgery, and subsequently decreased to 21 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 24 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 vitro* biomechanical assessment to examine pressure reactions of the telemetric catheter in specific conditions and to further substantiate the previous findings.

Board 06 QUANTITATIVE ANALYSES OF CONNECTIVE TISSUE PROGENITORS FROM BONE MARROW BETWEEN GENDERS. Ingrid P Baumann, ibaumann07@hb.edu, Chizu Nakamoto (lead faculty) * (nakamoc@ccf.org), Cynthia A Boehm* (boehmc@ccf.org), Mounita Kundu* (kundum@ccf.org), and George F Muschler* (muschlg@ccf.org) · 520 Riverview Road, Gates Mills, Ohio, 44040 *Dept of Biomedical Engineering, Cleveland Clinic Foundation.

Bone is a dynamic tissue that is created by osteoblasts, and continuously resorbed by osteoclasts. Imbalance between osteoblasts and osteoclasts will result in either excessive or reduced bone mass/density. Osteoporosis is a syndrome of decreased bone mass that occurs mostly in the elderly and primarily in postmenopausal women. Various factors that lead to reduction of osteogenesis have been implicated in pathogenesis of osteoporosis. In this study, quantitative analyses were performed on connective tissue progenitor cells (CTPs); CTPs are cells that give rise to osteoblasts when they are appropriately stimulated. Bone marrow cells were isolated from eight women and eight men, and the prevalence of CTPs was assessed by the formation of cell colonies in tissue culture. The results showed that the mean colony prevalence (CTPs per million cell) was not different between men and women ($p=0.469$). There was a tendency in women toward a higher effective proliferation rate (Mean \pm SD = 0.797 ± 0.161) compared to men (Mean \pm SD = 0.713 ± 0.075). However there was no significant difference between the two groups ($p=0.102$). Women had a higher mean of area per colony (Mean \pm SD = $0.46 \text{ mm}^2 \pm 0.631$) compared to men (Mean \pm SD = $0.17 \text{ mm}^2 \pm 0.105$). Mean area per colony also showed no significant difference between the two groups ($p=0.130$). This was probably due to the small sample size. There was also no difference between men and women when looking at mean colony density. These data show that, although women are more likely to have osteoporosis, there is no evidence that this can be attributed to a difference in CTP prevalence or biological potential.

BOARD 07 BLOWING THE WHISTLE ON FRAGILE X. McKINSEY R. MUIR, mck1405@aol.com, 8402 EDGE LAKE OVAL, SAGAMORE HILLS OH 44067 (BEAUMONT SCHOOL).

This cell biology project examines the distribution of proteins within cells. Some proteins travel back-and-forth, "shuttling," between the nucleus and cytoplasm. Fragile X syndrome occurs when human cells do not produce Fragile X Mental Retardation Protein, FMRP, similar to the Rev protein in that both are RNA-binding proteins. These similarities allowed the investigation of the properties of Rev before investigating those of FMRP. Rev is an essential protein of HIV that mediates the cytoplasmic delivery of viral mRNAs by binding the mRNAs in the nucleus, exporting them, and returning to the nucleus. This study asked, "Does cytoplasmic diffusion of the Rev-GFP protein occur within a cell?" and "Does shuttling of the Rev-GFP protein between the nucleus and cytoplasm of a cell occur?" At the Research Institute of University Hospitals of Cleveland, a two-photon confocal microscope was utilized to test cellular fluorescence intensity levels. The method of photobleaching cellular regions and monitoring their ensuing fluorescence return is termed F.R.A.P., Fluorescence Recovery After Photobleaching. The cytoplasmic diffusion of Rev-GFP protein was examined by photobleaching a region in the cytoplasm and monitoring the return of fluorescence, which was rapid and complete, averaging four seconds. Diffusion was proven to occur in the cytoplasm. The nuclear-cytoplasmic shuttling of Rev-GFP protein was then investigated by bleaching a region in the nucleus and observing the intensity changes in the cytoplasm. This process, known as F.L.I.P., or Fluorescence Loss In Photobleaching, quantifies the extent to which regions outside a photobleached box contribute to fluorescence recovery in a bleached site. Less than one quarter of the coupled cytoplasmic-nuclear regions of interest, when

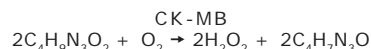
photobleached, showed significant losses and subsequent gains in intensity, respectively. Results show some evidence of the shuttling, but there appears to be too much photodamage to formulate a simple conclusion at present. Nuclear-cytoplasmic shuttling seems to occur and warrants further investigation, leading to an examination of the possible shuttling of FMRP.

BOARD 08 APOPTOSIS OF THE CELLS IN ATHEROSCLEROTIC LESIONS; INHIBITION BY ANTIOXIDANTS. CHRISTINA VAN LIER¹, SARA G. CARLSON², AND GUY M. CHISOLM², ¹THE STUDENT RESEARCH PROGRAM, HATHAWAY BROWN SCHOOL, SHAKER HEIGHTS OH 44122 AND ²THE DEPT 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 lipoprotein (oxLDL), 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 cell digestion. Cultured cells were treated similar to cells found 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. In monocyte and endothelial cells, 7K-treatment induced significant DNA laddering and caspase-3 activity; both processes were inhibited by vitamin E. Interestingly, in SMC, 7K induced DNA laddering but not caspase-3 activity. Thus, 7K causes apoptosis in endothelial cells, monocytic cells, 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 activated by 7K 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, JARRELL07@HB.EDU, (CHUNG-CHIUN LIU², CXL9@CWURU.EDU), ¹HATHAWAY BROWN SCHOOL, 1960 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 health professionals of the degree 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 microfabricated thick-film biosensor that can quantify CK-MB levels in the blood. The completed sensor will provide a more efficient and cost-effective means to monitor CK-MB levels. The principle of the sensor is based on the following reaction:



In this reaction, creatine ($\text{C}_4\text{H}_9\text{N}_3\text{O}_2$) is the substrate. In the presence of CK-MB, creatine is oxidized, producing hydrogen peroxide (H_2O_2). The detection of hydrogen peroxide is then used to quantify the CK-MB present. A standard three-electrode system including gold working and counter electrodes and a silver-silver chloride reference electrode is used. Three concentrations of CK-MB (1, 3, and 5 mg/dL) are used in this study, covering the normal physiological concentration of CK-MB. The detection of hydrogen peroxide is accomplished by applying an oxidation potential and measuring the oxidation current produced in this system. A linear relationship between the current output and the CK-MB concentration exists, serving as the calibration basis for this biosensor. Based on the experimental results, a practical sensor microsystem will be developed. Reproducibility, accuracy, sensitivity, and effective detection range of CK-MB of the practical sensor will be investigated. This biosensor will have unique scientific and clinical applications.

BOARD 10 THE PRIME ANNEALING TEMPERATURE FOR THE POLYMERASE CHAIN REACTION TECHNIQUE IN THE DETECTION OF THE HEREDITARY HEMOCHROMATOSIS ON THE HFE GENE. CAITLIN A. MIDKIFF, FAIRLAND HIGH SCHOOL, SCIENCE DEPARTMENT, PROCTORVILLE OH 45669.

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 to other diseases. 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. This study looked at the prime annealing temperature between 50 degrees and 75 degrees that would yield the best results after using the Polymerase Chain Reaction (PCR) technique. First, DNA was extracted from a buccal sample of a HH positive subject. The DNA was then isolated and amplified using the PCR technique. Then the product of the PCR was purified using the restriction enzyme RsaI. Gel electrophoresis was then used to visualize the results. It was hypothesized that the prime annealing temperature for the mutation that causes Hereditary Hemochromatosis would be between 50 degrees and 75 degrees. At the time that this abstract was written the results were inconclusive. This research offers much importance to the future of the diagnosis and treatment of this disorder.

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

Of the 75million tons of paper produced each year in the United States, 30% known as processed paper, can not be recycled due to a clay coating. While 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 most odorous compounds 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 .67N boric acid w/ 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 the ammonia content. After 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 determined that the optimum ratio by volume was 1.2:3.

BOARD 12 A BIOREMEDIATION STUDY OF PARKING LOT AND HIGHWAY CATCH BASIN RUNOFF WATER. VALERIE M. ANDRUS, O5VANDRU@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 control for this project. 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 I-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 the increased toxicity from this runoff source. The procedure for this project had two test trials: (1) Runoff water collected from a parking lot site, and (2) Runoff water collected from the highway site. Each trial had five test containers holding 7.5 L each. These test containers are as follows: (0) a control rainwater only, (1) parking lot or highway runoff water only (depending on the event), (2) duckweed (*Lemna sp.* and *Wolffia sp.*), (3) 10 Fathead Minnows (*Pimephales promelas*), and (4) duckweed (*Lemna sp.* and *Wolffia sp.*) and 10 Fathead Minnows (*Pimephales promelas*). All containers were aerated. Test and log the following: pH (standard units), total dissolved solids (ppm), turbidity (NTU), zinc (ppm), copper (ppm), nitrate (ppm), and phosphate (ppm). Each of these parameters is tested, along with minnow mortality, after 0 hrs (start), 24 hrs, 48 hrs, 72 hrs, and 96 hrs. The data for this project indicates that 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. YAUSY, YAUSY@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 Killdeer 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 management practices that limit 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 numerically determine habitat preferences of different species, possibly 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 water and grasslands, and eastern 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 inadequate, so other survey methods would have to be employed. This study was conducted in cooperation with the Ohio Department of Natural Resources.

