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Jane E. Huffman, PhD, MPH
Editor
Larry Laubach
Co-editor
Department of Biological Sciences
East Stroudsburg University
East Stroudsburg, PA 18301

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90th Annual Meeting

of the

Pennsylvania Academy of Science

March 21 - 23, 2014

Susquehanna University

Selinsgrove, PA

Journal of the Pennsylvania Academy of Science 88(3): 107-108, 2014

Schedule of Activities

90th Annual Meeting of the Pennsylvania Academy of Science

March21-March 23, 2014

Susquehanna University Selinsgrove, PA

Friday, March 21, 2014

Time	Activities	Location, Description
12:00 - 5:00 pm	Field Trips	See list of activities
2:00 - 4:00 pm	Board Meeting	Degenstein Conference Room: 3
5:00 - 5:30 pm	Reception (PAS Board & SRHCER)	President's House
5:30 - 6:45 pm	Dinner (PAS Board & SRHCES)	President's House
6:30 - 9:45 pm	Meeting Registration	Degenstein Theater Hallway
7:00 - 9:00 pm	Social Hour and Welcome	Degenstein Art Gallery

Saturday, March 22, 2014

7:30 - 9:00 am	Breakfast	Mellon Lounge
8:00- 5:00 pm	Meeting Registration	Mellon Lounge
Session I (9:00 - 10:30 am)		
9:00 - 9:15 am	Welcome & Introduction by Jay Lemons and Robert Coxe	Degenstein Theater
9:15 - 9:30 am	"Skip" Wieder - SRHCES	Degenstein Theater
9:30 - 10:30 am	Symposium	Meeting Room 4 & 5
9:30 - 10:30 am	Oral Presentations I. Gene Expression II. Biomolecules - Fat	Meeting Room 1 & 2 Meeting Room 1 Meeting Room 2
10:00 - 12:00 pm	Posters I. Explotartions and Applications in Life Science	Mellon Lounge and Hallways
10:30 - 10:45	Refreshment Break	Mellon Lounge
Session II (10:45 am - Noon)		
10:45 - 12:00 pm	Symposium	Meeting Rooms 4 & 5
10:45 - 12:00 pm	Oral Presentations III. Animal Ecology IV. Microbiology V. Immunology	Meeting Rooms 1 - 3 Meeting Room 1 Meeting Room 2 Meeting Room 3

12:00 - 1:00 pm	Lunch	Evert Dining Room
1:00 - 1:30 pm	Tour of Natural Sciences Center	Meet in Lobby of NSC

Session III (1:30 - 2:30 pm)

1:30 - 2:30 pm	Symposium	Meeting Rooms 4 & 5
1:30 - 2:30 pm	Oral Presentations	Meeting Rooms 1 - 3
	VI. Anthropogenic Impacts on Aquatic Systems	Meeting Room 1
	VII. Mammal Ecology and Behavior	Meeting Room 2
	VIII. Wildlife Disease	Meeting Room 3
2:30 - 2:45 pm	Refreshment Break	Mellon Lounge

Session IV (2:45 - 4:30 pm)

2:45 - 4:30 pm	Oral Presentations	Meeting Rooms 1 - 3
	IX. Plant Ecology and Habitat Restoration	Meeting Room 1
	X. Geography and GIS	Meeting Room 2
	XI. Cancer Biology and Cell Replication	Meeting Room 3
2:45 - 4:30 pm	Poster II. Ecology and Environmental Biology	Mellon Lounge and Hallways
4:30 - 6:00 pm	Annual Meeting	Degenstein Theater
7:00 - 10:00 pm	Banquet and Dinner -Keynote Speaker: John Arway, PFBC	Evert Dining Room

