2004-03

Index to Sessions

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The Ohio Branch of The American Society for Microbiology (OBASM) will meet jointly with The Ohio Academy of Science. Please see the following schedule, or contact:

Dr. Chet Cooper at Youngstown State University.
Phone 330-941-1361; fax 330-941-1483 or by email crcooper.01@ysu.edu

Saturday, April 17th

8:00 AM – 3:00 PM Registration

8:30 AM Welcome - Auditorium, DeBartolo Hall

9:00 AM – 10:00 AM My virus is nastier than your virus!! Strain dependent differences in the molecular properties of the ICP34.5 protein of HSV-1 that determine the virulence of HSV-1 Dr. Ken Rosenthal, Northeastern Ohio Universities College of Medicine

10:00 AM - 11:00 AM General Microbiology Lecture

Cepacia means more than onions
Dr. Christine Weingart
Denison University


1:30 PM – 3:00 PM Molecular Biology Forum: 50 Years of the Double Helix
Co-sponsored by Sigma Xi, YSU Chapter

Chaired by Dr. Diana Fagan, Department of Biological Sciences, Youngstown State University

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

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

Other participants to be announced

3:00 PM – 5:00 PM “Late Breaker” Session – brief oral presentations on recent discoveries in the microbiological sciences

5:00 PM OBASM General Meeting

6:00 PM OBASM Dinner and Student Awards
Chestnut Room, Kilcawley Center. Contact Dr. Chet Cooper by April 9th. $16.00

Index to Sessions in DeBartolo Hall

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

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

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

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

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

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

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

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

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

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

Plant Ecology/Wetlands
02:00 PM Saturday, April 17, 2004
DeBartolo Hall Room 356
Mr. Tracy Engle-Presiding
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. LONET, KLAUS KLEPEIS, 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 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 to be generated by instruments such as MRI, CT scan, temperature and pressure sensors, x-ray diffraction, atomic absorption, and petrographic imaging equipment, among others. This study reports on the initial progress of the development of the GSSF, including estimates of the facility and proposed instrumentation specifications and timeline for development.

BOARD 02 CHARACTERIZATION OF HYDRIC SOILS IN WETLAND MITIGATION SITES IN CENTRAL OHIO. 
KIMBERLY A. PREEST, KREEST@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 1,200-acre park in the Blacklick Creek Watershed. The second site is a mitigated wetland located in Three Creeks Metro Park also in Franklin County, a 74.1-acre site that is used by Blacklick Creek. The third and final site of this study is the New Albany Wetland Preserve in Delaware County; a 23-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 of iron or manganese nodules, and surface sulfate (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 aquatic/moisture regime. The study will document evidence of reducing conditions, and proper matrix chromas, and motting.

BOARD 03 TEMPORAL AND SPATIAL PATTERNS OF NITRATE AND PHOSPHATE IN AGRICULTURE AND FOREST SOILS IN SOUTHEASTERN STARK COUNTY. 
FRANK M. Morocoo, MOROCCO@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. Furthermore, cultivation, homogenizes the surface horizon; in contrast, the same horizon is spatially variable in a forest. Understanding spatial variability of nutrients in the landscape is useful for studying patterns of productivity in future experiments. The goal of this study is to observe the effects of land use by contrasting namely a seventy-five year old unmanaged ten acre forest and a six acre adjacent plot that has been farmed for the past fifty plus years, on the concentrations and spatial patterns of nutrients in soils. Forest levels of nitrate and phosphate should be lower due to the lack of external additions. The spatial variability of cropland should be greater 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 using the ion chromatography method for nitrate 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 HOMEOECARPA IN THE FIELD. 
AMY L. MUSKUSK, MUSKUSK@OSU.EDU, YOZV@OSU.EDU, 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 variety of fungicides to control the disease in the field. Sclerotinia homoeocarpa isolates were recovered from 42 golf course fairways throughout Ohio and screened using the 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. Epidemiological data was collected on the status of the disease in the field. 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 profiling of the isolates from the fairway 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 2004. In vitro screening assays were excellent predictors 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 TADPOLES. 
TERA M. ROBINSON, TRobinson54@hotmail.com, (DAVID L. REED) DEPT OF NATURAL SCIENCES, THE DEPIANCE 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 are harming the frogs by adversely affecting their immune system and causing them to be more susceptible to parasites and other infections. Changes in temperature and wetness and timely applications of fungicides has been reported. The goal of this study was to determine the ability of a variety of fungicides to control the disease in the field. Sclerotinia homoeocarpa isolates were recovered from 42 golf course fairways throughout Ohio and screened using the 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. Epidemiological data was collected on the status of the disease in the field. 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 profiling of the isolates from the fairway 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 2004. In vitro screening assays were excellent predictors 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 06 COMMUNITY - LEVEL RESPONSE TO NUTRIENT SUPPLEMENTATION IN OHIO FRESHWATER PLANKTON COMMUNITIES AT THE JAMES H. BARROW FIELD STATION. 
RUDY J. WOJCIECH, WOJ@HIRAM.EDU, J.H. BARROW FIELD STATION, DEPT OF 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 L of unfiltered pondwater, (38 species of plankton were found in these inoculations). Total phosphorus was elevated to 5.67 mg/l using a commercial plant food in two of the mesocosms. The other two mesocosms were used as controls with no visible effects upon endocytosis, cell morphology, or cell density. Treated and control cells were used to obtain partial complementation of the Nif phenotype of BG98. This result implicated that P258S region of the amino acid sequence is the major substrate for NifM.

**Board 09** DETERMINATION OF MITOCHONDRIAL ENRICHMENT AND ACTIVITY THROUGH VARIATIONS IN DIFFERENTIAL CENTRIFUGATION SPEEDS AND STORAGE CONDITIONS.

NGAVINI NGAVINI@GNET.BGSU.EDU; DEPT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

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 speeds 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 centrifuge speed (of the SS34 rotor used in the RC-2 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 -80 degree Celsius refrigerator. A centrifugal speed of 2000 RPMs with a desirable results after calculating mitochondria activity in milligrams of protein per minute. However, at least two more runs will be conducted comparing two mitochondrial samples with a second and either 1800 or 2000 RPMs before the storage aspect of the experiment is attempted.

**Board 08** P232 AND P258 ARE INVOLVED IN NifM MEDIATED FOLDING OF THE Fe PROTEIN OF NITROGENASE. SUDHEER TONGUTUR, STUNGUTU@BGENET.BGSU.EDU; LAKSHMI PULAKAT, LPULAKAT@BGENET.BGSU.EDU; PADMA KOSARAJU, PKOSARAJU@BGENET.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 y, homodimer encoded by NifH. The maturational of the Fe protein which contains 8 proline residues is assisted by the nif accessory protein NifH that has putidril prolyl cis/trans isomerase activity. To identify the proline residues that function as site-directed mutagenesis to change leucine to isoleucine, aspartic acid or tyrosine at position 66. Also, serine was mutated to cysteine. Aspartic acid was chosen for analysis of function will be performed through an ONPG bioassay. 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 show highly conserved motifs. The amino acid sequence is G-X-X-X/D/E-R-K-X-G-R-K/R. The X represents positions that show variable conservation. However, closer analysis of amino acid chemistry suggests a higher level of specificity than previously proposed. The positions of Ser and Thr residues at position 66 or 44 are highly conserved. Theoretical predictions of 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 upon these residue mutations created by PCR site-directed mutagenesis to change leucine to isoleucine, aspartic acid or tyrosine at position 66. Also, serine was mutated to cysteine 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 neutral 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. Work on analysis of position 66 continues. We hypothesize that the leucine 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, PKOSARAJU@BGENET.BGSU.EDU; LAKSHMI PULAKAT, LPULAKAT@BGENET.BGSU.EDU; NARA GAVINI, NGAVINI@BGENET.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 site.

**Board 07** THE CALCIUM/CALMODULIN-DEPENDENT PROTEIN PHOSPHATASE, PP2B, HAS ROLE IN REGULATING EXOCYTOSIS IN PARAMECIUM. DEAN FRAGA (DEFRAGA@WOOSTER.EDU), SABRINA BIANCO (SABRINABIANCO@WOOSTER.EDU) AND WHIT SCHOFIELD (WSCHOFIELD@WOOSTER.EDU) DEPARTMENT OF BIOLOGY, 931 COLLEGE MALL, THE COLLEGE OF WOOSTER WOOSTER OH 44691.

Paramecium tetraurelia are ciliated protozoa that contain membrane- enclosed 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 P2B 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 and exocyst section. Normalized scores 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 24% in treated cells (n=119) (p<0.0005). After prolonged treatment, a 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 density. Treated and control cells were treated with 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 and exocyst section. Normalized scores 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 24% in treated cells (n=119) (p<0.0005). After prolonged treatment, a 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 density.

**Board 10** MUTATIONAL ANALYSIS OF THE LEU66-66 AND SERINE-66 MUTATIONS OF 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 UNIVERSITY, 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 show highly conserved motifs. The amino acid sequence is G-X-X-X/D/E-R-K-X-G-R-K/R. The X represents positions that show variable conservation. However, closer analysis of amino acid chemistry suggests a higher level of specificity than previously proposed. The positions of Ser and Thr residues at position 66 or 44 are highly conserved. Theoretical predictions of 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. A test this upon these residue mutations created by PCR site-directed mutagenesis to change leucine to isoleucine, aspartic acid or tyrosine at position 66. Also, serine was mutated to cysteine 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 neutral 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. Work on analysis of position 66 continues. We hypothesize that the leucine 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.
surface of the Fe-protein. It was suggested that the loss of dinitrogenase function in A. vinelandii UW97 might be 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 dinitrogenase growth, mutations were induced in the nifH gene. To do this, the region of nifH spanning codon 45 - 289 was PCR amplified and was cloned into pCR-TOPO. The cloning reaction was done to ensure that the codon 44 would remain unchanged (44phx) throughout this mutagenesis process. Random mutations were introduced into this truncated nifH gene (nifH 45-289) by transforming red cells (Fe-protein deficient) with pBG3205. The mutated pBG3205 was isolated after propagation through red cells, and the ability of the mutated nifH 45-289 to complement the nif phenotype of A. vinelandii UW97 was analyzed. The pBG3205 carries only colEl rep initiator. This plasmid was used to complement the nifH 45-289. However, since A. vinelandii has high efficiently homologous recombination, the mutated nifH 45-289s, 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 (FOSTERA@BGNET.BGSU.EDU), L. PULAKAT (PULAKAT@BGNET.BGSU.EDU) AND N. GAVINI (NGAVINI@BGNET.BGSU.EDU) DEPARTMENT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.**

The nitrogen reductase (NirH) serves as the electron donor in the nitrogenase enzyme. Growth curve analysis of AV98 transformants of the strain transformed and nirH mutants generated by primerless PCR. The resulting DNA fragments are PCR amplified. The library of NirH mutants generated by gene shuffling were screened for their ability to complement a nirM defective strain of Azotobacter vinelandii, AV98. Two mutants from the library complemented the AV98 strain. The first mutant strain designated as BG1416 contains the following mutations in the NirH protein: K107, N107S, N149V, P232A, E266V, and E277. The mutant strain designated as BG1416+ was the second AV98 complimenting 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 Nir protein. Growth curve analysis of AV98 transformants of the strain BG3461 confirmed that this strain complements the NirH defective strain. BG3461, the NirH independent strain, will aid in studying how NirH interacts in the biosynthesis and will also lead to the design of a Nir independent nitrogenase complex.