BOARD 14 SOY ANTIBIOTICS KATY L. GARRETT, FAIRLAND 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 glyceollin was overproduced in the cotyledons when 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 applied to the cotyledons. 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 LOLLIPOR603@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 motivating this behavior, a survey consisting of 524 test subjects was concluded 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, 3.6% were 5-10 years old, 35.3% were 10-20 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 44 times per year. Wendy's is the first fast food restaurant choice with 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 food affects 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) ; SM VILLARRUEL (VILLARRS@BME.RI.CCF.ORG) ; CA BOEHM (BOEHM@BME.RI.CCF.ORG) ; GM MUSCHLER (MUSCHLG@CCF.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 harvested from the iliac crest of patient donors and the CTPs were cultured for 15-days. Protein content was quantified using the Bradford method. 10mg were loaded onto a polyacrylamide gel. The protein was electrophoretically transferred to a nitrocellulose membrane. The membrane was blocked to prevent non-specific binding, incubated overnight in 1° antibody (mouse monoclonal) and then in anti-mouse IgG-HRP with rinses before and after. Protein antibody complexes were detected by chemiluminescence. The film demonstrated the presence of an antibody specific protein at 92KD, thus indicating the presence of b-Catenin in the CTPs cytosol and nucleus. This suggests that Wnt signaling is occurring and future studies will assay the presence of Frizzled. These results may have important implications in the survival/maintenance of non-differentiated CTPs and also influence the design and development of delivery systems for CTPs in tissue engineering applications.

BOARD 17 THE GERM SQUIRM. HEIDI A. HOFFECKER, HOFFECKERC@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. The muscles around the lungs contract, making an 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 sneezer. 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 with an ultraviolet light. To aid in the process of testing the hypothesis, an artificial sneeze procedure was developed. The researcher spit a large amount of mucus into a balloon to create the equivalent of a sneeze. The balloon was inflated to the approximate size of a human lung. The diameter of the balloon was measured and compared to a lung capacity chart. The balloon was punctured with a sterile needle inside the sneeze chamber. The procedure was repeated 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 COMMERCIALY PREPARED HAMBURGERS IN COSHOCTON, OHIO. AMY C. SCHLEGEL,

DSCHLEGEL@COSHOCTON.COM, 1900 ATWOOD TERRACE, COSHOCTON, OHIO 43812.

This five-year study of the bacterial counts of hamburger meat, and second-year study of the effects of *Allium sativum L.* and the surfactant Poloxamer 407 used Burger King and Wendy's plain hamburgers as well as Big Bear Raw Ground Beef Chuck (used based on previous study) in a 10: -3 dilution. Banicide, a mouth rinse containing the surfactant Poloxamer 407, *Allium sativum L.*, and a combination solution (*Allium sativum L.* and the mouth rinse) were added and left to sit for one hour. For twelve months, samples were plated on TSA plates; for ten months, samples were also plated on TSA with 5% Sheep's Blood Agar. It was hypothesized that an *Allium sativum L.* solution would decrease the bacterial growth in all tested meat samples and that the combination solution would have the greatest effect. Results read at 24, 48, 72, 96 hours, indicated that *Allium sativum L.* on TSA plates was effective at decreasing counts, but that on TSA with 5% Sheep's Blood plates, counts increased. On both types of mediums, the combination solution decreased counts efficiently, though not as well as Banicide and the mouth rinse containing the surfactant Poloxamer 407 alone. Seasonal trends demonstrated that 72.7% of plain hamburger samples would be unacceptable if compared to an after pasteurization milk recommendation, and therefore, some sort of recommendation, standard, or year long testing should be done to observe trends in beef at the consumer level, because fast food is a substantial part of everyday life.

BOARD 19 FACTORS INFLUENCING THE VIABILITY OF SPORES OF BACILLUS SUBTILIS AND BACILLUS MEGATERIUM. KASSIE M YOUNG; KY_COURTDLVA@HOTMAIL.COM; 5307 Rd. 153, ZANESFIELD OH 43360 (BENJAMIN LOGAN HIGH SCHOOL).

When the first accounts of anthrax were found in America, everyone became scared, and not knowing anything about 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 which factors influence the viability of spores of *Bacillus subtilis* and *Bacillus megaterium* could prevent the spread of anthrax. *Bacillus subtilis* and *Bacillus megaterium* spores were used as models for *Bacillus anthracis* spores, which is the cause of anthrax, due to *Bacillus anthracis* being too dangerous to handle. In initial experiments, it was concluded that *Bacillus subtilis* and *Bacillus megaterium* spores were decreased by an average of 91% when treated with disinfectant for 24 hours and 76% when treated in a dry oven 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, PSEARS@ASHLAND.EDU, P.O. BOX 998, 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 results were 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 is 95% certain 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 ($\chi^2 = 4.96$).

BOARD 21 DYNAMIC HOLOGRAPHY IN PHOTOREFRACTIVE POLYMER COMPOSITES WITH METAL NANOPARTICLES. ELYSA W. CHAO¹, ECHAO05@HB.EDU, DR. KENNETH D. SINGER², JESSICA M. MERLIN², 13489 FAIRMOUNT BLVD., CLEVELAND HTS. OH 44118 (HATHAWAY BROWN SCHOOL) AND ²CASE 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, C₆₀ 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 allowing 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 increased two to three times 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 increase 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 60watts and low voltage at 11watts) with a third group used as a control. The 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 30cm 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 the higher voltage electromagnetic field (gauss level 4.4mG at 15 cm) grew less (mean height = 9.5) than those that were grown in the absence of an electromagnetic field (gauss level 0.0mG at 15cm)(mean = 11.0cm). The low voltage group grew taller than the high voltage group (mean height 10.5). A t-test was conducted to compare the high and low voltage trials to the control group. The difference in growth between the high voltage group and the control group was statistically significant ($p < .05$). The lower voltage trial was not statistically significant ($p > .05$) from the control but had a lower mean height. These results support 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. This project aims to develop and test techniques relating to alpaca color genetics by utilizing a series of arbitrary primers in correlation with various alpaca samples of either buccal swabs or blood. A spin protocol (QIAGEN) and GeneReleaser® (BioVentures) are being utilized to extract DNA from its source. The isolated DNA is placed into a PCR master mix containing HotStarTaq (QIAGEN) and amplified in an Eppendorf MasterCycler. An electrophoresis apparatus using a 2% agarose gel produced banding patterns analyzed for amplification of desired markers. To date six published primers (VOLP-03, VOLP-33, VOLP-42, LCA33, LGA63, and LGA77) have been tested to identify accurate DNA extracting and amplifying methods. Using these control primers it has been demonstrated that the PCR reaction has not been optimized for this procedure. Thus far, only primer VOLP-42 has shown any desired results, but has helped to determine that the techniques utilized to search for DNA markers is a valid approach. It would appear that the protocol being used is effective and promising for determining these markers.

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 use wild behavior. There is concern that the intermittent 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 $p = .01$ level of confidence, of the stool consistency and count one, two and three days after enrichment showed no significance. Each enrichment type examined separately did not show a correlation between stool count and consistency. It can be concluded that enrichment items given to the American bears 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^A, HEATHER NEES^A, NATALIE RADER^A, MATTHIAS ZELLER^B, ALLEN HUNTER^B ^ADEPT OF CHEMISTRY, MUSKINGUM COLLEGE, NEW CONCORD, OH 43762 PSZALAY@MUSKINGUM.EDU ^BDEPT OF CHEMISTRY, YOUNGSTOWN STATE UNIVERSITY.

Research activity in recent years has led to significant developments 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 ($[n\text{-Bu}_4\text{N}]_2[\text{DAS}-(\text{SO}_3)_2]$) 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-tetraazacyclododecane - 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 polyimides. 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 DEEPAMALI V. PERERA DPERERA@MUSKINGUM.EDU DEPT OF CHEMISTRY, MUSKINGUM COLLEGE, NEW CONCORD, OH 43762, TOBY M. CHAPMAN, UNIVERSITY OF PITTSBURGH.

The chemical synthesis of nucleic acids requires the protection of reactive sites on the bases. If left unprotected, these sites 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, the exocyclic amino group and the amide function at position 1. The usual protecting method used for deoxyguanosine is the isobutyl 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 fluorescence may allow the cyclic compound to be used as a probe in various biological systems, such as in the detection of abasic sites.