Sunday, March 23, 2014

8:00 - 9:00 am	PAS Board Meeting	Degenstein Conference Room: 3
8:00 - 10:00 am	Meeting Registration	Mellon Lounge
9:00 - 11:00 am	Oral Presentations	Meeting Rooms 1 & 2
	XII. Aquatic Ecology	Meeting Room 1
	XIII. Science Applications	Meeting Room 2
9:30 - 11:00 am	Poster III. Plant Biology, Organismal Biology, and Chemistry	Mellon Lounge and Hallways
11:30 - 12:30 pm	Lunch	Evert Dining Room
12:30 -1:30 amd	Awards Ceremony	Degenstein Theater

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Abstracts of Poster Presentations

90th Annual Meeting

of the Pennsylvania Academy of Science

March21-March 23, 2014

Susquehanna University
Selinsgrove, PA

(Arranged in alphabetical order of first authors or presenters)

Alvarez*, Dennis C. and Carl R. Pratt. Immaculata University, Immaculata, PA 19345. *Microclimatic conditions among Trees in Parking Lot "Islands"*-- These results are part of an ongoing analysis to determine the microclimatic conditions experienced by trees placed in potentially stressful conditions such as automobile parking lots and sidewalk areas. Environmental parameters (soil surface temperature, air temperature, wind speed, relative humidity) and physiological parameters (leaf-xylem potential, leaf temperature) were compared among red maple trees (*Acer rubrum*) growing on two adjacent sites: one set of trees was in confined planting bed within a parking lot surrounded by asphalt and the other site contained similar trees (trunk diameter, stature, and age) planted along a lawn area. Wind speed, air temperature, and relative humidity were measured using a hand-held Kestrel 4500 Pocket Weather Tracker. Environmental surface and leaf temperatures were determined using a Fluke IR thermometer (model 561). Leaf potentials were measured at approximately 2:00 PM once a week during the summer of 2013 using a Pressure Chamber (PMS model 600). Trees on the parking lot site experienced significantly higher mean leaf potentials [7.50 $\pm$ 0.24 mBar] as compared to those trees in lawn area [5.94 $\pm$ 0.27 mBar] as determined by ANOVA and student t-test. Leaf potentials increased during the summer from May through August in both sets of trees, reaching a maximum in August. These measurements suggest trees in the parking lot islands were subject to potential drought stress as compared to trees in the lawn. Mean surface temperatures on the parking lot surface beneath trees [36.6 $\pm$ 1.9 °C] were significantly higher than those beneath trees on the lawn site [23.9 $\pm$ 1.1 °C]. However, mean leaf surface temperatures did not differ significantly among trees on the two sites [parking lot: 24.3 $\pm$ 0.4 °C; lawn: 23.1 + 0.35 °C]. (122)

Anthony, Andrew*, Michael Bilger, Katherine Guild and **Jack Holt** Susquehanna University, Selinsgrove, Pa. 17870. *An Assessment of the Susquehanna River Upper Main Stem by Interpreting Different Methods of Sampling Benthic Macroinvertebrate Communities Over a Two-Year Period (2012-2013)*-- The benthic macroinvertebrate communities have been sampled for the past five years in an attempt to evaluate the state of the Susquehanna River, the primary source of the Chesapeake Bay, at the upper main stem, the portion of the river below the confluence of the North and West Branches at Sunbury, Pennsylvania. Our protocols involved collecting samples in a wide transect seven kilometers below the confluence (the Byers Island Transect). The plumes of the two branches are only poorly mixed and maintain their chemical and physical signatures (e.g. the West Branch is influenced by abandoned mine drainage while the North Branch is influenced mainly by agriculture). Our comparisons were made between a site in the West Branch plume (WBP) and a site in the North Branch plume (NBP) in the transect. During the period of 2012 to 2013, we collected macroinvertebrates by active methods (D-net and Surber samplers) and passive methods (rock baskets and Hester-Dendy multiplate samplers) to evaluate their usefulness on large rivers such as the Susquehanna. To that end, we applied common metrics [%Ephemeroptera-Plecoptera-Trichoptera (%EPT), Shannon Diversity (SDI), and Hilsenhoff Biotic Index (HBI)] to the interpretation of our macroinvertebrate collections, which were identified to the family-level for 50 taxa. The metrics were very inconsistent depending on the sampling method used for in-site comparisons. For example, HBI results described the WBP as having some organic pollutants (5.14, active methods) and as having slight organic pollution (3.10, passive methods). While the application of HBI to NBP collections indicated slight organic pollution for both sampling methods (3.93 for active methods and 3.58 for passive methods). Our results suggest a need for re-evaluation of sampling methods to assess large river systems. (105)