**Board 13 DIRECT INTERACTION BETWEEN THE ANGIOTENSIN II TYPE 2 RECEPTOR AND THE TRANSMEMBRANE 9 SUPERFAMILY 3 PROTEIN. VIKAS KUMAR, VIKASVEY@BGNET.BGSU.EDU; NARA GAVINI, NGAVINI@BGNET.BGSU.EDU; LAKSHMI PULAKAT, PULAKAT@BGNET.BGSU.EDU DEPARTMENT 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 method. A rat AT2 receptor peptide that span 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 a protein 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 cytoplasmic terminus of AT2. SMBP is a cleavage product of the AT2 receptor containing 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 activity such as inhibition of 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 NfH, AZOTOBACTER VINELANDII, SINNY DELACROIX, SINNYDV@BGNET.BGSU.EDU; LAKSHMI PULAKAT, PULAKAT@BGNET.BGSU.EDU; NARA GAVINI, NGAVINI@BGNET.BGSU.EDU DEPARTMENT 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 Fe-protein (encoded by nifH) contains a single Iron-Sulphur (Fe-S) cluster whereas Iron-Molybdenum protein (Mofe-protein) is a 2x2 β-heterotetramer (encoded by nifDK) containing 2 Mo atoms and 30 Fe atoms organized in six pairs of molelars of Fe-S clusters and Fe-Mo-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) and the cysteine residues required for liganding the Fe-S cluster in Fe-protein are conserved in ChlH. Therefore, it could be assumed that the chlH might complement nifH-minus strain such as Azotobacter vinelandii D154. To test this idea we introduced chlH into A. vinelandii strains of different genetic backgrounds. For this purpose, the chlH gene from Chlamydomonas reinhardtii was PCR amplified and 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 restoring nif-minus strains with nif + phenotype. Moreover, the C-terminal deleted mutant of AT2 was replaced with the third intracellular loop (ICL) of the AT2 receptor containing 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 activity such as inhibition of 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 15 MET225 and TYR230 ARE INVOLVED IN THE NifM INDEPENDENT FOLDING OF THE Fe PROTEIN. PREETI KAPOOR, PREETIK@BGNET.BGSU.EDU; LAKSHMI PULAKAT, PULAKAT@BGNET.BGSU.EDU; NARA GAVINI, NGAVINI@BGNET.BGSU.EDU; DEPARTMENT 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 subunits 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 nifH protein gene has been suggested to be involved in the biosynthesis or insertion of the FeS cluster into the apo Fe-protein and synthesis of the inorganic sulfide needed for the 4Fe4S core assembly. Therefore, the role of NifM protein could be to impart activity and stability to the Fe-protein. Based on the above, 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 region of the AT2 receptor. The importance of NifM is confirmed the complementation that was allowing the activity of a Fe-protein containing the mutations M225T and Y230H assigned as pBG2478. Growth curve analysis for AV98 transformants of the strain BG1416 confirmed that this strain complements the NirM defective strain. BG1416, the NirM independent strain, will aid in studying how NirM interacts in the biosynthesis and will also lead to the design of a Nir independent nitrogenase complex.
protein. The possibility that NifM promotes the proper conformation of Ni/H polypeptides necessary to accept the [Fe4S4] cluster is particularly attractive. Since isolated Fe-protein does not contain any Ni/H protein, it is unlikely that the NifM is a subunit of the Fe-protein. Furthermore, the role of Ni/H could be to impart activity and stability to the Fe-protein through some sort of catalytic event. Based on this reasoning, we isolated a mutant Azotobacter vinelandii strain in which the NifM protein is no longer required for nitrogenase activity. Further analysis showed that the Ni/H gene from this mutant strain contained multiple mutations spanning three easily recognizable regions in the Fe-protein. We constructed mutants in all three regions, 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 analysis showed that the region spanning amino acids 220 to 240 is involved in the Ni/H-mediated folding of the Fe-protein of nitrogenase.

**Board 17**

**FUNCTIONAL NIFD-K FUSION PROTEIN IN A. VINELANDII IS A HODIMERIC COMPLEX AS DETERMINED BY USINGBACTERIOPHAGE™ TWO-HYBRID SYSTEM**

Surobjit D. Lahiri, Shalini B@genet.bgsu.edu, Lakshmi Pulakat, pulakat@genet.bgsu.edu, Gavini Nara, ngavini@genet.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 the NifD-K fusion protein of nitrogenase was demonstrated in A. vinelandii, consistent with the MoFe protein being flexible as it could accommodate major structural changes, yet remain functional. This finding led us to further explore the type of interaction between the fused MoFe protein units. We aimed to determine whether an interaction exists between the two fusion MoFe proteins to form a homodimer that is equivalent to native heterotetrameric MoFe protein. Using the Bacteriophagen™ Two-Hybrid System, fused constructs of NifD-K(fusion) with the N-terminal α-RNAP of the pTRG target vector were made. To compare the extent of interaction between the NifD-K proteins to that of the β-β interaction in the native MoFe protein, we proceeded to generate fused constructs of NifK with the β-RNAP of the pTRG and βCI protein of the pBT vector. The strength of the interaction between the proteins in a study was determined by measuring the β-galactosidase activity and extent of ampicillin resistance of the colonies expressing these proteins. This analysis demonstrated that direct protein-protein interaction exists between NifD-K fusion proteins, suggesting that these homodimers. We propose that these homodimers of NifD-K fusion protein may function in a similar manner as that of the heterotetrameric native MoFe protein. The observation that the extent of protein-protein interaction between the β-subunits of the fused NifD-K proteins to that of the β-β interaction in the native MoFe protein, we proceeded to generate fused constructs of NifK with the β-RNAP of the 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, rajagok@genet.bgsu.edu, Lakshmi Pulakat, pulakat@genet.bgsu.edu, and Nara Gavini, ngavini@genet.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 NiM protein is required for the activation and the stabilization of the Fe protein. Guan et al. [1] propose that the NifM protein is required for proper progression of mitosis in humans. It has very high similarity to the NiM protein of the Azotobacter vinelandii. Azotobacter vinelandii BG98 is a nifM::kanamycin strain and does not grow on Burks’s nitrogen free media due to the deletion of the nifM gene. The human pin1 gene was cloned into pBG1380 that has a nifM promoter, histidine tag and chloramphenicol resistance marker. The recombinant plasmid containing the pin1 gene was designated as pBG1553. 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 Burks’s nitrogen free medium indicating that the PPIase activity of Human PIN1 is not sufficient for the A. vinelandii BG98 strain to show nif+ phenotype. We hypothesized that the pin1 gene might require a recognition sequence from NifM to recognize 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 Burks’s nitrogen free medium, indicating that the PPIase activity of Human PIN1 combined with the recognition sequence of NifM is sufficient for the function of the Fe-protein the renders the A. vinelandii BG98 with nif+ phenotype.

**Board 19**

**SUBSTRATE RECOGNITION DOMAINS OF PPIASE: GENETIC COMPLEMENTATION OF S. CEREVISIAE ESS1[5] BY THE SINGLE DOMAIN PPIC OF E. COLI.**

Vandana Chaturvedi, vchatur@genet.bgsu.edu, Lakshmi Pulakat, pulakat@genet.bgsu.edu, and Nara Gavini, ngavini@genet.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 mRNA processing. Temperature sensitive S. cerevisiae ESS1 strains were isolated used for structure/function analysis of PPIases from various organisms. It was reported that plant pin1 which has only the PPIase domain with four conserved amino acids could rescue ESS1 in S. cerevisiae. The multiple alignment of amino acid sequences revealed that the Escherichia coli PpiC has considerable homology with PPIase domain of human Pin1 and ESS1, and is devoid of WW domain as well as four conserved amino acids. This led to the interest to see whether the E.coli PpiC, a prototype member of the parvulin family, could rescue the ESS1 mutants in S. cerevisiae. The E.coli PpiC is 92 amino acids long and the entire protein represents the PPIase domain. E. coli 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 of the mutant ESS1 strain. 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 domain is not 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 beta subunit of Iron protein in the Iron-protein complex that disrupts the proper conformational interaction of 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 motif modeling programs and found that these mutations are most likely involved in facilitating binding to the defective Iron-protein from UW97. The purification and characterization of these altered proteins is consistent with a mechanism of the suppression involving the alteration of conformational changes during the nitrogenase complex formation.

**Board 21**

**ORF9 FUNCTIONS AS NITROGENASE-SPECIFIC CLPX DURING THE BIOGENESIS OF THE MOFE PROTEIN.**

Preethi H. Patil, ppatil@genet.bgsu.edu, Pulakat Lakshmi, pulakat@genet.bgsu.edu, and Gavini Nara, ngavini@genet.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) proteins. The PPIase activity of the MoFe protein being flexible as it could accommodate major structural changes, yet remain functional. The 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 motif modeling programs and found that these mutations are most likely involved in facilitating binding to the defective Iron-protein from UW97. The purification and characterization of these altered proteins is consistent with a mechanism of the suppression involving the alteration of conformational changes during the nitrogenase complex formation.
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 plumeage of birds, have been used as an aid in producing high-value chemicals. They were tested because they completely degrade 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 fungi of these 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 five fungal isolates were slightly more resistant in the lichen test than in the agar test. The results of this study indicate that fungus from avian environments could be a valuable antimicrobial agent against feather-degrading bacteria.

**Board 24** Keratinase-Producing fungi isolated from the plumeage of wild songbirds and soil. Heather M. Costello, hmcostello@owu.edu, and Jann M. Ichida, hmi@owu.edu, Ohio Wesleyan University, Botany and Microbiology, OHIO WESLEYAN UNIVERSITY, DELAWARE, OH 43015.

**Board 25** Birds, herbs and bacteria: The Effects of antimicrobial plant nesting material on feather-degrading bacteria. Nicole-Marie K. Cotton, nkcotton@owu.edu and Jann M. Ichida, hmi@owu.edu, Ohio Wesleyan University, DEPT OF BIOLOGICAL SCIENCES, 500 E. MAIN ST., CHH 256, KENT OH 44242.

**Board 26** The presence of antibiotic resistance in coliforms in lakes in the Maumee Valley Watershed Area of Ohio. Tiffany N. Cadill, Tiffany_Cadill@hotmail.com (Heather Hug, hhug@defiance.edu) The Defiance College, 701 North Clinton, W12, Defiance OH 43512.
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 from (1) sediment, (2) water, (3) temperature, conductivity, and turbidity were monitored. Total bacterial counts were done via epifluorescent microscopy using 3,6-diamidino-2-phenylindole (DAPI). Sediments were done using taxonomic 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 February (3.89E +05 per ml) and in July (9.71E +05 per ml). Sediments were monitored during 2000 (9.86E +07 per g dry weight). Trends were similar with the Domain Bacteria probe. An autumn peak on leaves, 2.76E +05 per cm² 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 GENES TO CHARACTERIZE COMPLEX MICROBIAL COMMUNITIES. Frederick C. Michie, Jr. (michel.36@osu.edu) and Stephen Sciarrini (sciarrini.3@osu.edu), Dept of Food, Agricultural and Biological Engineering, The Ohio State University—OARDC, Wooster, OH 44691.

Terminal restriction fragment length polymorphism analysis of 16S rRNA genes with a microsatellite 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 other marker models and comparisons 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 (BF, 907R, 11F, 226F, 111R) and restriction enzymes (MspI, HhaI, Rsal, HaeIII, and BfaI) to TRFs from simulated amplification and digestions of 34,531 ribosomal gene sequences. The output is a list of microorganisms and TRF sizes that correlate with T-RFLP profiles in the order of similarity 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 bacillales. In silico amplification and digestion 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 (BF, 907R, 11F, 226F, 111R) and restriction enzymes (MspI, HhaI, Rsal, HaeIII, and BfaI) to TRFs from simulated amplification and digestions of 34,531 ribosomal gene sequences. The output is a list of microorganisms and TRF sizes that correlate with T-RFLP profiles in the order of similarity from the greatest to the least normalized TRF peak areas. 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high deer density are expected to show higher browsing pressure than in areas of low density. Also, plants with higher browse pressure are expected to show an increase in the number of flowering shoots and less root biomass to increase the chance of reproduction. In areas of 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, NICKELL.3@WRIGHT.EDU 49 BOULDER DR., FRANKLIN, OH 45005.

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

Board 34 THE EFFECTS OF HERBICIDE (ROUNDUP©) APPLICATION ON GARLIC MUSTARD (ALLIARIA PETIOLATA) DENSITY AND SUBSEQUENT EFFECTS OF GARLIC MUSTARD ERADICATION ON THE FOREST FLOOR PLANT COMMUNITY. B. RADFORD S. B. S. NICKELL, SLAGHERS@MUOHIO.EDU, DAVID L. GORCHOV, GORCHOV@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 species richness in an old-growth forest stand 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 as controls. In May 2000 we determined the adult 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 (χ² = 12.30, P < 0.001) and second-growth (χ² = 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 predators. As a result of a treatment, the number of 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). ANGY L. SCHULER AMY@WILLIS.EDU, C.N. WILLIS@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 in Ohio. The sample set, one or two phytophthora species were typically isolated.