9:30 BETA-CATENIN MEDIATED WNT-SIGNALING AS A MARKER FOR CHARACTERIZATION OF HUMAN BONE MARROW-DERIVED CONNECTIVE TISSUE PROGENITOR CELLS BA HOOVER (BAH14@CWURU.EDU) ; CA BOEHM (BOEHM@BME.RI.CCF.ORG) ; 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 beta-catenin, 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 in an 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 fluorescent secondary Ab. Digital images were captured 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. These positive stain results were noted 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, DAVIS.1081@AG.OSU.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 dependent 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 length of employment. 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 17th 2004

DeBartolo Hall Room 358

Dr. Courtenay Willis

9:00 NESTLING PROVISIONING BEHAVIOR AND REPRODUCTIVE SUCCESS IN ACADIAN FLYCATCHERS. COURTENAY N. WILLIS CNWILLIS@YSU.EDU, DEPT OF BIOLOGICAL SCIENCES, YOUNGSTOWN STATE UNIVERSITY, YOUNGSTOWN OH 44555 AND LASHALE D. PUGH PUGHL@GEOG.UMD.EDU, DEPT 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 the foraging strategy used by adults to provision young reflects adaptations for maximizing reproductive success. Acadian Flycatchers (*Empidonax vireescens*) 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 videotaped feedings of 7, 8, 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 the 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 nestling weight between specialist and generalist nests (p=0.28). Therefore, it appears

that nestling 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) by using one of several different types of mouths, including chewing/ lapping. Some ant species also collect second-hand sugar (honeydew) from homopteran insects which had 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), *Myrmica emeryana* (Forel), and *Lasius alienus* (Mayr), were seen foraging for nectar from extrafloral nectaries of cowwheat, *Melampyrum lineare* (Desr.) in a jack pine forest in Grand Traverse County, Michigan. In 2002, the Allegheny Mound Ant, *Formica exsectoides* (Forel), was observed foraging honeydew from locust treehoppers, *Vanduzeeia 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 uniqueness 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.

KATHRYN E. REIF, KEREIF@OWU.EDU, RAMON A. CARRENO, RACARREN@OWU.EDU, LAURA TUHELA, LMTUHELA@OWU.EDU. DEPT OF ZOOLOGY, OHIO WESLEYAN UNIVERSITY, DELAWARE, OH 43015.

The Oxyurida are a diverse order of parasitic nematodes that inhibit 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 oxyurids from cockroaches using light and scanning electron microscopy (SEM). Here we report several new morphological characters, including new cephalic and tail papillae, from *Leidyneria portentosa*, a parasite from the Madagascar hissing cockroach (*Gromphadorhina portentosa*). Live nematodes were fixed in glutaraldehyde 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. portentosa*. Cephalic and tail structures are also redescribed. These results indicate external morphological features not previously described or conflicting with the previous published description of *L. portentosa*.

9:45 THERMOCONFORMERS OR THERMOREGULATORS: IS THE TUATARA (SPHENODON PUNCTATUS) TRULY A MALADAPTED LIVING FOSSIL OR A RESULT OF NON-SQUAMATE LEPIDOSAURIAN ADAPTATION TO COLD CLIMATES. CHRISTOPHER K. CARMICHAEL¹, CCARMICHAEL@MALONE.EDU, AND JAMES C. GILLINGHAM², GILLI1JC@CMICH.EDU, ¹MALONE COLLEGE, DEPT. OF NATURAL SCIENCES, 515 25TH ST., NW, CANTON, OH 44709-3897, AND ²CENTRAL 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 does possess many ancestral characteristics 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 imply the retainment of ancestral physiological adaptations to 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 (forested and open paddock habitat) on

Stephens Island, New Zealand to evaluate whether or not these animals actively seek out sun or shade patches (i.e., heliothermy) that are splayed on the floor of each respective habitat. Using the McNemar test for the significance of behavioral change (i.e., moving into and out of sun patches) we found that tuatara will generally switch between thermoconforming and thermoregulating repertoires within the forested habitat depending on the evenness of sun patches present on the forest floor. If sun patches were evenly distributed, the tuatara generally did not actively thermoregulate by shuttling into and out of sun patches ($p > 0.05$), however during cloudy conditions, the tuatara frequently displayed heliothermic behaviors ($p < 0.01$). Additionally, thermally sensitive radio-telemetric methods were used to assess body temperature in relation to ambient temperatures. Within the open paddock habitat, tuatara were restricted to their burrows and would at best extend their head toward the base of the burrow (daily activity of the paddock tuatara is primarily limited to burrows due to the presence of a predatory Australasian harrier during the day). Based on the thermally sensitive radio transmitter data, it is apparent that T_B strongly correlates with T_A which indicates that tuatara may be physiological eurytherms. However, during partially sunny days, they may switch to more active roles in seeking out sun patches, although animals monitored still retained T_B that closely correlates with T_A . The tuatara, like many reptiles with low metabolic rates, may simply be active at much lower T_B and utilize sun patches only during times when radiant energy is minimal in order to achieve a preferred, albeit low in the context of reptiles, body temperatures. A decrease in the preferred body temperature may reduce the constant need to seek out basking sites, and may be an adaptive response to the potential predatory behaviors of Australasian harriers. Field studies using fabricated harrier models demonstrate that tuatara quickly retreat into their burrows when a harrier shadow passes overhead. These birds may provide a selective pressure that limits the net bioenergetic gain achievable by consistent basking in open areas (which has a greater impact on tuatara inhabiting the open paddock as they are generally limited to the burrow during daytime hours, whereas tuatara inhabiting the forested areas have access to sun patches within the protection of the forest canopy). Additionally, the low energy requirements for both metabolism and growth in tuatara may help offset the highly variable seasonal effects in this region that can often reduce potential prey densities. These specializations are most likely indicative of adaptations to a cool climate that experiences short-term and long-term temperature fluctuations.

10:00 ROLE OF CHEMORECEPTION AS AN IMPORTANT FORAGING MODALITY IN CROCODILIANS. HANNAH S. KANG, MALONE COLLEGE, DEPT OF NATURAL SCIENCES, 515 25TH ST., NW, CANTON, OH 44709-3897, (CHRISTOPHER K. CARMICHAEL, CCARMICHAEL@MALONE.EDU, AND ROBERT J. MOFFITT, BMOFFITT@MALONE.EDU).

Chemoreception is an important sensory modality in many squamate (lizards and snakes) reptiles during prey detection, however, only anecdotal data has been collected to describe foraging behaviors in the extant crocodylians. Recent research has shown that crocodylians use mechanoreceptors to sense water-borne vibrations produced by potential prey items. These vibrations are not only sensed by the crocodylian, but these reptiles are able to orient toward the source of origin of these mechanical sensations. In the absence of water disturbance and the subsequent production of prey-induced vibrations, crocodylians will switch to a more active underwater foraging style whereby they exhibit concurrent head-waving and mouth-opening behaviors after prey scents are detected using gular pumping and olfaction. A modified Y-maze chamber is currently being used to test behavioral chemosensory orientation in two crocodylian species (*Alligator mississippiensis* and *A. sinensis*). Two widely spaced influent PVC pipes, each equipped with prey-extract feed ports, are connected to the bottom of the test arena which is filled with approximately 12 inches of water. The prey-extract feed ports allow for the introduction of various native prey scent extracts, such as fish, amphibians, reptiles, birds, and mammals. Various test treatments (e.g., no scent vs. fish scent) are introduced into the test arena after the test animal has been acclimated, and foraging behaviors and orientation (including latency, frequency, and duration of such behaviors) are observed. The influence of prey scent on selection and orientation to one of the two influent ports will be statistically treated using a 1-tailed binomial test with equal probabilities. Crocodylians tested to date demonstrate a well-developed chemosensory mechanism for both prey detection and orientation toward prey during foraging based on Y-maze results ($p < 0.05$). A comparative study of several genera of crocodylians (e.g., *Paleosuchus* and *Alligator*) will be conducted to evaluate whether or not these behaviors can be used to generate a behavioral phylogenetic hypothesis for this taxonomic order, and if so, determine if our results are congruent with molecular phylogenetic hypotheses that have been presented.

10:15 CRAYFISH AESTHETASC STRUCTURE IS CORRELATED WITH FLOW ENVIRONMENT AND POSITION ON THE ANTENNULE. KRISTINA S. MEAD¹

MEADK@DENISON.EDU AND AMY E. BRUESTLE²
AMY.BRUESTLE@PSYCHIATRY.UC.EDU ¹BIOLOGY DEPARTMENT, DENISON UNIVERSITY, 100 W COLLEGE ST, GRANVILLE, OH 43023 ²DEPT OF PSYCHIATRY, UNIVERSITY OF CINCINNATI MEDICAL CENTER.