Astor, Michael*, Samantha Gleich* and **Michael W. Butler.** Lafayette College, Easton, PA 18042. *Mid-life immune challenges affect melanin deposition in male mallard feathers*—Immune challenges can affect the quantity and distribution of melanin within integument. Although the effects of greater melanin production can be beneficial in birds, the consequences of using energy to produce melanin

in avian plumage could be costly when energy is limited. Specifically, the effects of energetically expensive immune challenges early in life on subsequent melanin-based feather color are currently unknown. In order to determine if immune challenges during development would affect adult plumage coloration, we raised male mallards (*Anas platyrhynchos*) and presented them with the same immune challenge (injections of sheep red blood cells) at different times during early, mid-, and late stages of development. The control group consisted of birds that did not receive immune challenges. At adulthood, the same feather from each mallard was removed and analyzed through picture analysis by measuring the areas and lengths of black and white feather regions. Ducks that faced immune challenges in the middle of their development had a thinner black band (section of black between the white distal end and the medial iridescent section) than those that received immune challenges at other points in life, suggesting less melanin production. At 8-10 weeks of age, young mallards are preparing to fly for the first time as they fledge from their nest. As birds prepare to leave their mothers, energy conservation is extremely important as young mallards are now responsible for their own nutrition and well-being. Without a nest of family members to rely on for food and protection, these developing mallards may not have extra energy to expend on melanin production if presented with other difficulties such as immune challenges. (192)

Baier, Richard F.*[1], Vijayalakshmi Gabbeta[2], Amal Dakka[2]. York College of Pennsylvania[1], York, PA 17403. PTC Therapeutics[2], South Plainfield, NJ 07080 - *Evaluating the Effects of Small Molecule Drugs on Correcting Alternative Splicing of SMN 2 mRNA in Spinal Muscular Atrophy*- Spinal Muscular Atrophy (SMA) is an autosomal neuromuscular disorder, which causes degeneration of the alpha motor neurons in the spinal cord. A Deletion of the housekeeping gene Survival Motor Neuron 1 (ΔSMN1) results in Spinal Muscular Atrophy. However, there is a second Survival Motor Neuron called SMN2. SMN2 has a splicing mutation in exon 7 that prevents correct splicing of exon 7. This mutation results in a truncated protein that is not sufficient for proper biological function. The focus of this study is to test PTCTM small molecule drug compounds in GMO 3813 skin fibroblast patient cells, and transgenic mice. The goal of the study was that the small molecule drugs would improve positive splicing signals in the area of exon 7 in SMN2. In both studies, mRNA was isolated and amplified in a PCR reaction. The PCR products were then analyzed on a 4% agarose gel. Compounds RB-302 and RB-808 showed an increase of Full-length SMN mRNA and a decrease of exon Δ7 at the lowest concentration. In the mice study, compound RB-119 and RB-247 were mildly effective at a higher concentration. These compounds seem to be enhancing the positive splicing signals in the area of exon Δ7 causing inclusion of exon 7. The future outcome of this research is to hopefully make it to human trails and be first drug of its kind to be brought to humans. If this research leads to an approved drug, many individuals that suffer from SMA will benefit from this research by the correction of the alternative splicing of SMN2. (33)