Board 36 SURVEY OF OHIO’S NURSERIES FOR THE SUDDEN OAK DEATH PATHOGEN, PHYTOPHTHORA RAMORUM, AND RELATED FUNGAL SPECIES ON RHODODENDRON (ERICACEAE). MIKAEL P. SCHILB1 (M_SCHILB18@HOTMAIL.COM), JEFFREY S. LEHMAN1 (JLEHMAN@OTTERBEIN.EDU), MARIA BELLIZZI1 (MBELLIZZI1@OSU.EDU), ALBERTO BONELLO2 (ABONELLO2@OSU.EDU), 155 MAIN ST DEPT OF LIFE SCIENCE, OTTERBEIN COLLEGE, WESTERVILLE, OH 43081, 1DEPT 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) identify pathogens on foliar tissue of P. ramorum, and 2) determine whether P. ramorum is present in Ohio. Rhododendrons in 15 nurseries throughout Ohio were sampled for foliar/shoot disease symptoms, and 50 samples were cultured on a selective medium from a total of 213 diseased leaves and shoots. Based on ELISA, 52 of the diseased tissue samples tested positive for the presence of Phytophthora spp., and 40 samples showed concuring positive results for Phytophthora spp. in culture and with ELISA. We successfully sequenced the ITS region of the rDNA operon of 51 isolates, and this information was used to determine species identity and whether P. ramorum was among the isolates. Based on the sequence data, Of these samples, 4 isolates of Phytophthora ramorum and 1 isolate of P. nicotianae were 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.
Ferns differ in their ability to tolerate arsenic, a widespread environmental contaminant. This study describes gametophyte development of *Pteris vittata* (an arsenic hyperaccumulator) and *Platycerium bifurcatum* (a non-accumulator) in the presence of potassium arsenate. Specifically, the objective was to quantify the percentage formation and mean development time (MDT) of prothallia. Spores of *Pteris vittata* and *Platycerium bifurcatum* were grown on basal salts medium amended with arsenic (0, 100, 500, and 1000 ppm). Throughout development, numbers of spores that produced prothallia were counted and used to calculate the percentage formation and MDT (days) for prothallia. Data were analyzed as a completely random design with two fern species, four arsenic treatments, and five replications. MDT values (±SD) for *Pteris vittata* were 6.4 ± 0.6, 7.0 ± 1.0, 7.0 ± 0.3, and 7.2 ± 0.5 days at 0, 100, 500, and 1000 ppm of arsenic, respectively, and statistically were not different. In contrast, MDT values for prothallia of *Platycerium bifurcatum* were 8.1 ± 0.8 and 8.9 ± 0.9 days at 0 and 100 ppm, respectively. Values for 500 and 1000 ppm were statistically longer and were 18.8 ± 0.3 and 19.5 ± 0.7 days, respectively. Percentage formation of *Pteris vittata* prothallia was 63.6% ± 4.1, 64.2% ± 6.9, 61.0% ± 4.2, and 60.4% ± 3.0 at 0, 100, 500, and 1000 ppm arsenic, respectively; all values were statistically the same. Values for percentage formation of prothallia of *Platycerium bifurcatum* were 59.1% ± 20.1, 45.1% ± 26.4, 2.4% ± 0.5 at 0, 100, 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 of arsenic while prothallia of *Platycerium 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, hsgolomon@student.cce.ccc.edu, and Morteza Javadizadeh, mjawadi@columbusstate.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, 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 25 ppm, 75 ppm, and 225 ppm of nitrogen to the plants. Control plants received only the nutrient solutions, and their growth was monitored in the form of height, mass, 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, plant mass, and 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.
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 punctum, a spider mite predator imported into New Mexico, for potential use in soybean fields in the midwestern United States. Typically water balance profiles 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 electrophoresis instrument. Test conditions were conducted at 14:10h 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 able to maintain water vapor content in subsaturated air. 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 (AMBLYOMMA AMERICANUM) AS AN INTEGRATION FACILITY R.A. SHAH, M. M. OPALUCH, s05.aopaluch@wittenberg.edu, JOSHUA B. BENSDORF, 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 Florida to the western and midwestern United States (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 weighed every 10 min by weighing the whole egg on an electronic balance; test conditions were 14:10h 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 stress of viable eggs occurred at 100% RH (87% hatching rate) with a drop in viability if adults and the American dog tick, *Dermacentor variabilis* (Say) did not register a positive response (0% arrestment; 10 per replicate; N=10; 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 for use in field trials for MALB control on grapes.

### Board 07
**PHYSIOLOGICAL SURVEY OF LEAF GALLS ON GRAPES AT KINGSVILLE, OHIO. ROGER N. WILLIAMS, WILLIAMS.14@OSU.EDU, SANDRA GARCÉS, IMED DAMI, KEVIN MCCiLLE, DENNY 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 *D. vitifoliae* has been a pest of grapes in the State of Ohio 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 remain 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; N=10; 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 for use in field trials for MALB control on grapes.

### Board 08
**CONTROL OF MULTICOLORED ASIAN LADY BEETLES ON GRAPES, WOOSTER, OHIO. ROGER N. WILLIAMS, WILLIAMS.14@OSU.EDU, DAN S. FICKLE, KEVIN B. MCCiLLE, MARK E. HEADINGS, OARDc AND ATTI, 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 contaminate 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 (repellance), and knockdown (debilitation). The resultant recovery or mortality of the MALB after knockdown was also noted. Consequently, we found several products with potential for control of MALBs in grapes. Of the 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 knockdown mortality of these products have potential for use in field trials for MALB control on grapes.
Sensory neuronal hearing loss and causes hair cell growth in the colourless mutant of zebrafish. Patrick McKenzie (pmckenzie@wooster.edu), Richard Lehtinen (klehtinen@woostor.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 Sensory-neural hearing loss 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 neurotrophic factor developed therapies. To study deafness in fish, wild-type zebrafish were exposed to a white noise 168dB tone for twenty-four hours causing temporary deafness. The fish were either injected with 0.05cc of a saline/BSA solution or a saline/BSA solution with Neurotrophin-3 (100ng/ml). Hearing recovery was measured using a behavioral assay that tested the fish’s response to a 400Hz tone. The colourless mutants were exposed as fry to either a solution of saline/BSA or a saline/BSA solution with NT-3 (100ng/ml). Changes in inner ear morphology were studied using a Scanning Electron Microscope. Noise-induced deafness fish exposed to saline/BSA (n=63) had a recovery time of 11.2 ± 0.7 (s.d.) hours while the fish exposed to Neurotrophin-3 (NT-3) had a recovery time of 4.7 ± 0.4 (s.d.) hours. The NT-3 treatment group had a significantly decreased time to recovery compared to the control treatment. This indicates that NT-3 may be a therapy employed to treat humans that experience temporary hearing loss. Scanning electron microscopy 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 Lasky, lasky@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 were exposed to doubly-labeled water technique. Provisioning was measured for flight and adult field metabolic rate (FMR) was measured using the doubly-labeled water technique. The goal of this study was to examine the effects of nocturnal light on the activity of Telektogeton torrenticola (Diptera). Marina Stanbery stanberry@notes.udayton.edu, Mark G. Nielsen, nielsen@notes.udayton.edu, Bio. Sci., University of Dayton, OH 45469-2320.

The Hawaiian Islands provide an exceptional opportunity to address evolutionary hypotheses because of their isolation and known age. Chironomids (midges) colonized the oldest island, 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 means other than flight. To resolve these hypotheses, the population structure and evolutionary history of the chironomid Telmatogen torrenticola is determined using the mitochondrial gene cytochrome oxidase as a molecular clock. Cytochrome oxidase has been estimated from 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 genetic evidence explains this separation of the 50 remaining DNA samples representing marine and terrestrial forms from three islands are analyzed, patterns may emerge that could resolve the hypotheses and serve as a model to understand the more general phenomenon of insect evolution in these islands.

Board 13 The Effects of Valproic Acid on Limb Development in Chicken Embryos. Denise M. Post, d-post@onu.edu. (Amy L. Aulthouse, a-aulthouse@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 abnormalities in VPA treated embryos will be apparent when compared to controls. In phase 1, 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 double labeled with Alizarin red and Alcian blue (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 14 The Effects of Nocturnal Light on ontotaxans disjunctus (Coleoptera: Passalidae). Richard Lasky, lasky@kenyon.edu; Robert A. Mauck, mauckr@kenyon.edu. Dept of Biology, The College of Wooster, Wooster OH 44691.

Paraecium tetraceria 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). Paraecium has three PP1 isoforms: the PP1C, PP1Y, and PP1W. This study will determine if those isoforms have an effect on the activity of Paraecium. In the importance of the PP1 genes in the regulation of Paraecium cell division, the genes will be silenced by RNA interference (RNAi). To accomplish this, RNAi will be delivered to Paraecium in ovo. Paraecium embryos 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 double labeled with Alizarin red and Alcian blue (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.
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.

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 star Echinaster (Echinaster) sp. and allowing them to submerge 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 (Echinaster) 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 ± .46 MPa vs. 182.3 ± 139.6 s at 2.0 ± .43 MPa; p< 0.05). The same was true of A. articulatus tissues (116.2 ± 80.4 s at 1.5 ± .29 MPa at 1.9 ± .32 MPa; p< 0.05). This suggests that the chemical mechanisms that cause stiffness changes in the classes Holothuroidea and Asteroidea might be similar.

Echinoderm extracts from the inner and outer body walls 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 different species. These 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) decreased with increasing extract concentrations, F(2,18)=30.86, p<0.05. There was a significant effect of solution type on time to breakage when concentration was not taken into consideration, F(1,18)=1.886, p>0.05. An interaction effect of extract type and concentration was found. For the inner-dermis extract, time to breakage times in 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 (2754 ± 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.

A. utahana spiders were tested, seven chose their own web, six chose the other web, and six did not choose. 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 more often than did A. utahana (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 heterospecific web choice test six A. pennsylvanica chose their own web, two chose the heterospecific web and four did not choose. Based on a binomial test the A. pennsylvanica did not discriminate between webs (although there was a noticeable trend, P = 0.1093). A. 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.
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 43775. Differences in population parameters among habitat patches were compared among six two-habitat Type C (small isolated grassland patches and larger grassland isolated patches) and one control (large contiguous grassland). Isolation was defined as the proportion of a given patch not connected to other grassland patches without being fragmented by barrier (forest, road, or stream). Each sampling plot had an area of 1600 m$^2$ (40m x 40m) and contained 25 Sherman live traps placed in 10 m intervals 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. HOGASTRON, C–HOAGSTROM@ONU.EDU, OHIO NORTHERN UNIVERSITY, DEPT OF BIOLOGICAL SCIENCES, ADA OH 45810.

Ohio Northern University and the Ohio Department of Natural Resources have been 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. Eastern Meadowlarks (Sturnella magna) and Vesper Sparrows (Ammodramus savannarum); 2 and 6 Henslow's Sparrows (Ammodramus henslowii); 12 and 14 Grasshopper Sparrows (Poecetes gramineus); and 6 and 6 Savannah Sparrows (Passerculus sandwichensis). Numbers were similar between the two years for each species. Two of the new ponds were dug and diked within the area occupied by the Bobolink colony with no meaningful difference between years. The wetland development activities appeared to have little effect on the bird populations.

**Board 22** PREDATION HABITS OF THE EASTERN COYOTE (Canis latrans) IN SOUTHEASTERN OHIO. JASON A. 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 designated to provide areas supporting habitat diversity. 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 associated with shifts from autotrophic to heterotrophic production. 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 vascular plants. By identifying the predation habits 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, AARONJ@MUSKINGUM.EDU 1648 JACSON RD. ZANESVILLE, OH 43701 (DANNY J. INGOLD, INGOLD@MUSKINGUM.EDU).

Herpetofauna are often used as indicator species to evaluate the health of an ecosystem. We have reclaimed strip mines 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 states of 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 compared to the remnant forests. The Wilds site (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 greater in the remnant forests (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).
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 hydrology 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 flood-pulse periodicity. Following heavy rain events, water levels in flood-pulse wetlands increased from 160 cm to 165 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. Mean 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 GUHIER, guhier@hiram.edu, J. H. BARROW FIELD STATION, HIRAM COLLEGE, 44000 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 2.0 m pieces of corrugated sheet steel. We captured snakes under the boards and ad hoc by hand and measured immediately released them where they were captured. Species captured were eastern garter snake (Thamnophis 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 diamondback (Agkistrodon piscivorus trianulum). Snakes greater than 20.0cm snout-vent length were also PIT (passive integrated transponder) tagged using AVID Muscic 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. Turtles were captured with hand nets, and released back into 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 products. One-liter sediment samples were collected on one traverse. Each traverse was composed of 15-40 depth intervals at 0.010 cm layers along a riffle. Each sample was sieved through 4.0, 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 from rounded quartz grains (~0.7 mm avg. dia.), while the scarcity of quartz sediments in the Ashabula Creek watershed. The study also examined the influence of distance on the foraging of the eastern chipmunk (Tamias striatus). This study examined the influence of distance on the foraging of the eastern chipmunk (Tamias striatus). Giving-up densities (GUD) were used as the indicator in this study in order to draw conclusions about the impact of distance on the foraging behavior of chipmunks. The study was performed during months September, October and November of 2003. Artificial patches were made using pans holding fifty grams of sawdust. Fifty of these pans of sand to each of the study 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 sawdust. Fifty of these pans of sand to each of the study areas.