Many aquatic crustaceans use water-borne chemical cues in ecologically critical activities such as finding food, mates, suitable habitat, detecting predators, and communicating with conspecifics. These chemical cues are often present as odor plumes, which consist of fine filaments containing high concentrations of odor molecules interspersed with the surrounding fluid. Several parameters affect the structure of an odor plume and thus, how the plume is encountered by navigating animals. These include the size-scale of the bottom substrate 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. sanborni* and *O. virilis*) were collected from a variety of flow habitats, including streams with silt, sand, gravel, cobble, 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 filaments, to best encounter odors in that habitat. Antennules were examined from at least three individuals per species using scanning electron microscopy, and measured structural parameters at three positions along the antennules from micrographs using Scion Image Software (Scion Corporation). The number of aesthetascs, aesthetasc length, and diameter were greatest in species from high flow habitats, 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 antennule.

10:30 DOES BODY SIZE AND GENDER AFFECT OLFACTION CHEMOSENOR STRUCTURE IN THE CRAYFISH ORCONECTES IMMUNIS? JAMES K. MCCLOSKEY, MCCLOS_J@DENISON.EDU, (KRISTINA MEAD, MEADK@DENISON.EDU), DENISON UNIVERSITY, SLAYTER 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 aesthetascs on the antennules. Crayfish sample their olfactory environment by moving 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 hypothesis that antennule chemosensory 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, 50-65 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 aesthetascs bearing segments, aesthetasc length, diameter, insertion angle, and the distance between adjacent aesthetascs. These parameters were compared among size classes and gender using one- and two-way ANOVAs (Statview, SAS Institute)

Phycology & Aquatic Ecology
9:00 AM, Saturday, April 17th 2004
DeBartolo Hall Room 356
Dr. Robert Heath - Presiding

09:00 SURVEY OF ALGAL TAXA FROM THE UNGLACIATED WESTERN ALLEGHENY PLATEAU EXCLUSIVE OF THE OHIO RIVER. DAVID A. TAYLOR¹ (D-TAYLOR@ONU.EDU), REBECCA BIXBY² (BBIXBY@SPARROW.ECOLOGY.UGA.EDU), DALE A. CASAMATTA³ (DCASAMATTA@JCU.EDU), WAYNE B. CHIASSON⁴ (CHIASSON@OHIO.EDU), NANDA R. FINLKN⁵ (NF160798@OHIO.EDU), MELISSA M. HALL⁶ (M-VERB@ONU.EDU), SARAH E. HAMSHER⁵ (HAMSHSE5@HOTMAIL.COM), MORGAN L. VIS⁵ (VIS-CHIA@OHIO.EDU), AND ROBERT G. VERB⁶ (R-VERB@ONU.EDU). ¹311 S. MAIN ST., ADA, OHIO 45810. ²INSTITUTE OF ECOLOGY,

UNIVERSITY OF GEORGIA. ³DEPT OF BIOLOGY, JOHN CARROLL UNIVERSITY. ⁴COLLEGE OF ARTS AND SCIENCES, DEAN'S OFFICE, OHIO UNIVERSITY. ⁵DEPT OF ENVIRONMENTAL AND PLANT BIOLOGY, OHIO UNIVERSITY. ⁶DEPT OF BIOLOGICAL SCIENCES, OHIO NORTHERN UNIVERSITY

While algae represent integral components of aquatic ecosystems there are often limited baseline data present regarding the presence/absence of species from various habitats and regions. One such region that has been the focus of sporadic algal inventory is the unglaciated Western Allegheny Plateau (UWAP) in Ohio. The primary purpose of this study was to compile a comprehensive list of algal taxa found within this distinctive ecoregion. Two groups of data were referenced to form a list for the survey. The first data set was composed of taxa identified from field samples collected from 115 various habitat sites throughout the UWAP. These collections were made in conjunction with various projects, theses, and dissertations conducted at Ohio University. Habitats sampled included streams, lakes, vernal pools, cliff walls, springs and wetlands. Systems in this aspect of the study had mean species richness values of 54 species with a minimum of one species and a maximum species richness of 273 being recorded. Depressed levels of species richness recorded were often attributed to the prevalence of acid mine drainage in this region. The second data set was accumulated by performing a literature search of 22 previous investigations conducted in the region. The combination of both data sets yielded a total of 1,716 infrageneric taxa for this survey. Groups that exhibited the greatest species richness included the Chlorophyta (39%), Bacillariophyta (34%), and the cyanobacteria (15%). Additional groups of lesser taxonomic dominance included the euglenophytes (6%), chrysophytes (2%), xanthophytes (2%), dinophytes (1%), cryptophytes (0.5%) and the rhodophytes (0.5%).

9:15 NEW LEPTOLYNGBYA (CYANOBACTERIA) REPORTED FROM THE ALL TAXA BIODIVERSITY INVENTORY OF GREAT SMOKY MOUNTAINS NATIONAL PARK. CATHERINE E. OLSEN (COLSEN06@JCU.EDU), JEFFREY R. JOHANSEN AND REX. L. LOWE¹. DEPT OF BIOLOGY, JOHN CARROLL UNIVERSITY, UNIVERSITY HEIGHTS, OH 44118. ¹DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY.

The All Taxa Biodiversity Inventory (ATBI) began in 1997 with the goal of inventorying and providing a database of information for every species located in the habitat replete Great Smoky Mountains National Park (GSMNP). The ATBI work on the algal communities of GSMNP has yielded many new records to the park and possible new records to science. In this study, algal samples were collected from three wet rock seeps within GSMNP. Both living and preserved material was examined and photographed. Eight *Leptolyngbya* (Oscillatoriales, Cyanobacteria) species were identified from the three sites. In an effort to conform to recent taxonomic trends, the ecological preference of the cyanobacterial species was taken into consideration. Of the eight *Leptolyngbya* observed, three are putatively new species to science, two have been reported as new records to the park, and three others did not fit any previously circumscribed taxa, but currently not enough material was available to describe them as new species under the Botanical Code of Nomenclature. In the past, North American phycologists have used European keys to identify species of cyanobacteria. Rather than depending on these descriptions as the sole basis of classification, morphological, ecological, and biogeographical data were combined in this study to determine taxonomic identification. Forcing potentially new taxa into previously described morphologically similar, but ecologically very different, species has been avoided by the inclusion of ecological and biogeographical data in addition to morphology as species descriptors

9:30 TWO NEW CYANOBACTERIAL TAXA FROM THE GREAT SMOKY MOUNTAIN NATIONAL PARK (USA). DALE A. CASAMATTA (DCASAMATTA@JCU.EDU), SHANNON R. GOMEZ AND JEFFREY R. JOHANSEN. DEPARTMENT OF BIOLOGY, JOHN CARROLL UNIVERSITY, UNIVERSITY HEIGHTS, OH 44118.

The Great Smoky Mountain National Park (GSMNP) serves as a refuge for one of the largest, richest collections of plants, animals and cryptogamic taxa in the world. Here, we describe two new taxa from drippy walls within the GSMNP system. Both belong to the clade of heterocyte-bearing cyanobacteria, but their higher level taxonomic status is uncertain. The first newly described species is *Capsosira lowii* (Capsosiraceae) which differs from the previously monotypic taxon *Capsosira brebissonii* Kütz. ex Born. et Flah. with regard to cell size, filament morphology and ecology. *C. brebissonii* is described as an aquatic or subaerophytic taxon, while our isolate is a phycobiont from the lichen *Hydrotheria venosa* J.L. Russell. The genus *Capsosira* is currently placed in the Capsosiraceae of the Stigonematales due to its ability to divide in two planes. However,

molecular evidence gathered in this study based on 16S rRNA gene data indicates closest affinity with *Aulosira* and *Nostoc commune* Vaucher, both in the Nostocaceae, Nostocales. *Rexia erectus* was also isolated from concurrently collected epilithic, aerophytic sites. The hormogonia production, near absence of heterocytes, and division in two planes are all typical of the Stigonematales. However, *Rexia* fits none of the currently circumscribed families in that order and appears morphologically similar to members of the Scytonemataceae and Microchaetaceae. Molecular evidence (16S rRNA sequence data and 16S-23S internal transcribed spacer region) places *Rexia* in the Microchaetaceae. These taxa are both problematic because they indicate that cell division in two planes has likely arisen more than once in the Nostocales and thus the Stigonematales as currently circumscribed is not a monophyletic group.

9:45 A NEW APPROACH TO CYANOBACTERIAL SYSTEMATICS AND TAXONOMY. JEFFREY R. JOHANSEN, JOHANSEN@JCU.EDU, AND DALE CASAMATTA, DCASAMATTA@JCU.EDU. DEPARTMENT OF BIOLOGY, JOHN CARROLL UNIVERSITY, UNIVERSITY HEIGHTS, OH 44118.