Bair, Nathan. Susquehanna University, *Selinsgrove, PA, 17870.* *The Risks Associated with Male Exposure to Thalidomide and the Potential Mechanism of Action*--During the late 1950's thalidomide came onto the market as an anti-emetic and sleep aid. It was used heavily in Europe by pregnant women to combat morning sickness. Exposure to thalidomide in the first trimester of pregnancy accounted for thousands of birth defects and the drug's removal from the market. Thalidomide returned to market in 1998 gaining approval from the FDA for treating leprosy, followed by approval for treatment of other diseases such as multiple myeloma, and subsequently AIDS symptoms. The FDA outlined strict policies regulating administration of thalidomide to women of child-bearing age, but rules concerning male exposure are less stringent. Thalidomide can be found in semen following oral dosing. Earlier work in this laboratory demonstrated that developing sea urchin embryos are sensitive to thalidomide exposure in culture. Prior to fertilization 125uL of sperm were incubated for one hour with either 2uL of sea water, DMSO, or a 25uM stock solution of thalidomide. After fertilization embryos were observed at blastula stage, 24 hours, gastrula stage, 48 hours, and pluteus stage 72 hours. At 72 hours the average malformation rate of the sea water control group was 6%, compared to 51% in the thalidomide treated group; T-Tests show a significant increase of malformations in thalidomide treated groups compared to all control groups (p value < 0.05). Embryonic malformations observed include gut abnormalities, exterior with excessive pigmentation, unusual cell masses, and lack of integral skeletal structure. Previous work demonstrated that thalidomide does not permanently adhere to the sperm and in all likelihood is not being carried into the egg suggesting the potential for an epigenetic mechanism of action. Ongoing experiments focus on sperm DNA isolation and analysis to determine if methylation of DNA could be altered during sperm and thalidomide interactions. (70)

Baker, Jenna* and Dr. Mel Zimmerman, Lycoming College, Williamsport, PA 17701. *Wilson Creek Riparian Demonstration Project – seventh year update*--The goal of the project was for the Tioga County Conservation District with the help of Babb Creek Watershed Association, Pine Creek Headwaters Protection and Lycoming College CWI to address a section of Wilson Creek that was classified as agriculturally impaired and placed on the DEP 303 list. With the help of two farms, Smith Farm and Coolidge Farm, riparian buffers were planted and best management

practices (BMPs) were put into place along impaired sections of Wilson Creek in 2006. Pre-monitoring though backpack electrofishing, macroinvertebrate identification and water chemistry was done in 2006. The two farm sites were compared to a reference site, Broughton Hollow. Post monitoring was done by Lycoming College Clean Water Institute in 2007, 2008 and 2013 to see how much the Riparian Buffers and BMPs have helped the water quality. The water chemistry data from 2013 compared to 2007 shows that the water quality at the farm sites has improved slightly. The macroinvertebrate data shows that the stream quality has gone from severely impaired to moderately impaired. The effectiveness of the riparian buffer and BMPs appears to be compromised because the farmers still allow livestock access to the stream periodically. (108)

Bartoli, Claudia*, Jennifer Elick, Dan Ressler. Susquehanna University, Selinsgrove, PA 17870. *Evaluating the Habitat Suitability of the Bald Eagle Haliaeetus alascanus Along the Susquehanna River* -In the summer of 2013, five bald eagle nests were identified along the Susquehanna River from Bloomfield County to Union County. In order to properly assess the habitat locations of these nests, a habitat suitability index (HSI) model was applied to each of the nest locations. The four main components in the HSI are measures of food availability, reproduction, and human disturbance. To determine food suitability, the use of the morpheodaphic index, variable 1 (SIV1), displays values of 0.2 – 0.4 for all five nests, while the percentage of open water and wetlands, variable 2 (SIV2), reveals values of 0.1-0.3. It was found that the amount of open foraging area increases from the northern to the southern nest locations (ranging from 11.1% to 3.19%). Regarding the reproductive suitability, variable 3 (SIV3) all of the nest locations display available mature forest for the bald eagles, and all the nests are located in trees ranging from 30.3- 44.7 feet tall. Through the use of aerial photography, the human disturbance component, variable 4 (SIV4), reveals a value of 1.0 for four locations, and 0.6 for one location. Preliminary results suggest that the environment of the nest locations is ideal as evident by the occurrence of a 15% growth rate of bald eagle populations in PA within the past 30 years (Gross, 2011). This would likely indicate an overall high HSI value for each of the five nest locations. Despite decreasing numbers of bass and migratory ducks within the area (Blazer et al. 2012), there are other environmental factors that are allowing the population of bald eagles to thrive. (124)