**Board 27**

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

**JENNIFER M. KAROW, 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 and reduction and decline of populations are evident. Many causes for these declines have been suggested, such as disease, climate change, habitat alteration, environmental contaminants, and increased exposure to ultraviolet-B radiation. This study was designed to examine climate change as a possible complicating factor in the declines. Larvae are known to have higher mortality rates in warmer temporary ponds, and this study will investigate whether this could be due to decreased hatching success, deformities, or slowed metamorphosis that could lead to a higher susceptibility to disease, predation, and/or depletion of resources. The study will be performed in the laboratory to maximize control over variables. Constant temperatures range from 72 to 82 degrees Fahrenheit. Each sample of larvae was 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 STRAITS; THE IMPORTANCE OF DISTANCE FROM THE BURROW.**

**JENNIFER B. WILSON, jbwilson@muskkingum.edu, (JAMES L. DOOLEY, jdooley@muskkingum.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 striatus). Giving-up densities (GUD) were used as the indicator in this study in order to draw conclusions about the impact of distance on the foraging behavior of chipmunks. The study was performed during months September, October and November of 2003. Artificial patches were made using pans holding fifty grams of sawdust. Fifty of these pans of sand to each of the study 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 sawdust. Fifty of these pans of sand to each of the study areas.

Many genera of caddisfly larvae (Trichoptera) construct cases from available materials, such as leaf fragments and sand grains. These cases provide the protective shelter, and help weight down 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 products. One-liter sediment samples were collected on one traverse. Each traverse was composed of 15-40 depth intervals at 0.010 cm layers along a riffle. Each sample was sieved through 4.0, 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 from rounded quartz grains (~0.7 mm avg. dia.), while the scarcity of quartz sediments in the Ashabula Creek watershed. The study also examined the influence of distance on the foraging of the eastern chipmunk (Tamias striatus). Giving-up densities (GUD) were used as the indicator in this study in order to draw conclusions about the impact of distance on the foraging behavior of chipmunks. The study was performed during months September, October and November of 2003. Artificial patches were made using pans holding fifty grams of sawdust. Fifty of these pans of sand to each of the study 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 sawdust. Fifty of these pans of sand to each of the study areas.

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 diethylentriamine-pentaacetic acid (DTPA) via Soxhlet extraction and pressure assisted extraction will be compared. In pressure assisted extraction, a glass reaction vessel was placed in an immersion bath 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 sample. The extraction 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
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, pres@mskingsu.edu), 163 Storymont 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 cyanides. With the cyanide transformation of existing compounds' interligand complexes solely of the ligand, cyanide. This 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 octachlorodirehenenate. 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, mkin2@kent.edu, A.K. Khitrin, akhitrin@kent.edu, Dept of Chemistry, Kent State University, Kent OH 44204-0001.

Magnetic resonance imaging (MRI) is among the most powerful techniques for nondestructive study of various objects. MRI has been widely used in biological science and medicine. The images are reconstructed from Fourier transforms of nuclear spins in the presence of radiofrequency and magnetic field gradient pulses. The achievable spatial resolution is restricted by the linewidth of NMR signals. For high spatial resolution, sharp NMR signals gradients of the 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. This method has high spatial resolution. Line-narrowing achieved with this new type of signal excitation. Compared to other techniques, the method does not require strong gradients of the magnetic field or radio frequency fields and, therefore, can be applied to large objects.

**Board 33 DISSOLUTION OF COPPER(II) OXIDE IN VARIOUS CONCENTRATIONS OF NITRIC ACID TO DEFINE THE SURFACE COMPOSITION USING ATOMIC ABSORPTION SPECTROSCOPY.** Erica J. Newbould, enewbould05@jcul.edu (Michael P. Setter, msetter@jcul.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 0.001%. CuO, 2HNO, = Cu(NO)2, + H2O. 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). Preweighed samples of copper(II) oxide powder were added to the nitric acid solutions. Small volume aliquots of the resulting mixtures were passed through a 0.1µm filter and then analyzed for copper using AA. It was found that the best way to linearly relate the AA data to time was a square root model. For short periods of dissolution (<2 hours), this square root model yielded correlation coefficients of 0.95 for twelve trials. The fraction of powder that would dissolve was linearly dependent on the pH of the solution; the lower the pH of the solution, the higher the fraction of powder that would dissolve. This relationship was observed that the powder would dissolve with a pH higher than 6.3 ± 0.8. When copper(II) oxide was placed in deionized water, no dissolution could be detected. This supports the linear model of the pH dependence of the dissolution.

**Board 34 STUDIES ON THE DEVELOPMENT OF BOTH THE ASEXUAL AND SEXUAL REPRODUCTIVE STAGES OF THE PATHOGEN GNOMONIA LEPTOSTYLA (Fr.) CEC. de R & DE M. ON ITS HOST JUGLANS NIGRA L. IN VITRO.** David L. Mason, dmason@wittgenberg.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 these examinations and histological sections revealed that the fungus formed acervular bearing spores, two-celled conidia, and necrotic areas of the host, primarily on the upper side of leaves, during the summer months. During the fall months, spermodinia bearing small, rod-shaped spermodinia and ascogonial coils with extending trichogyne were observed. Developing perithelia containing ascosogenous hyphae were detected during late fall, and in November and December on old partially decayed leaves, ascii bearing two-celled ascospores were observed. Cultures started from conidia and ascospores were induced to produce conidia, spermodinia, ascogonial coils with trichogynes and developing perithelia. Successful inoculations were carried out on healthy leaves from conidia produced in acervuli on infected leaves and from those produced in vitro.

**Board 35 ADDITION TO THE DISTRIBUTIONAL MAPS OF CASTANEUM DENTATA (FR.) IN 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 distinct 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 (WWU) and the herbarium archive of WWU. Specimens from the Herbarium of Youngstown State University (YUY) 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 WWU and YUY are plotted on county dot maps for the state. Mapping bryophyte distribution at the county level is important as an understanding of the amount of cryptogamic diversity can be found. Since the destruction of habitat through strip-mining and moss harvesting threatens bryophyte diversity, these distribution maps also establish a baseline by which the gain or loss can be identified. 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 boarder.

**Board 36 MORPHOLOGICAL AND PHYSIOLOGICAL TRADEOFFS OF AMERICAN CHESTNUT (CASTANEA DENTATA) AND OTHER HARDWOODS IN VARYING NUTRIENT AND LIGHT REGIMES.** Dana J. Thomas, thomas06@muohio.edu, M. Henry H. Stevens, stevemm@muohio.edu, Carolyn Howes Keiffer, keiffer@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 butternut Hickory (Carya cordiformis) were grown individually and in soilless pots 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. Survival and change in height were measured after six months. During the fall months, spermogonia bearing small, rod-shaped spermodinia and ascogonial coils with extending trichogynes were observed. Developing perithelia containing ascosogenous hyphae were detected during late fall, and in November and December on old partially decayed leaves, ascii bearing two-celled ascospores were observed. Cultures started from conidia and ascospores were induced to produce conidia, spermodinia, ascogonial coils with trichogynes and developing perithelia. Successful inoculations were carried out on healthy leaves from conidia produced in acervuli on infected leaves and from those produced in vitro.
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, smbeth@otsego.edu, (DANNY INSERRA), Otsego Field Station, Otsego Co., OH. Planktonic crustaceans are an important part of the aquatic food chain, consuming algae and bacteria while providing food for insects, fish, amphibians and waterfowl. Because of their ubiquity and their sensitivity to environmental variation, these organisms often serve as indicators of water quality. This study compared the diversity of orders from the Phylum Crustacea in samples taken from a wetland on a reclaimed strip-mine (The Wilds - Muskingum Co., OH), to a similar body of water in an area that was not strip-mined (Otsego Field Station - Muskingum Co., OH). Samples (n=6) were collected from a plankton net and preserved in a solution of formalin, sucrose, and glycerol. A light microscope was used to key the organisms. Representatives of the orders Podocopa, Notostacra, Cladocera, and Eucypodopa were found on both sites. Additionally, data was collected for every order found only at the strip-mined site. A contingency table revealed significant differences in the frequencies of the orders at the two sites (\(\chi^2 = 15.38, \text{df} = 4, p<0.01\)).

**Board 02 ASSESSMENT OF SOIL MOISTURE CONTENT BELOW SOYBEANS GROWN WITH DIFFERENT [OZONE], [CARBON DIOXIDE] AND RAINFALL INPUTS CHALANCE WILLIAMS, cwilliams@csu.edu, CANDACE LOWELL, clowell@csu.edu, UNIVERSITY 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 \(\text{CO}_2\) and \(\text{O}_3\), and under drought and non-drought conditions. The site consists of a range of topics from crop productivity and canopy energy fluxes to leaf physiology, and interactions with herbivores. The objective of my research during the summer of 2003 was to measure the water content of the soil profile under soybeans grown at different concentrations of \(\text{CO}_2\) and \(\text{O}_3\), and under drought and non-drought conditions. The site consisted of 16 experimental plots. There were four replicate plots growing soybeans at each of the following atmospheric concentrations: (370 ppm \(\text{CO}_2\) ~60 ppb \(\text{O}_3\)), elevated \(\text{CO}_2\) (550 ppm), elevated \(\text{O}_3\) (~90 ppb), and elevated \(\text{CO}_2\)/\(\text{O}_3\) combined (550 ppm \(\text{CO}_2\)/~90 ppb \(\text{O}_3\)). Levels of \(\text{O}_3\) and/or \(\text{CO}_2\) were generated by rings of pipes surrounding the plots at elevated concentrations of \(\text{CO}_2\) and \(\text{O}_3\). During a two-week period of low rainfall in August, soil moisture averaged 30% lower under ambient conditions than the combined elevated \(\text{CO}_2\)/\(\text{O}_3\). This finding suggests that soybean crops may suffer less drought stress in 2050.

**Board 03 THE IMPACT OF AVIAN PREDATION ON SEA URCHINS ARBACIA PUNCTULATA INHABITING A SEA WALL IN BEAUFORT NC.** Adrianna N. Zito1, zitoa@wittenberg.edu, (JAMES M. WELCH), Wittenberg University, PO Box 1004, Wilberforce, OH 45894; 1DUKE UNIVERSITY MARINE LABORATORY.

The purple sea urchin Arbacia punctulata inhabits subtidal hard-bottom habitats on the southeast 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, where gulls are motivated to find food quickly. This finding suggests that urchins at the two sites (\(t=3.625, p<0.05\)) and diversity tended to be higher below the dam (\(t=3.902, p<0.05\)). Although diversity did not differ between

**Board 04 AVIAN SPECIES DIVERSITY AT A SUMMER ROOSTING SITE AT OHIO NORTHERN UNIVERSITY’S CAMPUS, ADA, OHIO.** LAUREL B. HRIECIK, lhriecik@onu.edu, 312 SOUTH SIMON STREET, ADA OH 45810.

A barn on the Ohio Northern University campus in Ada houses a summer colony of brown gulls (Eszetipes fuscus). Their numbers and activity patterns were studied by counting birds at the colony during spring, summer, and fall. Counts were made twice 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 counts initiated evening activity ten to twenty minutes after sunset throughout the year. The south side of the barn consistently provided the highest number of birds. Since it was not possible to count exiting birds from all four sides at every survey, the counts from the south side were used to evaluate the activity patterns of the barn. 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 = 6.7, df = 2, \(p<0.05\)). The small autumn count was the basis for the difference and probably reflected early departures to explore hibernacula. In the fall of both years the bats disappeared gradually, but with a major decline in a one or two week period in late September and early October. The bats reappeared gradually in the spring of 2003 with a distinct change, from 10 to 47 bats, between April 13, and April 14.