In the past, cyanobacterial species delimitation has been confined to morphospecies descriptions under the International Code of Botanical Nomenclature. Although recommendations have been made to delimit species in accordance with a polyphasic approach under the Bacteriological Code of Nomenclature, very few taxa have actually been described in this way. We propose that cyanobacterial species be described using the autapomorphic (monophyletic) species concept, using morphological, ecological, or molecular autapomorphies. Differences in each of these should be considered as sufficient but not necessary to describe taxa. In studies of terrestrial representatives in the genera *Nostoc* and *Leptolyngbya*, we found that strains with very similar morphology actually had distinctly different secondary structure in their 16S-23S rRNA ITS regions. These molecular structures provide autapomorphies that we consider to be sufficient for recognition of our strains as new, separate species. In other strains, specifically a putatively new species of *Capsosira*, several stable morphological and ecological autapomorphies were observed which separated it from other previously described species, even though the molecular data provided no compelling evidence the strain differed from *Nostoc commune*. We propose that there are many undescribed species of cyanobacteria worldwide, and that no single character set (morphological, ecological, molecular) is always sufficient or always necessary. Strains and populations showing clearly definable autapomorphies of any kind should be taxonomically recognized. A polyphasic approach is recommended simply because it improves the likelihood that significant autapomorphies will be discovered.

10:00 SEASONAL AND ANNUAL METAPHYTON DYNAMICS IN A RECENTLY CONSTRUCTED WETLAND IN DEFIANCE COUNTY OHIO. SARAH E. HAMSHER¹ (HAMSHSE5@HOTMAIL.COM), LEE M. LUCKEYDOO¹, DALE A. CASAMATTA² AND NORMAN R. FAUSEY¹. UNITED STATES DEPT OF AGRICULTURE, 590 WOODY HAYES DR., COLUMBUS, OH. ²DEPARTMENT OF BIOLOGY, JOHN CARROLL UNIVERSITY.

Algae are one of the primary components of a wetland community and 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 used to ameliorate agricultural drainage in Defiance County. Metaphyton samples were collected between April and November in all years. Water samples were collected concurrently with algal samples in 2000 and 2003 for further nutrient analysis. Metaphyton were identified, enumerated, and biovolume 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 unknown. A comparison of biomass at 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 were significantly ($p < 0.05$) greater. Overall, it appears that the algal community structure changed in biomass and taxa present while simultaneously decreasing nitrate and orthophosphate levels.

10:15 DISSOLVED ORGANIC PHOSPHORUS (DOP) COMPOUNDS AS A SOURCE OF PHOSPHORUS AND CARBON TO FRESHWATER PLANKTON COMMUNITIES, EAST TWIN LAKE, PORTAGE COUNTY. ROBERT T. HEATH (RHEATH@KENT.EDU) AND DENNIS HANSEN (HADE0201@STCLOUDSTATE.EDU) DEPARTMENT OF BIOLOGICAL SCIENCES, KENT STATE UNIVERSITY, KENT, OHIO 44242.

Although dissolved organic phosphorus compounds (DOP) have traditionally been thought of as a source of P for bacteria and algae in natural freshwater environments, the significance of DOP as a C-source has largely been ignored. Because recent findings indicate that labile dissolved organic compounds (LDOC) may greatly influence phosphate uptake by bacterioplankton and because bacterioplankton are generally C-limited, the possibility that freshwater bacteria may use DOP as a source of both P and C was examined. The purpose of this study was to follow the assimilation of the P- and C- moieties from glucose-6-phosphate (G6P) and the 5' mononucleotide, adenosine-triphosphate (ATP), by a natural plankton assemblage drawn from a hardwater glacial kettle lake (East Twin Lake, Portage County, Ohio). Uptake of ^3H -glucose and ^{32}P -phosphate from G6P and ^3H -adenosine and ^{32}P -phosphate from equimolar quantities of ^{32}P -ATP and ^3H -ATP, ranging from 10 to 80 nM (total conc.), was followed by filtration onto 0.2 μm and 1.0 μm filters. Both bacterioplankton and phytoplankton assimilated the phosphoryl moiety in preference to the organic moiety; bacterioplankton but not phytoplankton assimilated a significant fraction of the organic moiety from DOP compounds, too. Our findings are consistent with the view that bacteria may utilize DOP as a source of P and C, while phytoplankton use DOP only as a source of P. This study was supported in part by the NSF and Ohio Sea Grant.

10:30 LABILE DISSOLVED ORGANIC CARBON (LDOC) AND DISSOLVED ORGANIC PHOSPHORUS (DOP) INFLUENCE PHOSPHATE UPTAKE IN LAKE ERIE BACTERIOPLANKTON. TRACEY TRZEBUCKOWSKI MEILANDER, TTRZEBUC@KENT.EDU, ROBERT T. HEATH, RHEATH@KENT.EDU, DEPARTMENT OF BIOLOGICAL SCIENCES, 256 CUNNINGHAM HALL, KENT STATE UNIVERSITY, KENT OH 44242.

While phosphorus is the major limiting nutrient in the Great Lakes ecosystem, phosphate-uptake by bacterioplankton may depend on the amount of labile dissolved organic carbon (LDOC) present as well as the dissolved organic phosphorus (DOP) in the water column, a view called the Microbial Shunt Hypothesis (MSH) of phosphate apportionment in freshwater plankton communities. According to the MSH, in low LDOC (<50 nM) environments, bacterioplankton will uptake most available P; but, in high LDOC environments (>70 nM), phytoplankton will uptake most available P. The purpose of this study was to determine whether field 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 was measured radiometrically using $^{33}\text{PO}_4$. LDOC was determined from the difference in dissolved oxygen concentration over time and converted to available carbon dioxide, a labile carbon compound. Ambient phosphate concentration was estimated radiometrically 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 off-shore 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).

Basic & Applied Microbiology

9:00 AM, Saturday, April 17th 2004

DeBartolo Hall Room 346

Dr. Paul Baker – Presiding

9:00 IDENTIFICATION AND CHARACTERIZATION OF BACTERIAL STRAINS FROM THE MIR SPACE STATION. BO SONG, BSONG@KENT.EDU, LAURA G. LEFF, LLEFF@KENT.EDU, DEPT OF BIOLOGICAL SCIENCES, KENT STATE UNIVERSITY, KENT OH 44242-0001.

Twenty bacterial isolates supplied by NASA from the Mir space station water system were identified using traditional methods and 16S rRNA gene sequencing. Results from Vitek[®] GNI+ test card, API[®] 20NE and 16S rRNA gene sequencing methods showed

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 three identifications for the isolates were corroborated by each of the three techniques. Four strains matched each other between the API[®] 20NE and Vitek[®] GNI+ test card. Only 4 species were identified the same between 16S rRNA gene method and API[®] 20NE while 5 species matched between 16S rRNA gene sequencing method and Vitek[®] GNI+ test card. API[®] 20NE was unable to identify 6 strains and 2 strains were not identified by Vitek[®] GNI+ test card. Based on 16S rRNA gene method, the following five taxa were found: *Arthrobacter* sp., *Stenotrophomonas maltophilia*, *Ralstonia pickettii*, *Pseudomonas* sp. and *Chryseobacterium* sp. API[®] 20NE and Vitek[®] GNI+ test card were limited in their utility for identifying environmental 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 food webs, and microorganisms play major roles in the breakdown of leaf litter. Fungi dominate in the early stages and bacteria in the later stages of decay. In a preliminary study in a Northeast Ohio stream (the West Branch of the Mahoning River), as much as 1.84×10^7 CFU/gm of bacteria were obtained from decomposing leaves ($N=3$) while numbers were 2.31×10^3 CFU/gm and 1.15×10^4 CFU/gm from water ($N=3$) and sediments ($N=3$) respectively. Kanamycin-resistant bacteria were more abundant (up to 7.16×10^6 CFU/gm) than tetracycline, rifampicin or chloramphenicol-resistant bacteria. In this study, we examined microbial colonization of leaves decomposing in this same stream from Nov, 2003 to June, 2004 and examined interactions among different components of the microbial assemblage. Aquatic hyphomycetes (eukaryotic) and actinomycetes (prokaryotic, Gram positive), antibiotic-resistant bacteria and non-actinomycete and non-antibiotic resistant bacteria were studied. Microbial flora on two leaf species, white oak ($N=3$) and sugar maple ($N=3$), were compared using various methods, such as conidia staining (hyphomycetes) and DGGE (bacteria and hyphomycetes). The varying chemistry of the leaf species may be responsible for the higher numbers of kanamycin-resistant bacteria on sugar maple (as high as 5.78×10^7 CFU/gm) than on white oak (as high as 3.21×10^7 CFU/gm). As the leaves decompose, we hypothesize that the abundance of antibiotic-resistant bacteria will become more common in the community.

9:30 DETECTION OF HELICOBACTER PYLORI ORGANISM IN REGULARLY-SUBMITTED STOOL SAMPLES USING RAPID ENZYME IMMUNOASSAYS. SAROJ K SIGDEL, MD SAROJSIGDEL@YAHOO.COM, SYED WAHAB, MS SWAHAB@FORUMHEALTH.ORG, DEPT OF PATHOLOGY AND LABORATORY MEDICINE, FORUM HEALTH, 500 GYPSY LN, YOUNGSTOWN OH 44501.