Bedsaul, Jacquelyn R.,* and Jeffrey P. Thompson. York College of Pa, 441 Country Club Rd. York, Pa 17403. *The Design and Creation of Fusion Protein, hIL-13.E11Y-KillerRed: A Photoactivatable Ligand Designed to Target and Kill Human Glioblastoma*. Human Interleukin- 13 is a cytokine involved in inflammation and, when mutated, binds with greater affinity to a decoy receptor, known as receptor hIL-13alpha2, which is overexpressed on human glioblastomas. KillerRed is a newly engineered fluorescent protein that is not only used in research to fuse to other proteins and provide visual location, but also to emit damaging reactive oxygen species when it is excited by 585 nm light. While the specific binding to, and killing of, human gliomblastoma is the ultimate goal, the current objectives of this experiment were to design, create, and purify the fusion protein, hIL-13.E11Y-KillerRed in a prokaryotic expression system. The most effective methods to create the expression vector were using PCR and Gibson Assembly to recombine multiple DNA fragments. Transformation was performed for both hIL- 13.E11Y-KillerRed and KillerRed control using SHuffle T7 Competent *E. coli* to increase the likelihood of accurate protein folding. Low-pressure column immobilized metal-ion affinity chromatography was used for protein purification. Fluorescence microscopy images verified the folding accuracy of KillerRed protein in control and fusion; they also verified the presence of control and fusion within the *E. coli* and on Ni-NTA resin beads. Sodium Dodecyl Sulfate Polyacrylamide Gel Electrophoresis and linear regression analysis confirmed KillerRed and hIL13.E11Y-KillerRed were created and isolated. This fusion protein presents new opportunities in research, including future studies pertaining to interleukin-13 and the destructive nature of KillerRed. The hIL-13.E11Y-KillerRed fusion may one day be used as a novel photodynamic therapy to treat human glioblastoma because of its dual abilities to bind with high affinity to the glioma-associated receptor and to emit damaging free radicals. (27)

Boyd, Nathan R.* and Matthew H. Persons. Susquehanna University, Selinsgrove, Pennsylvania 17870. *Recognizing predators before you are born: The effects of prenatal and perinatal predator cue exposure on wolf spiderling antipredator responses*-- Early predator recognition is critical for effective antipredator responses but may take time to learn, leaving the prey vulnerable beforehand; therefore, it may be adaptive to program or prime offspring prior to birth to exhibit appropriate defensive behavior when born into predator-rich environments. The female wolf spider, *Pardosa milvina*, which responds to silk and excreta from the larger predatory wolf spider, *Tigrosa helluo*, may mediate predator cue exposure of their offspring both prior to (prenatal) and following (perinatal) egg sac production by selectively occupying substrates with these cues. Here, we tested whether predator cue exposure of the eggsac and/or mother prior to eggsac production primes offspring for more effective antipredator behaviors after eggsac emergence (eclosion). Mated female *Pardosa* were exposed to one of four substrate treatments (n = 10/treatment): 1) exposure to predator cues after mating but before eggsac production (prenatal only), 2) after eggsac production but before eclosion (perinatal), 3) both prenatally and perinatally, or 4) a control group without predator cue exposure. Three-day old