**Board 05 AVIAN SPECIES DIVERSITY IN A CONTAMINATED RIPARIAN ECOSYSTEM.** Shawn U. Blohm, shawnblohm@yahoo.com, COURTNEY N. WILLIS, cwilliss@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. The Mahoning River is heavily contaminated from steel mill pollution, particularly near low head dams. The goal of this study was to examine the relationship between sediment contamination and avian species diversity in a riparian ecosystem. During June of 2003, avian point counts were conducted at Lowellville, Youngstown, and Girard. At each study site, four avian point counts were conducted above and below low head dams and were at least 200 m apart. The American Robin (Turdus migratorius), Northern Cardinal (Cardinalis cardinalis) and House Sparrow (Passer domesticus) were the most common species observed. Diversity was estimated using the Shannon-Weiner diversity index and indices were compared using a Student’s t-test. Diversity did not differ at Lowellville (\(n = 21\) sp.), Youngstown (\(n = 21\) sp.) and Girard (\(n = 19\) sp.). However, diversity was higher below the dam (\(n = 16\) sp.) than above it (\(n = 8\) sp.) in Girard (\(t=3.625, p<0.05\)) and diversity tended to be higher the dam (\(n = 16\) sp.) than above it (\(n = 12\) sp.) in Lowellville (\(t=1.698, 1.010>P>0.05\)). 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 CELLS IN HYDRA.** Monica K. Anderson1, L.Epp, mka01@uiuc.edu, SHELBY JAMES, (L.EPP), MOUNT UNION COLLEGE, 1792 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 the rate of the latter increases the rate of gland cells. These data dramatically then do 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 can then be identified and counted. After baseline labeling indices of gland cells and epithelial cells are known, the relative effect of feeding and starvation on the proliferation of these two cell types will be determined.

**Board 07**

THE EFFECTS OF REGULATORY PEPTIDES ON FOOT REGENERATION IN HYDRA

Jessica L. Gordon, gordonj@muohio.edu, (I.E. Eph, eph@ohio.edu) Mount Union College, 1972 Clark Ave, Alliance, OH 44601.

Regulatory peptides have been found to influence pattern formation and regeneration in hydra. For example, the peptides pedin, pedbin, and HYM 323 have a positive effect on the rate of foot regeneration. Peptides isolated from hydra tissue have not been bioassayed. In this study the effects of 15 such peptides on foot regeneration are being investigated. Different species and strains of hydra, were used. The rate of foot regeneration in peptide-treated hydra is being compared to that of controls by timing the onset of basal disk specific peroxidase staining during regeneration. Peptides which prove to have an effect on this process 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. Bronson, matthew01@mmu.edu, 216 Center Road Apt. 312, Chardon, Ohio 44024. Cuyahoga Community College (Stanley Hazen hazenl@cleveland.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. This study 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% after six weeks 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 sera of patients receiving montelukast or theophylline are compared.

**Board 09**

ANALYSIS OF THE KERATINASE GENE FROM FEATHER DEGRADING BACILLUS LICHENIFORMIS.

Patricia B.S. Celestino, pbcelest@owu.edu, Allison K. Morrell, amorrell@owu.edu, and Gordon J. Riemann, riemannj@owu.edu, OSU Biological Sciences Dept, Ohio State University, 2121 Neil Ave., Columbus, OH 43210.

The poultry industry produces over eight hundred million kilograms of feathers 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. 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 5’ - noncoding region had DNA 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 regulatory elements must be involved in the control of expression of keratinase genes.

**Board 10**

INVESTIGATION OF OXIDASE-ASSOCIATED REACTIONS BY AN ENZYME-COUPLING FLUORESCENT METHOD.

Katherine E. Miller – kmiller@muskkingum.edu, 163 Stormont St. New Concord, OH 43762 (Dr. Deepmali Perera).

The fluorogenic probe, Amplex red, N-Acetyl-3,7-dihydroxyphenoxazin, 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 aquatic environments, foods and other 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 ultimately to a nonfluorescent form 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 other oxidase enzymes, owing to the usage of higher wavelengths that reduce the background fluorescence and quenching of most biological samples. Resorufin has an excitation maximum at 563 nm and emission maximum at 587 nm, both of which lie in the visible region of the spectrum as opposed to the ultraviolet region. This makes it of particular interest for the detection of biological samples because most other probes use wavelengths in the ultraviolet spectrum and cannot be used to detect oxidative activity in crude biological samples.

**Board 11**

LIVER PROTEOME OF MICE WITH ALTERED GROWTH HORMONE PHYSIOLOGIES.

Joseph A. 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 for 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 VOLTMETRY AND FLOW INJECTION ANALYSIS.

Krista Stemple kstemple@capital.edu, L. Epps lepps@capital.edu, and Patricia B.S. Celestino, pbclest@owu.edu, OSU Biological Sciences Dept, Ohio State University, 2121 Neil Ave., Columbus, OH 43209.

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
Potato late Blight, caused by a fungus-like organism *Phytophthora infestans*, is one of the most devastating plant diseases. Responsible for the late blight of potatoes, *P. infestans* causes aboveground 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 in *P. infestans* and determine how these increases or 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.

Myasthenia gravis (MG) was the first autoimmune disorder of the peripheral nervous system to be characterized, and is still the usual model for other diseases that occur in neurological conditions. As one of the best understood neuroinvasive diseases, its pathological 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 autoimmunity, particular to MG, which occurs in the periphery prior to the autoimmune disease. Autoantibodies 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. Immune reactivity of the patient’s IgG and IgM antibodies has been used to identify the muscle protein titin-isoform N2A. The Western blots of both the ARMD and SPMG analyzed 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 isoform is also recognized by autoantibodies that are not IgG. 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 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.**


Sprague-Dawley rats were fed a diet containing a mixture of PCB 47/77 from conception (day 0) to 30 days post-gestation, while control rats received a normal powdered diet containing 0 ppm PCB. The study contained three experimental group permutations, each consisting of 8 pups per litter. A controlled amount of PCB. These groups received a normal powdered containing 1.25 ppm, 12.5 ppm, or 25.0 ppm of PCB. Beginning on day 20, learning and memory were 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 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 controls. 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.
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 PICs. Late in infection, different variants of ICP34.5 may determine differences in levels of sequestration of PICs into stress granules resulting in differences in viral protein synthesis and hence replication.

**Board 18**  
**EFFECTS ON BACTERIA IN THE DENTAL FLORA EXPOSED TO DIFFERENT CONDITIONS**  
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While eating and drinking habits vary greatly from person to person, little is known about how these habits influence the natural flora of the human oral cavity. Streptococcus salivarius, Neisseria sp., and Streptococcus mutans are of particular interest because in previous research some variation in occurrence was observed in S. salivarius and Neisseria sp. colonies from dental flora of adults consuming alcohol and tobacco. S. mutans play a role in the formation of dental caries. Therefore, the occurrence of these three bacteria in relation to various eating and drinking habits was chosen for this study. Young adults (N = 47; aged 18 – 23 years) were questioned about their eating, drinking, tobacco use, and antibiotic use prior to sampling their teeth to obtain bacterial samples (High levels of usual use: 1 week; moderate use: 3 – 5 times a week; low use: > 6 times a week; 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. Surface and root samples were collected and incubated on 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. Dental plaque samples from M. salivarius Agar (MTS) for S. salivarius, Neisseria sp., and MTS with 30% sucrose for S. mutans were cultured in Brain Heart Infusion Broth. The absence of S. salivarius, S. mutans and Neisseria sp colonies are not significantly affected by alcohol consumption and tobacco use.

**Board 19**  
**INVESTIGATING THE ROLE OF DBSR PROTEINS IN ADENOVIRUS REPLICATION**  
SHOMITA S. MATHews – matthew@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 effects 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. Thus, Mre11 acts to “refocus” against this “replication” by producing dsDNA proteins of 11kDa and 34kDa from the early region 4 (E4), which relocates Mre11 and target it for degradation respectively. We were interested in studying the relationship of Mre11 re-localization and DNA degradation to the onset of DNA replication. Our preliminary data, suggests that during a time course of wild-type Adenovirus (Ad5) infection, Mre11 is relocated 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 Mre11/Rad50/Nbs1 complex. When a cell is infected in addition to contributing to concatenation of the viral genome. We are currently carrying out experiments to measure binding of viral proteins to the viral DNA in amyloidosis and immunoprecipitation.

**Board 20**  
**PRODUCTION OF MONOCONAL ANTIBODIES AGAINST THE CAPSULAR POLYSACCHARIDE OF STAPHYLOCOCCUS AUREUS TYPE 8**  
JEREMY J. Mashburn, JEREMYMASHBURN@YAHOO.COM, CHRIS M CALDuell, cmcaldwell22@hotmail.com, (DIANA L Fagan, dlfagan@ysu.edu), YOUNGSTOWN, OHIO 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 injections of Staphylococcus aureus type 8 capsular polysaccharide with absorbance read at 630 nm. The purified capsular polysaccharide was found to be below baseline (0.158 at 630 nm) 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 to confirm the purity of the primary monoclonal antibodies to 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 phagocytic activity. These studies were supported by a YSU FAPER grant.

**Board 21**  
**BONE MARROW RECONSTRUCTION OF AN IMMUNODEFICIENT MOUSE MODEL**  
NICOLE R. TOOTH, TALLRX@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 disease cannot be determined. Therefore, the role of different antibodies to 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 injections of Staphylococcus aureus type 8 capsular polysaccharide with absorbance read at 630 nm. The purified capsular polysaccharide was found to be below baseline (0.158 at 630 nm) 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 to confirm the purity of the primary monoclonal antibodies to 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 phagocytic activity. These studies were supported by a YSU FAPER grant.

**Board 22**  
**THE EFFECT OF KAVA ON THE Estrous CYCLE OF A RAT WITH POSSIBLE CONTRACEPTIVE ACTION**  
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Polynesian 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 hypothesized that the kava will alter the estrous cycle, and 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 cycle will be examined for 30 days prior to the administration of the kava. Estrous cycles are systematically studied and evidence is only anecdotal. A rat model is hypothesized that the kava will alter the estrous cycle, and 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 cycle will be examined for 30 days prior to the administration of the kava. Estrous cycles are
Human papillomavirus (HPV) infections are the cause of several diseases including genital warts and high-grade cervical lesions. Interaction of viral proteins with 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 the ER receptor. HPV DNA (HeLa, B16CG 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 and 3'-O-methyl-NDGA caused cell cycle arrest in G1 phase. 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.**

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Proliferating Cell nuclear Antigen (PCNA) is a S-phase marker that associates with DNA without actually binding, via a ring shaped trimeric, symmetric homo-hexamer. Though this structure 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). 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 and 3'-O-methyl-NDGA caused cell cycle arrest in G1 phase. 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 25**

**A NEWSUBSTRATE FOR PERTUSSIS TOXIN.**

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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 protein. Since PTX ADP-ribosylates Gαi, this toxin may have an extensive role in the regulation of Gαi in the signaling mechanisms of membrane receptors that show seven transmembrane domain topology. Angiotensin II receptor AT2 is a protein with seven transmembrane domain topology and its function involves phospholipase A2 and inhibition of cell growth are inhibited by PTX. However the extent of the involvement of the Gα 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 insect cells. Our experiments imply that the interaction of the 3rd ICL of the AT2 may be the mechanism though which the PTX inhibit AT2 signaling.

**Board 26**

**REGULATION OF CYCLIN DEPENDENT KINASE INHIBITOR CdkN2a DURING GROWTH-ARREST IN MELANOMA B16 CG CELLS.**

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Cyclin dependent kinase inhibitors (CKIs), play important roles in regulation of cell growth by causing G1/S phase arrest. CdkN2b (p15) is a member of the INK4 family of the CKIs. This is located on the chromosome 9p21, which is a hotspot of genomic alterations in cancer. Inactivation of CKIs by methylation, mutation or deletion, leads to uncontrolled cell growth. We analyzed the regulation of 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 treated with extracts of the plants of Euphorbiaceae family (EPE). Western blot analysis further confirmed that this increased transcription resulted in increased protein levels. The growth of B16 CG cells was arrested when they were exposed to treated. Tumors generated in C57-B16 mouse by subcutaneous injection of B16CG cells also had highly reduced growth when treated externally with the EPE, and showed increased expression of CdkN2b. In cancers including melanomas, p15 expression is reduced or down-regulated. Our 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.**

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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 ATB binding domain of these receptors and the 3rd ICL of the 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 human breast cancer cell lines which overexpress HER2. ErbB2 is oncoprotein with 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 showed that this cell line does not express AT2 receptor. However, immunoprecipitation and Western-blotting studies showed high-level expression and constitutive phosphorylation of both ErbB2 and ErbB3 receptors in this cell line. It was further shown that introduction of the AT2 in these cells by transient transfection for a period of nine days resulted in significant reduction of the phosphorylation of the ErbB2. It was found that the level of ErbB2 itself was significantly reduced in these cells. In contrast, the AT2 receptor carrying mutations in the 3rd ICL of the AT2 did not affect the phosphorylation levels or the expression levels of the ErbB2 in these cells. The AT2 transfected cells were unable to grow more than two weeks suggesting that the AT2 inhibited the growth of these breast cancer cell lines. When the cells were treated with the AT2 for 3 days, the transfection rates 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 disrupting 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 Anjali.Nair@wooster.edu, Dean M Kofahl, William Morgan, Wooster, Ohio, YU91, 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 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, deletion of 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 chemorepellents. The Che A gene 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 29 CHEMOTAXIS AND INDUCTIBLE ANTIMICROBIAL RESISTANCE IN ESCHERICHIA COLI. Kobalka, Peter Pokobalka@wooster.edu; Mwilambwe, Kabulo B. Kwilambwe@wooster.edu; Ritchez, Katherine Kritchey@wooster.edu; (Johnson, Teresa A. Tjohnson2@wooster.edu, PhD.; Fraga, Dean Dfрага@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* strains at the molecular level. Previous research indicate that 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 chemotactants and chemorepellents. Chemotaxis can be defined as the movement of an organism in a directed manner toward or away from a chemoeffect. Therefore, this study will measure the level of expression of the chemoeffect. This study will quantify the mRNA from the strains, as well as knock down the expression of the target gene using RNA interference. This study will help determine the roles of the chemoeffect with respect to antibiotic resistance. The mechanism by which chemotaxis and inducible antibiotic resistance are related is not known. This study will provide insight into the relationship of these two processes. 