Helicobacter pylori is a common gastrointestinal pathogen in humans and is associated with chronic gastritis and peptic ulcer disease. Approximately 50% of the population in the developed world and 90% of the population in developing world are infected with *H. pylori* at some point in time. Ninety percent of patients with chronic gastritis and the majority of patients with peptic ulcer disease are positive for *H. pylori*. The objective of the study was to determine the prevalence of *H. pylori* in regularly-submitted stool specimens at Northside Medical Center, Youngstown, OH, using two rapid enzyme immunoassays (HpSA[™] microtiter wells and HpSA[™] immunocard). In a prospective study, 38 regularly-submitted stool specimens at Northside medical center, Youngstown, OH, were evaluated for the presence of *H. pylori*. Two rapid immunoassays, HpSA[™] micro titer wells and HpSA[™] immunocards (Meridian Diagnostics, Inc., Cincinnati, OH), were employed in the detection of the *H. pylori* antigen in the stool samples. Of the 38 regularly-submitted stool specimens at Northside Medical Center, Youngstown, OH, one sample was positive for both rapid immunoassay techniques (HpSA[™] micro titer wells and HpSA[™] immunocard). The study shows that approximately 2.6% (1/38) of patients whose stool samples were sent to the lab for various reasons were positive for *H. pylori* organism.

9:45 MOTILITY ASSAYS OF BACTERIA ISOLATED FROM WATER SOURCES AT KRAUS WILDERNESS PRESERVE, LEIA S. CORTHELL, LSCORTHE@OWU.EDU, (LAURA

TUHELA, LMTUHELA@OWU.EDU), HWCC Box 1151, OHIO WESLEYAN UNIVERSITY, DELAWARE OH 43015.

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., aquatic bacterial isolates were obtained from five water sources at The Kraus Wilderness 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 *Aeromonas*, the five isolates which were determined by microscopy to be most highly motile were selected for further study. To confirm the identification of the isolates as *A. hydrophila*, the BBL Enterotube II system and Biolog Micro Plates were used. Growth characteristics of one isolate, TA-Ca, indicated a doubling time of 60 minutes and the highest percentage of motile cells at 24 hours. Chemotaxis assays were done using 24 hour old TA-Ca cultures with aqueous solutions of 100 mM, 10 mM, 1.0 mM, 0.1mM, and 0.01 mM of glucose, L-histidine, or L-arginine as possible chemoattractants. A relative response ratio of 2.2 indicated that L-histidine at a 100 mM concentration was a chemoattractant for TA-Ca. Relative response ratios of less than 1.0 were observed for all three chemicals at concentrations of at least 0.1 mM or lower, suggesting that these chemicals might actually repel *Aeromonas* at low concentrations. In order to examine another aspect of *Aeromonas* motility, flagella were isolated from the 5 most highly motile isolates for the purpose of analyzing flagellar protein structure using SDS-PAGE.

10:00 BACTERIAL ATTACHMENT TO STAINLESS STEEL DISKS IN A SIMULATED MICROGRAVITY ENVIRONMENT. PAUL W. BAKER PBAKER3@KENT.EDU, LAURA G. LEFF LLEFF@KENT.EDU, DEPT OF BIOLOGICAL SCIENCES, KENT STATE UNIVERSITY, KENT, OH 44242.

Little is known about the effects of gravity on the formation of bacterial biofilms. Biofilms are commonly found in natural environments and are involved in biofouling and degradation. Previous studies have recovered bacterial isolates from the water supply aboard the Mir space station and it is possible that these microorganisms have proliferated by forming biofilms. These bacteria were incubated in high and low nutrient medium under clino-rotation. Clino-rotation enables the bacteria to remain in a geostationary orbit that is similar to a microgravity environment. The actual rotation speed used was 40 rpm that is equivalent to a G-force of 82 mg. Quadruplicate experiments under simulated microgravity were performed in parallel to normal gravity controls. Bacteria attaching to stainless steel disks were recovered using a stomacher. Sessile and planktonic bacteria were counted after staining with either DAPI or the Live/Dead BacLight kit. *Sphingobacterium thalophillum* showed no significant difference in attachment to the steel disks under microgravity compared to normal gravity. *Ralstonia pickettii* and *Pseudomonas fluorescens* attached to the steel disks at significantly higher numbers under microgravity compared to normal gravity. For all the bacteria examined, planktonic cells were often more abundant under microgravity compared to normal gravity. The community structure of bacteria in the water system aboard the Mir space station may be different than would be present in normal gravity.

10:15 DETERMINING THE MECHANISM OF BONE-LOCALIZED HUMAN GROWTH HORMONE (hGH) ACTION IN TRANSGENIC MICE (*MUS MUSCULUS*) USING QUANTITATIVE REAL-TIME PCR (QRT-PCR). RAJSREE D. BORTHAKUR, RDBORTHA@NEOU.COM.EDU, DONNA KING, DK@NEOU.COM.EDU, NORTHEASTERN OHIO UNIVERSITIES COLLEGE OF MEDICINE, 4209 SR 44, ROOTSTOWN OH 44272.

Transgenic mice that produce hGH in their marrow generate more bone matrix and are models of gene therapy in humans for problems of severe low bone density. Such therapy could benefit persons with osteogenesis imperfecta and astronauts in space travel by providing a constant, long-term, and local source of hGH. The purpose of this project was to determine the mechanism by which locally produced hGH stimulates bone deposition. RNA extracted from bones of two lines of hGH transgenic and control mice was reverse transcribed and analyzed by QRT-PCR to compare levels of gene expression. It was hypothesized that the anabolic effects of hGH on bone deposition were mediated through insulin-like growth factor I (IGF-I) and insulin-like growth factor II (IGF-II). Marrow-localized growth hormone production stimulated small increases in IGF gene expression. For example, females induced IGF-I 1.3 to 2.7 fold and IGF-II 1.3 to 3.2 fold in dose-dependent manners. The inductions of IGF-I and IGF-II were dampened in males that expressed the most hGH. Treatment (hGH expression level) and treatment by gender effects were significant for both IGFs (2-way ANOVA). Thus, hGH may act indirectly through these growth factors

to stimulate bone deposition. QRT-PCR also detected low levels of mouse GH expression in the bones of both transgenic and control mice. Thus, a natural mechanism may already exist for the local production of growth hormone to stimulate bone deposition. This phenomenon was exploited by the transgenic mice, which produce several thousand fold higher levels of growth hormone in their marrow.

10:30 SECOND-SITE SUPPRESSOR ANALYSIS OF TRANSMEMBRANE DOMAINS III AND VI IN THE LACTOSE PERMEASE OF *ESCHERICHIA COLI*. HEATHER J. CHANNEL* HTHJCHNN@OTTERBEIN.EDU, LEIGH C. HRANILOVICH* LGHCHRNL@OTTERBEIN.EDU. DR. AMY JESSEN-MARSHALL, AJESSEN-MARSHALL@OTTERBEIN.EDU. OTTERBEIN COLLEGE, DEPT OF LIFE SCIENCES, 1 OTTERBEIN COLLEGE, WESTERVILLE OH 43081.

The lactose permease couples the transport of lactose with proton movement, acting as a secondary active solute transporter in the Major Facilitator Superfamily (MFS). Members of this family include transport proteins such as the tetracycline antiporter and transport proteins implicated in diabetes, stroke, and depression. The lactose permease has been a model system in studies of transport activity for over 40 years. Studies to determine structure of the lac permease in *Escherichia coli* have led to a model of twelve transmembrane domains in a-helical conformations, with eight amphipathic helices responsible for solute transport, and four hydrophobic helices, which we hypothesize to stabilize the protein in the membrane. 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. To verify the orientations of the faces of these helices, we performed second-site suppressor screens. 15 gain of function mutants (red) were isolated on MacConkey plates from white/pink parental phenotypes and analyzed with an ONPG assay, which showed a gain of function for the suppressors V85K(+) at a level of activity 90%W.T., M86K(+) 84%W.T., in helix III, and I179K(+) 93%W.T., I180R(+) 112%W.T., and A11R(+) 102%W.T. activity in helix VI. This work yields evidence for the first time that the hydrophobic 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 - Presiding**

9:30 PRELIMINARY ANALYSIS OF THE PALEOFLORA OF THE DOAN BROOKS EXPOSURE OF THE UPPER DEVONIAN OHIO BLACK SHALE. WILMER C. STOWE (WILSTO@NCWEB.COM) AND SHYA CHITALEY (SCHITALE@CMNH.ORG). THE CLEVELAND MUSEUM OF NATURAL HISTORY, 1 WADE OVAL DRIVE, UNIVERSITY CIRCLE, CLEVELAND, OH 44106-1767.

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 as 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, 1992, 1996 & 2001). 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 slide with glycerin jelly. Compared to samples collected 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. There is a greater abundance of spores on the west side of the brook than the east side. The palynomorphs from the Chagrin Shale collection were much more abundant and diverse than those from the two Cleveland Shale collections.