**Board 30 IDENTIFICATION OF SALMONELLA GENES THAT ARE EXPRESSED IN THE PRESENCE OF OTHER BACTERIAL SPECIES. Jessica L. Dysezel, Jessica.L.Dysezel@nmsu.edu; Carter Carter, Carter.323@osu.edu, Jonathan G. Frye; Jfrye@ars.usda.gov, Michael McClelland; mmcCLELLAND@skcc.org, Brian M. Ahmer; Ahmer.1@osu.edu, The Ohio State University Department of Biology 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. The sdiA gene 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 one additional gene was also identified. Chromosomal lacZ2 fusion lines were being constructed to the sdiA gene 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 shown to be induced by an overexpression 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 elucidated 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 archaeabacteria anaerobes. Mitochondrial genes still retain a substantial amount of DNA encoding tRNAs 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 some eukaryotes 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 conflicting data. Using Fangman's two-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 fragment. However, the modified 2-D gel revealed circular forms attached to larger molecules forming an "eyebrow" structure that has previously been shown to be a hallmark of rolling circle replication.
The physical effects of testosterone are well-documented, but the role testosterone plays in a social context is less clear. Previous studies have indicated that testosterone levels may predispose men to divorce or abusive relationships, or conversely, to success in business. Therefore, we are studying 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 married 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 saliva passive dot (4 ml), and the standards curve will be obtained, using a 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 were then compared using the Student’s t-test, and it was determined that there is a significant difference with p=.001, thus supporting the hypothesis of 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 (MRI) of their brain performed, and the 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, the intake of the different variables will be analyzed to see if they correctly identified 4 images using Barbie™ as fair use in a social context. The survey was administered to thirteen persons with artistic backgrounds to determine if there is any significant difference in the levels of testosterones between females 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, 504heritance.jw.org, (CATHY L. PEDERSON, cpederon@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 adulthood. 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 form bestow the control mice that do not 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 35 PERFORMANCE OF NR2B TRANSGENIC MICE IN TRADITIONAL AND NON-TRADITIONAL VERSIONS OF THE HEBB-WILLIAMS MAZE. ANJULIE, AKORNA A2RORA@wooster.edu (Amy Jo Stavnezer, jstavnezer@wooster.edu) 1109 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, cues 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 located in a curtain. The purpose of this is for 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: PART 2, PRESENT AND FUTURE VALUE. FJKLUTH, FJKLUTH@OSU.EDU, ERIN BOGUSKI, ERIN.BOGUSKI@KENT.EDU, ERIN KRAY, ERIN.KRAY@KENT.EDU. OPEN SPACE ART GALLERY, 612 N. MANITUA ST. KENT, OH 44240-2318.

An overzealous intellectual property movement in the 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 determine 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. Each of these persons was located locally in Kent where 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 fair use, the test was considered significant. 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 the process though other aspects of this issue need to be studied before this conclusion follows.

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

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. This article will review the chemical properties of CCPs and their use in agriculture, such as 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 CCPs are 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.
used by the greenhouse and landscape industries. 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-Atmospheric Emission Spectroscopy (ICP-AES). We evaluated 44 mixes, with 4 replicates for each, for their ability to support growth of wheat (Triticum sativum), tomato (Lycopersicum esculentum) and marigold (Tagetes patula) plants. The biomass produced was weighed at the end of the experiment. Our results showed that significantly (p<0.0001) higher growth (7-130%) was achieved with experimental mixes containing CCPs (a/v), compared to amaranth (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” spacetime. This causes light to bend as it travels from a point-source to a quasar, to appear bent. These 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. Although more complex 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 contained a distribution that was adapted depending on the model selected. Approximately the same range of masses was found using the isothermal sphere model, supporting the mass estimates from the point-source, point-lens model.

BOARD 02  ROTATION = +/- ROTARY NYSTAGMUS.  Kaleigh E. Gallagher, DancingOte@ AOL.com 5768 Colonial Blvd, Willoughby Ohio, 44094, BEAUMONT SCHOOL.

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

BOARD 03  FACTORS INFLUENCING THE GROWTH OF PROTEIN CRYSTALS.  Jason A. Robson, robsonj@access.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 th 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 to create an electron density map used to determine the sequence of amino acids. The most difficult step in this process is growing crystals to a size of .2mm or greater. Finding more reliable ways of growing these crystals is the focus of this experiment. In this experiment, samples of protein solution grown in environments of pH's 4.5,6,7,8,9,10, and temperatures of 4°C, 22°C, and 30°C were or will be taken and run on an electrophoresis gel checking contamination along with the possibility of multiple proteins. In all trials that have been tested (pH 4.5,6,7, and 22°C) contamination was a common problem and probability for multiple protein structures appearing occurred only once in the 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 basic life's functions and processes.

BOARD 04  THE ROLE OF ENOLASE PHOSPHORYLATION IN SALMONELLA TYPHIMURIUM.  Taruna Singh, tsingh06@hb.edu, 25405 Bydend Road, Beachwood, OH 44122 911-443-5128.  David G. Kehres, dkg2@case.edu, Case Western Reserve University, Dept of Pharmacology.

Little is known about the specifics of protein phosphorylation in bacteria, despite the abundant information known about it in eukaryotes. The Salmonella genome encodes hundreds of phosphorylated proteins and at least nine protein kinases and phosphatases. Two of the protein kinases that dephosphorylate the Salmonella "phosphoprotein." One approach entails for the overall efficiency in phosphorylation of enolase with the phosphoenolpyruvate dependent phosphoprotein phosphatases. This approach is the study specific phosphate in 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 plasmogen. Furthermore, several distinct phosphorylated forms of Salmonella enolase were found on 2-D polyacrylamide gels. The working hypothesis is that it is phosphorylation of enolase that 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 PrP and PrPb, two Mn4+ 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.  Madeleine M. Coquilleture, coquillumm@bmc.rcf.ccf.org, (216) 444-1670 X 3309.  Deepak Joshi, DH 44110, Cleveland Clinic Foundation, Cleveland, OH 44106.  Gail Derrara, Radiology Research Laboratory, Richard Schlenk, Edward Benzel, Cleveland Clinic Spine Institute, Aaron Fleischman, Shuvo Roy, Ellya 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 for monitoring the formation of bone on bone grafts 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 pressure variations within the bone graft for 4 in vivo 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 21 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 histological and histochemical analyses to examine pressure reactions of the telemetric catheter in specific locations and to further substantiate the previous findings.

**Board 06 QUANTITATIVE ANALYSES OF CONNECTIVE TISSUE PROGENITORS FROM BONE MARROW BETWEEN GENDERS.** Ingrid P Baumann, ibaumann07@hhb.edu, Chizu Nakamoto (lead faculty) * (nakamoc@ccf.org), Cynthia A Boehm* (boehmc@ccf.org), Mounita Kundu* (kundumccf@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. Interplay between osteoblasts and osteoclasts will result in either excessive or reduced bone mass. Osteoporosis is a syndrome of reduced bone mass/density. Osteoporosis is a disease of major angiogenesis in vascular tissues and in skeletal tissues. 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 proliferative proliferation rate (Mean± SD= 0.79±0.16) compared to men (Mean± SD= 0.71±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± SD= 0.46mm²±0.631) compared to men (Mean± SD= 0.17mm²±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 (BERNOULLI 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 occur between the cytoplasm and the nucleus?” The cytoplasmic diffusion of Rev-GFP protein was examined by photobleaching a region in the cytoplasm and monitoring the return of fluorescence intensity, 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 of the cytoplasm. This process, known as F.R.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 in 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 Lies1, Sara G. Carlsson2, and Guy M. Chiolsom1. *The Student Research Program, Hathaway Brown School, Shaker Heights OH 44122 and *The 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 angiogenesis. 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 (LDL), 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 division. Cultured cells were treated simultaneously with 7-ketocholesterol, a toxic component of oxLDL. DNA laddering and caspase-3 activity were examined in untreated cells, 7K-treated cells, and 7K-treated cells pretreated with the antioxidant vitamin E. Interestingly, in SMC, 7K induced DNA laddering but not caspase-3 activity. The SMC is the endothelial cell, foamy cells, macrophages, 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 involved. SMC and 7K may serve 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, jjarrell07@hhb.edu, (Chung-Chun Liu)2, CXL9@ccwru.cas, 1HATHAWAY BROWN SCHOOL, 19600 NORTH PARK BOULEVARD, SHAKER HEIGHTS OH 44122 and 2CASE WESTERN RESERVE UNIVERSITY, ELECTRONICS DESIGN CENTER, CLEVELAND OH 44106.

Creatine kinase-MB (CK-MB) levels in the blood inform health professionals on 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 presented in the blood. The completed sensor will provide a more sensitive, and effective detection range of CK-MB levels in the blood. Therefore, a microfabricated thick-film biosensor that can quantify CK-MB levels in the blood. The completed sensor will provide a more sensitive, and effective detection range of CK-MB levels in the blood. The principle of the sensor is based on the following reaction:

\[
2	ext{H}_2\text{O}_2 + 2	ext{C}_4\text{H}_7\text{N}_3\text{O}_2 \rightarrow 2\text{H}_2\text{O} + 2\text{CO}_2 + 2\text{H}_2\text{O}.
\]

In this reaction, creatine (\(\text{C}_4\text{H}_7\text{N}_3\text{O}_2\)) is the substrate. In the presence of CK-MB, creatine is oxidized, producing hydrogen peroxide (\(\text{H}_2\text{O}_2\)). The detection of hydrogen peroxide is then used to quantify CK-MB present. Three concentrations of CK-MB (1, 3, and 5 mg/dL) are used in this study, covering the normal physiological range 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 effectiveness of the detection range of CK-MB of the practical sensor microsystem 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 THE HEREDITARY HEMOCROMATOSIS ON THE HFE GENE.** Caitlin A. Miskipf, 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 do fairly commonly occur among 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. A study looked at site to site precluding temperatures 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 to a single subject. The DNA fragment that has been listed as 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 COMPARTMENT RATIOS FOR ODOR REDUCTION. JARED B. STEED, STONEYFARM@HSN.COM, 5979 RADNOR ROAD, RADNOR OH 43066.**

Of the 75 million tons of paper produced each year in the United States, 30% known as processed paper, can not be recycled due to a layer of clay. This clay allows 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 0.7N boric acid w/ indicator. The boric acid traps were replaced after 24, 72, 120, and 168 hours. The traps were titrated with 0.7 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<9.96E-16). Regression analysis determined that the optimum ratio by volume was 1:2:3.

### Board 12  
**A BIOREMedIATIOn STUDY OF COLLECTING LOT AND HIGHWAY CATCH BASIN RUNOFF WATER. VALERIE M. ANDRUS, 05VANDRU@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 sample of choice with 72.2% responding. The following in order of convenience with 67.4% of the respondents and McDonald’s ranking a choice with 67.4% of the respondents. Out of the 332 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, 38% were between 18-20 years old, 35% were 20-25 years old, and 56% were 30-35 years old, and 60% were 20 or years 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 consumed it 48 times per year. McDonald’s is the 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%),

The Ohio Journal of Science
Board 16  THE CHARACTERIZATION OF CONNECTIVE TISSUE PROGENITOR CELLS (CTPs): B- CATENIN RI RAKOS (rbrakos05@oh.net); SM VILLARUEL (villaruel@pgh.ni-ccf.org); CA BOEHN (boehm@pgh.ni-ccf.org); CD MUSCHLER (muschler@pgh.ni-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 patients 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 1st 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 development of delivery systems for CTPs in tissue engineering applications.

Board 17  THE GERM SQUIRM. HEIDI A. HOFFECKER, HOFFECKER@AOL.COM, 361 MARY AVE., WESTERVILLE OH 43081 (ST. FRANCIS DE SALES HIGH SCHOOL).

The purpose of this experiment was to find out how far the microorganisms in a sneeze travel, in order to avoid germs from a sneeze. During a sneeze most of the microorganisms actually issue from the mouth and then are inhaled as the sneeze contracts and expansion 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 of bacteria 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 these intervals in the sneeze chamber. 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 probe was inserted 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 37oC for 48 hours.

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: Salmonella is present in chicken bought in Ashland, OH 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 both brands in previous study) to test the first hypothesis. 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 18  TOTAL PLATE COUNT OF HETEROPTEROTIC MESOPHILIC BACTERIA USING FRESH ALLIUM SATIVUM L. AND POLOXAMER 407 IN THE FORM OF A MOUTH RINSE AS VARIABLES IN COMMERCIALLY PREPARED HAMBURGERS IN COSHOCTON, OHIO. AMY C. SCHLEGEL, SCHLEGEL@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 both brands in previous study) to test the first hypothesis. 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; KIMBERLY M. VILLARRS, 6307 RD. 153, ZANESFIELD OH 43360 (BENJAMIN LOGAN HIGH SCHOOL).

When the first accounts of anthrax were found in America, everyone began examining anything and everything. The government of America 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 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. Factors related 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 violent 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, OHIO 44805.

The procedure was repeated using a total of six balloons with 70% ethanol for 24 hours.

The Ohio Journal of Science Vol. 104 (i)
nonlinear chromophore, and a plasticizer. The PR effect in the samples was studied using a four wave mixing setup 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 observing 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 efficiency of the device depends 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 that interact with the electric fields which were 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.

**Physical Sciences & Education**

9:00 AM, Saturday, 17, 2004
DeBartolo Hall Room 347
Dr Paul Szalay – Presiding


Research activity in recent years has lead to significant development in the generation 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 linkers. The results of reactions of copper (II) and cobalt (II) with the organic linker tetrabutylammonium 4,4’-diaminostilbene -2,2’ disulphonate ([Cu-NH_4][DAS-(SO_3)_2]) will be presented. Organic acids that have been used in reactions with metal ions have also been the subject of anhydride syntheses. The preparation of polyamides from organic acids containing nucleophilic moieties such as 1,4,7,10 - tetraazacyclododecane - N,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.).

**Vol. 104 (1) The Ohio Journal of Science**

A-31
is translocated into the nucleus. As a result, beta-catenin mediated Wnt-signaling can be easily detected using cell specific staining. Beta-catenin can therefore serve as a convenient marker for in vitro evaluation of strategies that can increase or decrease Wnt-signaling events, the effort to manipulate the in vitro behavior of CTPs. Bone Marrow was aspirated from 9 human donors. Marrow was processed to isolate CTPs in vitro using established methods and cells were plated onto 16-well Lab-Tech chamber slides. At day 6, the cells were fixed using 4% Paraformaldehyde in PBS, blocked with goat serum in PBS, and incubated/stained with a monoclonal mouse anti-beta-catenin Ab and then a fluorescent secondary Ab. 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. The number of cells stained 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@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. Reports of learning styles utilized throughout the independent end of the continuum are influenced by the surrounding field, whereas perceptions of learners leaning toward the field independent end of the continuum are separated from the surrounding field. Research shows that the majority of preservice agricultural educators favor field independence which relates closely with a preference for a subject centered approach to teaching. To determine if these findings would hold true with practicing agricultural Extension educators, the learning style preferences of Ohio Extension educators were measured in Spring, 2004 using the Group Embedded Figures Test. GEFT scores were examined in relation to programmatic area of focus, gender, age, academic background, level of education, and length of experience. 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 Wills

9:00 NESTLING PROVISIONING BEHAVIOR AND REPRODUCTIVE SUCCESS IN ACADIAN FLYCATCHERS. Courtenay N. Willis cwwillis@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.

Nesting 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 strategies used by adults to provision young reflects adaptations for maximizing reproductive success. Acadian Flycatchers (Empidonax virescens) in northeastern Ohio were observed to determine if nestling feeding rates differed between specialists and generalists. Specialists were classified as adult pairs for which greater than 50% of the food fed to nestlings consisted of a particular order of arthropods. Arthropods fed to nestlings by specialist pairs (n=4 nests) and generalist pairs (n=5 nests) were identified using 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=0.26). 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 plants (floral and extrafloral nectaries). One of several different types of mouth, 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 extraloral 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 (Shiraki), Formica emeryana (Forel), and Lasius niger (Fabr.) have been seen foraging for nectar from extrafloral nectaries of cowweave, Melampyrum lineare (Desr.) in a jack pine forest in Grand Traverse County, Michigan. In 2002, the Allegheny Mound Ant, Formica auricularia (Fabricius), has been observed to collect extrafloral nectar from treehoppers, Vanduzea arquata, on black locust trees in Jefferson County, West Virginia. Ant species were also seen feeding at extrafloral nectaries of mung beans in Wayne County, Ohio. The 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, rcarreno@owu.edu, Laura Tuheha, lmtuheha@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 Leidynema portentosae, a parasite from the Madagascar hissing cockroach (Gromphadorhina portentosa). Live nemaatodes were fixed in gluteraldehyde and dehydrated using HMDs (hexamethylylazilane) or critical point drying preparation. Using SEM, several new characters have been observed including unusually wide lateral alarys, additional papillae along the posterior end of both the male and female L. portentosae. Cephalic and tail structures are also described. These studies indicate external morphological features not previously described or conflicting with the previous published description of L. portentosae.

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. Carmichael, ckar michael@malone.edu, and James C. Gillingham, gillig1@malone.edu, 1Malone College, 2Northern Illinois University, Dept of Natural Sciences, 515 25th St., NW, Canton, OH 44709-3897, and 3Central Michigan University, Department of Biology.

The tuatara (Sphenodon punctatus) is one of two sole surviving species of sphenodontids that is often viewed as a "living fossil" that has remained unchanged since the Triassic. Although the tuatara possesses many ancestral characteristics such as aurocent dentition, lack of a male copulatory organ, gastralia, a diapsid temporal region and fixed quadrate, a thorough study of the tuatara’s current thermoregulatory regime does not necessarily invalidate the physiological acclimatization of the tuatara 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 (forest 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 splashed on the floor of each respective habitat. Using the McNemar test for the significance of behavioral change (i.e., moving in and out of sun patches), we found that tuatara shies, birdly switch between thermotransforming 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 shutting into and out of sun patches (p > 0.05), however during cloudy conditions, the tuatara frequently displayed heliothermic behaviors (p < 0.05). Additionally, thermal conditions radiate to surface area that limits the net bioenergetic gain achievable by consistent passes overhead. These birds may provide a selective pressure for forage for the Australasian predatory Australasian harrier during the day). Based on the thermally sensitive radio transmitter data, it is apparent that T_b strongly correlates with T_s, 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_s. The tuatara, like many reptiles with low metabolic rates, may simply be active at much lower T_s 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 preferred body temperature is typically found when an animal is submersed in water or the body is shaded or above the substratum. Several species of crocodilians (e.g., **Paleosuchus** and **Crocodylus**)) will be conducted to determine if our results are congruent with molecular phylogenetic hypotheses that have been presented.

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 antennules, to best encounter odors in that habitat. Antennules were examined from at least three species of crayfish using electron microscopy, and measured structural parameters at three positions along the antennules from micrographs using Scion Image Software (Scion Corporation). The number of aesthetascs, aesthetasc length, and diameters in each species from different 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.

### 10:15 CRAYFISH AESTHETASC STRUCTURE IS CORRELATED WITH FLOW ENVIRONMENT AND POSITION ON THE ANTENNULE. KRISTINA S. MEAD1 MEADK@OHIO.EDU AND AMY E. BRUESTLE2 BRUESTLE@OHIO.EDU. 1DEPARTMENT OF ZOOLOGY DEPARTMENT, DENISON UNIVERSITY, 100 W COLLEGE ST, GRANVILLE, OH 43023 2DEPARTMENT OF PSYCHIATRY, UNIVERSITY OF CINCINNATI MEDICAL CENTER.

Many aquatic crustaceans use water-borne 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 antennules, to best encounter odors in that habitat. Antennules were examined from at least three species of crayfish using electron microscopy, and measured structural parameters at three positions along the antennules from micrographs using Scion Image Software (Scion Corporation). The number of aesthetascs, aesthetasc length, and diameters in each species from different 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.

### 10:00 ROLE OF CHEMOCEPTION AS AN IMPORTANT FORAGING MODALITY IN CRAYFISH. 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 crocodilians. Recent studies of anacondas (e.g., *Eunectes imitator*) have shown that crocodilians use mechanoreceptors to sense water-borne vibrations produced by potential prey items. These vibrations are not only sensed by the crocodilian, but these reptiles are able to orient themselves toward the sound source of origin using directional hearing mechanisms. In the absence of water disturbance and the subsequent production of prey-induced vibrations, crocodilians will switch to a more active underwater foraging style whereby they exhibit concurrent head- 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 of crocodilians (e.g., *Paleosuchus* and *Crocodylus*) using gular pumping and olfaction. A modified Y-maze chamber is currently being used to test behavioral chemosensory orientation of crocodilians (e.g., *Paleosuchus* and *Crocodylus*). The influence of prey scent on selection and orientation to one of the two influent ports will be statistically tested using a 1-tailed binomial test with equal probabilities. Crocodilians tested to date detect odors via a well-developed chemosensory mechanism that is involved in prey detection and orientation toward prey during foraging based on Y-maze results (p < 0.05). A comparative study of several genera of crocodilians (e.g., *Paleosuchus* and *Alligator*) will be conducted to evaluate whether or not these behavioral phylogenetic hypotheses for this taxonomic order, and if so, determine if our results are congruent with molecular phylogenetic hypotheses that have been presented.
While algae represent integral components of aquatic ecosystems there are also significant taxonomic presence/absence of species from various habitats and regions. One such region that has been the focus of sporadic algal inventory is the glaciated 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 of taxa exhibited in this way included the Chlorophyta (39%), Bacillariophyta (34%), and the cyanobacteria (15%). Additional groups of lesser taxonomic dominance included the euglenophytes (6%), chrysophytes (2%), xanthophytes (2%), chlorophytes (2%), 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), JEFFERY R. JOHANSEN AND REX. L. LOWE1. DEPARTMENT OF BIOLOGY, JOHN CARROLL UNIVERSITY, UNIVERSITY Heights, OH 44118. 2 DEPARTMENT OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY.


9:45 A NEW APPROACH TO CYANOBACTERIAL SYSTEMATICS AND TAXONOMY. JEFFER Y R. JOHANSEN, JOHANSEN@JCU.EDU, AND DALE CASAMATT A, DCASAMATT A@JCU.EDU. DEPARTMENT OF BIOLOGY, JOHN CARROLL UN IVERSITY, UNIVERSITY Heights, OH 44118.

In the past, cyanobacterial species delimitation has been confined to morpho-species 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 been circumscribed 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 separate taxa based on studies of terrestri al 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 rDNA 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 Capsosira 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 METABOTYPY DYNAMICS IN A RECENTLY CONSTRUCTED WETLAND IN DEFANCE COUNTY OHIO. SARAH E. HAMSH E5 (hamshse5@hotmail.com), LEE M. LUCKEYDOO2, DALE A. CASAMATTA2 AND NORMAN R. FAUSEY3. UNIVERSITY OF GEORGIA. 3 DEPARTMENT OF BIOLOGY, JOHN CARROLL UNIVERSITY, UNIVERSITY Heights, OH 44118.

Algae are one of the primary components of wetland communities, therefore, 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 metaphyt on (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, Ohio. Water 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. Metaphyt on 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 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 increased significantly, and more than doubled. This suggests 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 TWI N LAKE, PORTAGE COUNTY, ROBERT T. HEATH (HEATH@KENT.EDU) AND DENNIS HANSEN (HADEN0201@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 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 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 1H-glucose and 32P-phosphate from G6P and 1H-adenosine and 32P-phosphate from equimolar quantities of 32P-ATP and 1H-ATP, ranging from 10 to 80 nM (total conc.), was followed by filtration onto 0.2 ìm and 1.0 ìm filters. Both bacterioplankton and phytoplankton assimilated the phosphoryl moiety in preference to the organic moiety; bacterioplankton did not photolyse ATP. This study is consistent with the view that bacteria may utilize DOP as a source of both P and C.