9:45 STANDARDIZATION OF EMERGENCY MAPPING SYMBOLOGY IN THE UNITED STATES. EMMANUEL K. MBOBI, EMMOBI@STARK.KENT.EDU, KENT STATE UNIVERSITY, STARK CAMPUS, DEPT OF GEOGRAPHY, 6000 FRANK AVENUE, NW, CANTON OH 44720.

Recent advances in computer applications for mapping, especially in Geographic Information Systems (GIS), have resulted in a much more rapid exchange of data and information 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 and, in some cases, serious time delays in the process of map interpretation. Recognizing the problem, the Federal Emergency Management Agency (FEMA) led research efforts and launched reviews of the emergency and hazard management symbology used by the First Responders in their disaster operations. The Homeland Security Working Group of the Federal Geographic Data Committee's (FGDC) joined FEMA's efforts to 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 development of a matrix to a) identify the hazards and emergency 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. This information was compared in order to identify 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 the contents of commercial map software. Unfortunately, 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, RHONJACK@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 photographic surveys and Landsat to quantify the percentage of the Alum Creek watershed urbanized 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 localized 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 suggest higher flows 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, 210 KOTTMAN HALL, 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 intact cores (N=480). Denitrification potential was determined by incubating sediment slurries (N=1440) under three different conditions (addition of nitrate, addition of nitrate plus glucose, and no addition). Peak rates of denitrification were $1.73 \pm 0.17 \text{ mg N}_2\text{O g}^{-1} \text{ DW hr}^{-1}$ and $0.54 \pm 0.08 \text{ mg N}_2\text{O g}^{-1} \text{ DW hr}^{-1}$ in one-stage and two-stage ditches, respectively. In presence of glucose and nitrate, denitrification potentials were $0.45 \pm 0.04 \text{ mg N}_2\text{O g}^{-1} \text{ DW hr}^{-1}$ and $0.87 \pm 0.12 \text{ mg N}_2\text{O g}^{-1} \text{ DW hr}^{-1}$ 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 NO_3^- concentration present, as well as the type of sediment.

10:30 EFFECTS OF MACROPHYTE FUNCTIONAL GROUP AND FUNCTIONAL GROUP DIVERSITY ON SURFACE WATER PARAMETERS LISA M. GARDNER, GARDNER.232@OSU.EDU, THE OHIO STATE UNIVERSITY, SCHOOL OF NATURAL RESOURCES, 520 STINCHCOMB DR. APT. 5 COLUMBUS, OH 43202, VIRGINIE BOUCHARD, BOUCHARD.8@OSU.EDU, AND SERITA FREY, SERITA.FREY@UNH.EDU UNIVERSITY OF NEW HAMPSHIRE, DEPT OF NATURAL RESOURCES.

Created wetlands tend to have less plant diversity than natural wetlands, raising the question of the role plant diversity plays in wetland function. The goal of this study was to determine if macrophyte functional groups and functional group diversity affects wetland function by studying basic surface-water parameters. These parameters included dissolved oxygen (DO), pH, oxidation-reduction potential (ORP), water temperature, conductivity, percent algae cover, and nitrate, ammonia and ortho-phosphate concentrations. Four macrophyte functional groups (FGs) were selected for this study (obligate annuals, tussock, reeds, and facultative annuals). Forty-eight 416.4 L mesocosms were divided into 8 sets of 6 replicates consisting of individual FGs, random combinations of 2 FGs, 3 FGs, all 4 FGs, and controls (no plants). Water was sampled *in-situ* on 5 occasions during Spring 2003. The data was analyzed using ANOVA to determine if any of the water parameters differed between FG diversity treatments or individual FG treatments. Relationships were also investigated between each water parameter and biomass using a least-squares regression, and between the parameters themselves using Pearson's product. Results indicate water temperature and pH differs greatly in planted versus unplanted control treatments ($p < 0.001$). The number of functional groups does not influence water quality, but particular functional groups do. Characteristics determined to be most influential were the amount of biomass a functional group produced and the quantity of algae present in the surface water.

10:45 TIME TRAJECTORIES FOR ACCUMULATION OF SOIL ORGANIC CARBON IN CREATED MARSH WETLANDS OF CENTRAL OHIO. KATHLEEN A. HOSSLER, HOSSLER.3@OSU.EDU, VIRGINIE BOUCHARD, BOUCHARD.8@OSU.EDU, OHIO STATE UNIVERSITY, ENVIRONMENTAL SCIENCE GRADUATE PROGRAM, SCHOOL OF NATURAL RESOURCES, 2021 COFFEY RD., COLUMBUS OH 43210.

Section 404(b) of the Clean Water Act dictates that a degraded wetland be mitigated to replace lost wetland function. The purpose of this study is to evaluate the mitigation of natural wetland soil function by created wetlands. Of specific interest is the potential for created wetlands to function as natural wetlands by sequestering carbon in their soil. Five created (ages 3-8 years) and four natural marsh wetlands in Delaware, Franklin, Knox, Marion, and Pickaway counties of Ohio, were selected for this study. Nine to fifteen soil cores were collected at each site and analyzed for percent water-stable macroaggregates ($>250 \mu\text{m}$). The macroaggregate data were fit to a simple exponential model using the mean natural wetland aggregate content as the equilibrium value. Preliminary results suggest a time to equilibrium of thirteen years (N=36). Based on literature studies, the rate for aggregation is expected to be more than 35 times the rate for organic carbon accumulation; this suggests a time to equilibrium of over 400 years for soil organic carbon in created marsh wetlands. Most modified and maintained agricultural ditches have a traditional one-stage ditch form with oversized channels and no floodplain. In the absence of

maintenance, these one-stage ditches develop into more stable naturalized two-stage ditches that incorporate small main channels and benches or floodplains.

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 ASTUDER001@DEFIANCE.EDU 17231 PRATT
LN GRAND RAPIDS OHIO 43522
(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's 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 known demethylating agent, will be applied to plants with the hypothesis that it will turn on the *P* gene. Then methylating and ethylating alkylating agents, with different substrates, will be tested for efficiency of remethylation 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, AASABERE@KNOX.EDU, BRUCE J. ARONOW², BRUCE.ARONOW@CCHMC.ORG, ¹K-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 the effects of QTLs on the expression of other genes *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 lines, DBA2 and C57B/6 were identified. Genes whose expression varied across the panel were filtered for those which might elicit a cascade of downstream tissue-specific effects with physiologic impact. Using this approach, c-Fyn, non-receptor tyrosine kinase whose expression was strong in the brain of humans and mice, and whose expression systematically varied according to the inheritance of a specific trans-acting region that differed in DBA2 and C57B/6 mouse strain parents was identified. Using WebQTL, traits in the forebrain that shared similar expression variation with Fyn were located. An interval mapping of the chromosomes was calculated using the traits co-regulated with Fyn and putative QTLs were located on Chromosomes 1 and 10. Polymorphic genes at these QTLs were identified using the UCSC Genome Browser. Further analysis identified genes with binding sites conserved amongst the co-regulated genes and putative QTL genes. Putative QTLs might include protein tyrosine phosphatase, inositol polyphosphate-1-phosphatase, amyotrophic lateral sclerosis 2, thioredoxin reductase 1 and Anti-Mullerian hormone.

2:30 EFFECT OF ADENOVIRUS DNA CONCATEMERS ON LATE GENE EXPRESSION.
SUMITHRA JAYARAM AND EILEEN BRIDGE. DEPT OF MICROBIOLOGY,
MIAMI UNIVERSITY, OXFORD, OH 45056.

Human Adenovirus early genes encode a series of non-structural proteins that are essential for expression of late viral genes. Early region 4 (E4) open reading frames 3 and 6 code for 11kDa and 34kDa proteins that are involved in modulation of viral late gene

expression, viral DNA replication, apoptosis, and cell transformation. Recently these proteins were shown to be involved in regulating double strand break repair (DSBR) process by degradation and relocalization of cellular enzymes that are involved in non-homologous end joining of double strand DNA breaks. The absence of the 11kDa and 34kDa proteins in infection by E4 mutants leads to concatenation of viral DNA genomes by cellular DSBR proteins. We have investigated the effect of concatemer formation on expression of viral late genes. Human glioma cell lines that are either DNA dependent protein kinase (DNA PK) proficient (MO59K) or DNA PK deficient (MO59J) were used. DNA PK is one of the enzymes that is involved in concatenating the viral DNA in E4 mutant infections. We infected MO59J and MO59K cells with an E4 mutant and measured the late gene expression by western blotting. Preliminary studies have shown that an E4 mutant virus expresses late genes better in MO59J than in MO59K cells. Furthermore, the late gene expression defect was partially rescued in MO59K cells and HeLa cells cultured with wortmannin, a drug that inhibits DNA PK. Pulsed field gel electrophoresis studies have shown that wortmannin inhibits concatemerization in E4 mutant infected cells. Our results indicate that concatemers of viral genomes express late genes less efficiently than single length genomes at high multiplicity of infection. We are currently performing experiments to explore the mechanism through which concatemer formation effects late gene expression.