10:30 LABILE DISSOLVED ORGANIC CARBON (LDOC) AND DISSOLVED ORGANIC PHOSPHORUS (DOP) INFLUENCE PHOSPHATE UPTAKE IN LAKE ERIE BACTERIOPLANKTON. TRACEY TRZEBUCKOWSKI MEILANDER, TRZEB@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, uptake and assimilation 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, bacterial phosphorus uptake will be most available P, but in high LDOC environments (>70 nM), phosphorus will be most available labile C. 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 velocity was measured radiometrically using 32P-labeled 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 from biomass data, determined bioassay (estimated from P-uptake rate constant, bacterial cell growth rate, and bacterial cellular phosphorus content). Bacterioplankton in nearshore relatively eutrophic sites with higher LDOC, assimilated phosphorus 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, LL@ART.EDU, DEP. 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 one of the isolates was identified by API® 20NE and 16S rRNA gene sequencing method and Vitek® GNI+ test card. Only 4 isolates were identified by Vitek® GNI+ test card, based on 16S rRNA gene method. The following five taxa were found: Arthrobacter sp., Stenotrophomonas maltophilia, Raistonia picketti, 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, LL@KENT.EDU, DEP. OF BIOLOGICAL SCIENCES, KENT STATE UNIVERSITY, KENT OH 44242.

In woodlands streams, leaf litter serves as an important energy source for microbial communities. We examined the microbial community structure in leaf litter in the West Branch of the Mahoning River, in NE Ohio. The objective of the study was to determine microbial diversity and differences in Decomposition rate of leaf litter from different composition. Total bacterial diversity was determined by 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, Raistonia picketti, 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.

9:30 DETECTION OF HELICOBACTER PYLORI ORGANISM IN REGULARLY-SUBMITTED STOOL SAMPLES USING RAPID ENZYME IMMUNOASSAYS. SARO J SIGELD, MS, SAROJSIGELD@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 the 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 this 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™ immunocards). 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™ microtiter 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 immunoassays (HpSA™ microtiter wells and HpSA™ immunocards). 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, LEA S. CORTHELL, LSCOR@OWU.EDU, (Laura
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 the water sources in the Kraus 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 A. hydrophila, the BBL Enterotube II system and Biolog Micro Plates were used to determine if the isolates were Aeromonas strains. The chemotactic response of each isolate was 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 was used. The colony biofilm was stained with either DAPI or the Live/Dead BacLight kit.

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 colonies at the air 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 to simulate the different gravity environments. The community structure of bacteria in the water system aboard the Mir space station is different than what 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). Rajesree D. Borthakur, roborthakur@neoucom.edu, Donna King, dk@neoucom.edu, Northeastern Ohio Universities College of Medicine, 4209 SR 44, Rootstown OH 44242.

Transgenic mice that produce hGH in their marrow generate more bone 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 local growth hormone stimulates bone deposition. Such therapeutic use of a growth hormone with osteogenesis imperfecta and astronauts in space travel by providing a constant, long-term, and local source of hGH.

To verify the hypothesis that 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 exit for the local production of growth hormone to stimulate bone deposition. This phenomenon was exploited to the transgenic mice using 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. Channe@hpsr@otter.edu, LAB. DR. AMY JESSEN- MARSHALL, A. JESSEN-MARSHALL@OTTERBEIN.EDU. Otterbein College, DEPT OF LIFE SCIENCES, I 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 antipporter 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 lactose permease in Escherichia coli have led to a model of twelve transmembrane domains in a helical conformation, with eight amphipathic helices responsible for solute transport, and four hydrophobic helices, which we hypothesize to stabilize helices in the membrane. To test our hypothesis, we have used site-directed suppression to examine the importance of these stabilization helixes. We have previously shown that helix III and VI have been used using site-directed suppression to examine the importance of these stabilization helixes. 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 2004 PRELIMINARY ANALYSIS OF THE PALEOFLORA OF THE DOAN BROOKS EXPOSURE OF THE UPPER DEVONIAN OHIO BLACK SHALE. Wilmer C. Stowe (wilsto@ncweb.com) and Shiva Chitaley (schitale@cmmh.org). The Cleveland Museum of Natural History, 1 Wa de 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 in the type section of the “Cleveland Shale” 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 (1992, 1998, 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 Cuyahoga River was also collected. The samples were examined for macrofossils when none were found 50 grams of each collection were cultured using standard palynological techniques. The cleaned residue was mounted on 1 x 3 inch microscope slides with Naphrax. Contained in each sample 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. These differences in spore 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.
Recent advances in computer applications for mapping, especially in Geographic Information Systems (GIS), have resulted in a much more rapid change of data and a better visualization 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 considerable variation, so additional analysis utilizing climatologic data such as hourly rainfall records may be necessary to offer evidence of the impact of terrorist activities. Another problem identified was the lack of standardized emergency symbols. 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 Symbolology. 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 selection of a matrix (a to b) in which the hazards and symbols for which information for which symbolology was used, b) to identify the agencies that currently use hazard and emergency symbolology, c) to identify hazard mapping symbols embedded in commercial software, and d) to compare the information on hazard and emergency symbolology was not readily available. The preliminary results indicate that most of the information on symbolology is geared toward specific hazards such as hurricanes, tornadoes, and earthquakes. Symbolic evacuation information 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 Lahn, tlahn@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 changes the hydrology of the area, which may alter 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 (oblique aerial, true color) to quantify the extent 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 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 that urban discharge events are slightly larger and occur more frequently than non-urban discharge events. This suggests 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-
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

Drs. Jerry Cheesman – Presiding

2:00 REGULATION OF THE P GENE IN ZEA MAYS.

Anthony J. Studer, astudert001@defiance.edu. 17731 Pratt Rd. Defiance, OH 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 chemical methylation inhibitor will be added to the plants with the hypothesis that it will turn on the P gene. Then demethylating and ethylating agents, with different substrates, will be tested for efficiency of remethylation and ethylation of the P gene after ethylation. 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, brucearonow@chcmc.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 genes that code for 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 C57/6 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 downstream tissue-specific effects with physiologic impact. Using this approach, c-Fyn, non-receptor tyrosine kinase whose expression is variably expressed 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 parental strains 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 in these regions were in linkage disequilibrium with expression in the brain of humans and mice.

Further analysis identified genes with binding sites conserved among the co-regulated genes and putative QTL genes. Putative QTLs might include protein tyrosine phosphatases, insulin-like growth factors, myristoyl-transferases, -1-phosphatase, amytrophic lateral sclerosis 2, thioredoxin reductase 1 and Anti-Mullerian hormone.

2:30 EFFECT OF ADENOVIRUS DNA CONCATENAMERS 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 double stranded DNA repair. In the absence of the 11kDa and 34kDa proteins in infection E4 mutants leads to concatenation of viral DNA genomes by cellular DSBR pathways. 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 viral DNA 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 virus express only the late gene in MO59K cells and not 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 ANTIMICROBIAL RESISTANCE PATHWAY OF E. COLI.

Katherine E. Frato, kfrato@wooster.edu, Teresa Johnson, njohnson2@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 feedback mechanisms, the environment chemicals 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 signaling pathway 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 ANTIMICROBIAL RESISTANCE IN ESCHERICHIA COLI, Katherine C. Ritchey, kritche@wooster.edu, Peter Kolbaka, pkolbaka@wooster.edu, Blanche Mwilambwe, bmwilambwe@wooster.edu, (Teresa Johnson, njohnson2@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 that differ chemically from the antibiotics tested. Further studies by College of Wooster students have attempted to specifically define the function of chemorepellents and chemotaxons with inducible antibiotic resistance. A demonstration relationship between chemotaxis, chemoresistance 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 resistance phenotype and test specificity 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 combing different concentrations of ampicillin or chloramphenicol with either a chemorepellant (sodium acetate, 0-10mM) will test wild-type and tar-mutant strains. The results from these experiments will be combined with the previous data that determine the effect of aspartic acid and sodium acetate on antibiotic resistance in E. coli. Further investigation into the Tar pathway will test the hypothesis that the Tar chemoreceptor signaling pathway is linked to the inducible antibiotic resistance phenotype.

3:15 A FLUORESCENT PROBE FOR THE DETECTION OF MALTOSE UTILIZATION IN BACILLUS SUBTILUS.

Sarah K. McBeth, smcbeth@muskogean.edu, (Deepamali Perera,
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 molecularly designed to localize within a biological specimen and respond spectroscopically to a specific staining antigen. 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@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 mannann conjugation 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. Antigen conjugation to an adjuvant and/or proper route of vaccine administration increases the 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 CONJUGON ON BRAIN CHOLINE ACETYLTRANSFERASE (CHAT) ACTIVITY AND THYROID STIMULUS. DOUGLAS A. DODGHE and DOUGHE (DOUGHEAR@GNET.BGSU.EDU), EDWARD J. DOUGHERTY (DEDWARD@GNET.BGSU.EDU), and LEE A. MONSE (LMONSE@GNET.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 ubiquitous, 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 of PCB 47/77 at 1.25, 6.25, or 25.0 ppm. Rat pups (n=32) were decapitated on postnatal 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).

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 nearly constant between species and did not influence the species distribution. 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 LUPRON, ERIN PFEL, 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 25 x 20 m quadrats on five prominent streamside terraces. Understory trees 1-20 cm DBH were catalogued in 10-m quadrats located within the 30-m plots. Nineteen broadleaf and two coniferous species exceed 20 cm DBH, and form a multi-layered canopy. Four more broadleaf species...
(striped maple – Acer pensylvanicum L., flowering dogwood – Cornus florida L., witch hazel – Hamamelis virginiana L., and American hornbeam – Carpinus caroliniana Walt.) occur only in the understory. Thirteen species reach 80–126 cm DBH. Sugar maple (Acer saccharum) 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 log-normal. In contrast, shade-intolerant species occur 40–410 cm DBH clumped, 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, we are investigating the following questions in oak-hickory forests of Vinton County, Ohio: (i) what is the species richness and abundance of ectomycorrhizal fungal in disturbed and undisturbed oak forests, and (ii) how do thinning and burning practices affect the ectomycorrhizal fungal (EMF) community structure within a given landscape position? Our hypotheses include (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 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, 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, stucker1@ohiodohio.edu, CAROLYN H. KESNER and MARY STEVENS, DEPT. OF BOTANY, MIAMI UNIVERSITY, OXONOHIO 45056.

Phytoremediation is the use of plants and their associated microorganisms to increase contaminant removal 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 TruFLP to identify 16s RNA 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, Canada. The soil (Salix alba) is naturally occurring field soil, not amended. An advanced molecular technique (TRFPLP-terminal restriction fragment length polymorphism) is being used to assess bacterial community structure. TRFPLP is a PCR-based technique that allows environmental samples to be processed by amplifying a portion of the 16s RNA gene and acquire a unique marker for most unknown bacteria. The results provide estimates of the number of different species or rvalue that can be assigned to a community composition. Recently developed software (TRFPLP FRAGSORT, http://www.oardc.ohio-state.edu/trfplpfragsort/) will be used to obtain putative phylogenetic identification. The number of distinct rbitopes 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 WITH VARIOUS CERCARIAE SPECIES IN METZGER RESERVOIR, ALLEN COUNTY, OHIO. Tiffany L. Langenderfer, t-langenderfer@ou.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 determine the effects of Balance® Pro herbicide on aquatic sediments and communities of invertebrates. 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 impact of isoxaflutole and its derivative, diketonitrile, on untested aquatic communities of invertebrates and to further scientific understanding of snails infected with cercariae. Freshwater snails (Physa gyrina) were collected from a large, man-made reservoir with a drinking water supply, and from a small, seasonal cistern. To date, nine species of cercariae were tentatively identified including Notocotylus urbanensis, Cotylurus flabelliformis, Echinostomum revolutum, Plagiorchis muris, Cercaria laruei, and Trichobilharzia stagnicolae. The objective of this study was to determine the effects of Balance® Pro herbicide on organisms treated was collected from 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 have 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 GEAUGA 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, spieleso@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±0.16; mean±SE) than in restored (2.49±0.09) or enhanced (2.26±0.13; $p=0.01$, $F=4.7$, $n=45$). Created and restored wetlands support 12.4 and 12.2 species per 10 m$^2$ respectively, nearly four times more than the 3.2 species in 10 m$^2$ 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, b34348703@ohio.edu, DEAN LIEURANCE, lieuranced@bascom.com, KIM J. BROWN, kbrown@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.