2:45 EXPERIMENTAL STUDIES OF SIGNAL NOISE IN GENE REGULATORY SYSTEMS IN THE INDUCIBLE ANTIBIOTIC RESISTANCE PATHWAY OF *E. COLI*
KATHERINE E. FRATO, KERATO@WOOSTER.EDU, (TERESA JOHNSON,
TJOHNSON2@WOOSTER.EDU, JOHN LINDNER, JLINDNER@WOOSTER.EDU,
DEAN FRAGA, DFRAGA@WOOSTER.EDU) DEPT OF BIOLOGY AND
PHYSICS, THE COLLEGE OF WOOSTER, WOOSTER OH 44691.

Since the behavior gene regulatory systems are governed by nonlinear equations, thermodynamic noise in the environmental chemicals that interact with the regulatory regions may enhance signal detection. In this experiment the *mar* pathway, which detects environmental signals such as sodium salicylate and induces a multiple antibiotic resistance 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* signal cascade are 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 ANITIBIOTIC RESISTANCE IN *ESCHERICHIA COLI*, KATHERINE C. RITCHEY,
KRITCHEY@WOOSTER.EDU, PETER KOLBAKA, PKOLBAKA@WOOSTER.EDU,
BLANCHE MWILAMBWE, BMWILAMBWE@WOOSTER.EDU, (TERESA
JOHNSON, TJOHNSON2@WOOSTER.EDU), (DEAN FRAGA,
DFRAGA@WOOSTER.EDU). BIOLOGY DEPT, THE COLLEGE OF WOOSTER,
1189 BEALL AVE, WOOSTER OH 44691.

Studies have attributed inducible antibiotic resistance to chemorepellants in *Escherichia coli* (*E. coli*). Previous work demonstrated that inducible antibiotic resistance involved a variety of antibiotic mechanisms and structures and was induced by chemotactic repellants that differ chemically from the antibiotics tested. Further studies by College of Wooster students have attempted to specifically define the interaction of chemorepellants and chemoattractants with inducible antibiotic resistance. A distinct relationship between chemotaxis, cellular motility and antibiotic resistance is evident from their work and suggests that chemotaxis receptors may influence the antibiotic resistance phenotype. Additional experiments will confirm the inducible antibiotic response in previously tested *E. coli* strains and will 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 chemorepellant (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 previous 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 MALTOSYL UTILIZATION IN *BACILLUS SUBTILIS*.
SARAH K. McBETH, SMCBETH@MUSKINGUM.EDU, (DEEPAMALI PERERA,

DPERERA@MUSKINGUM.EDU), MUSKINGUM COLLEGE 163 STORMONT ST., NEW CONCORD OH 43762.

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. By attaching fluorescein to maltose, this study attempts to create a probe that will only fluoresce in the presence of maltose-metabolizing bacteria such as *Bacillus subtilis*. Organic synthesis will be used to make three 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, L^C ASHWORTH@ONU.EDU, 415 E. UNIVERSITY AVE, ADA, OH 45810.

Humoral response to immunization can be maximized by antigen conjugation to an adjuvant and/or proper route of vaccine administration. Reduced mannan 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 their impact on immune 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 intraorbital 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. DOUGLAS A. DONAHUE (DOUGDON@BGNET.BGSU.EDU), EDWARD J. DOUGHERTY (DEDWARD@BGNET.BGSU.EDU), AND LEE A. MESERVE (LMESERV@BGNET.BGSU.EDU), DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN, OH 43403-0212.

Polychlorinated biphenyls (PCB) are environmental contaminants that have been a problem since 1960s because they are widespread, 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, 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 1.25, 12.5, or 25.0 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 in the hippocampus regardless of dose, and in the basal forebrain except at 25.0 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 status. 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, MDWOMBLE@YSU.EDU, REBECCA S. LIPTAK, 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 (I_M), 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 I_M 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 hyperpolarize 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 I_M is persistently active. Application of retigabine produced a large and rapid elevation in holding current amplitude, indicating a substantial increase in I_M. A continuous ramp voltage-clamp protocol (-100 to 0 mV) was used to identify the I_M 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 I_M 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 (-WILSON@ONU.EDU) 402 W. COLLEGE AVE. UNIT 1941 ADA OH 45810.

In 1956, Whittaker 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 Mountains 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 also graphed against elevation, 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 Whittaker's Great Smoky Mountain transects.

2:15 RECENTLY DOCUMENTED OLD-GROWTH RIPARIAN FOREST IN ZOAR VALLEY, NEW YORK. THOMAS P. DIGGINS, TPDIGGINS@YSU.EDU, ADAM DRAA, KENT LUPTON, ERIN PFEIL, GREG SHOOK. 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 in twenty-three 30 x 30-m quadrats on five prominent streamside terraces. Understorey 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 38.0% 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 logarithmic. In contrast, shade-intolerant species occur mostly in >40-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. Increment 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 ECTOMYCORRHIZA FUNGI IN OAK-HICKORY FORESTS OF SOUTHEASTERN OHIO. DAWN R. BLACK DB642701@OHIO.EDU, KIM J. BROWN BROWNK4@OHIO.EDU, DEPT OF ENVIRONMENTAL & PLANT BIOLOGY, 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, our research investigates 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 forest thinning and burning practices affect the ectomycorrhizal fungal (EMF) community structure within a given landscape position? Our hypotheses include (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 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 at our study site, 20 of 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, STUCKRJ1@MUOHIO.EDU, CAROLYN H. KEIFFER AND MARTIN HENRY H. STEVENS, DEPT OF BOTANY, MIAMI UNIVERSITY, OXFORD OH 45056.

Phytoremediation is the use of plants and their associated microorganisms to remove pollutants from the environment or to render them 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 advantage of recent advances in the use of the 16s rRNA gene to identify soil bacteria and estimate diversity and species composition 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, where willows (*Salix alba*) are planted with a variety of soil 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 rRNA 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 (TRFLP FRAGSORT, <http://www.oardc.ohio-state.edu/trflpfragsort/>) 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 COURTNEY E. PAUL, CEPAL@BGNET.BGSU.EDU, AND JEFF G. MINER, JMINER@BGNET.BGSU.EDU, GRADUATE PROGRAM IN ECOLOGY, EVOLUTION, AND CONSERVATION BIOLOGY, 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 impacts of isoxaflutole and its derivative, diketoneitrile, on untested aquatic organisms and quantify resultant community responses. One centimeter of sediment and aquatic organisms from an agricultural drainage ditch were introduced into plastic pools (450 L) before addition of isoxaflutole. The community of organisms treated was composed of copepods, cladocerans, rotifers, algae, crayfish, isopods, amphipods, snails, and numerous insect nymphs. 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. Phytoplankton, zooplankton, and benthic invertebrate samples were taken throughout the 28-day experiment. Results indicate significant differences in populations of crustacean zooplankton. The macroinvertebrates were minimally effected 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 NCAVENDER@THEWILDS.ORG, THE WILDS, 14000 INTERNATIONAL RD. CUMBERLAND, OH 43732, JAMES C. CAVENDER CAVENDER@OHIO.EDU, DEPT OF ENVIRONMENTAL & PLANT BIOLOGY, 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 subsequent reclamation. We are interested in comparing 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 Blue Rock State Park, Black Hand Gorge State Nature Preserve, 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 remnant that had the least disturbance. In comparison, Dysart 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 45810.

There has been little research on cercariae prevalence and patterns from snails in man-made reservoirs. The purpose of this research is to compare with studies on naturally occurring bodies of water, to evaluating any contamination to a public fresh-water supply, and to further scientific understanding of snails infected with cercariae. Freshwater snails (*Physa gyrina*) were collected from a local man-made reservoir of drinking water and observed for cercariae (larval trematodes) shedding over a 16-week period from 19 June 2002 through 5 October 2002. During six collections, a total of 2,638 snails from six 10 m sites along the cobble shore 500 m apart were taken from the circumference of Metzger Reservoir in Allen County, Ohio. The rates of infection by different trematode species were compared to fluctuating water temperatures and distribution patterns around the circumference of the reservoir. Overall the infected snail prevalence was 2.5%, and six species of cercariae were tentatively identified including *Notocotylus urbanensis*, *Cotylurus flabelliformis*, *Echinostomum revolutum*, *Plagiorchis muris*, *Cercaria laruei*, and *Trichobilharzia stagnicola*. The density of *P. gyrina* populations declined drastically throughout the 16-week collection period, from 65.1 /m² on 19 Jun 2002 to 0.18 /m² on 5 Oct 2002. There was also a large variation in density and prevalence of infection among sites around the reservoir. No significant (p>0.05) correlation was found between the size of *P.*

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 cercariae 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 GEAGA COUNTY, OHIO WETLAND COMPLEX. TRACY L. ENGLE, TLENGLE@TRANSYSTEMS.COM, TRANSYSTEMS 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 ($PI = 2.06 \pm 0.16$; mean \pm 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 vegetative 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 BASCOM, JB348703@OHIO.EDU, DEAH LIEURANCE, LIEURANCEDM@AOL.COM, 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.