spiderlings from each of the four treatments were then given a choice test of substrates containing cues from an adult female *Tigrosa* or a blank sheet of paper. Duration of time on each substrate, time spent immobile, and mean speed were measured on each substrate for 20 spiderlings from each clutch. Another 20 spiderlings from each treatment were placed in containers with substrates containing predator cues from adult female Tigrosa as well as a live predator. Survival time of each spiderling was recorded across the four treatments. Preliminary results suggest females exposed to predator cues prior to eggsac production were less likely to produce an eggsac and eggsacs that were produced tended to be lighter with fewer offspring. Additional results will be discussed. (187)

Brenner, Fred, Heather Barton, Garrett Herald*, Lauren McGarvey, and Lydia Rittenhouse. Grove City College, Grove City, PA 16127. *Genetic Analysis of Brook Trout from Isolated Populations in the Western Branch of the Susquehanna Watershed* - The brook trout (*Salvelinus fontinalis*) is the only trout species native to the streams of Pennsylvania. Abandoned mine drainage (AMD) has been discharged into streams throughout the West Branch of Susquehanna for at least a 100 years that has resulted in the isolation of brook trout populations due to these acidic discharges that prohibited fish movement within these streams. As a result of this limited movement brook trout population became isolated resulting a lack of gene flow among these populations. In order to determine the extent of genetic diversity in these isolated populations, fin samples were collected from brook trout populations in headwater streams receiving AMD throughout the West branch of the Susquehanna watershed. Nucleic DNA was then isolated from these samples and primers were designed to amplify microsatellites in the DNA sequence. Using gene scans, the amount of heterozygosity and homozygosity was determined for each fish within each population. The amount of homozygosity within each the population would indicate that there was limited or no migration of trout within the stream system and the extent of isolation of these population. The amount of genetic diversity may also reflect the length of time that these populations were isolated and or the amount of genetic diversity within these populations prior to their isolation. If it is confirmed that there is a lack of genetic diversity in these populations then plans may be developed to mitigate the AMD discharges and restore the stream system. This is a joint study between Trout and Unlimited and Grove City College. (103)

Brenner, Fred J., Heather Barton, Durwood Ray, Kaitlyn Bailey, Arleigh McRae, Luke Latario, Stacey Senter, and **Amy Getz.**Grove City College, Grove City, PA 16127. *DNA fingerprinting of the White-Tailed Deer*- DNA fingerprinting of short tandem repeats (STRs) in nuclear DNA from white-tailed deer (*Odocoileus virginianus*) was investigated as a means of determining breeding patterns within deer herds in Presque Isle State Park in Pennsylvania as well as in two metroparks in Dayton, Ohio. Previously obtained liver tissue samples from a total of 38 deer were selected for study beginning in June, 2013. Isolated nuclear DNA from liver tissue and nine fluorescently labeled primers for DNA were used in polymerase chain reactions to amplify the STRs of nuclear deer DNA. Products of PCR reactions were then confirmed using gel electrophoresis in 2% agarose gel and photographed under UV light using a Bio-Rad imaging unit. Successful PCR products were then analyzed using an Applied Bio Systems 310 single capillary automatic DNA sequencer with GeneScan software to accurately measure STR length. This process was used to begin to create a unique DNA "fingerprint" of each deer based on the STR size and frequency, a procedure analogous to forensic identification of human DNA. Three analysis programs known as GenePop, FSTAT, and Arlequin were used to determine potential gene flow within the sample population, which yielded results consistent with Hardy- Weinberg equilibrium. It is suspected that a more exhaustive study will produce results displaying increased heterozygosity, which would suggest a lack of inbreeding and that bucks move in and out of the different herds. This information will contribute to determining more clearly paternal genetic history and infer the breeding behavior among white-tailed deer herds in Presque Isle and Dayton, OH. (134)

Brittingham, Jacob* and **Thomas Peeler**. Susquehanna University, Selinsgrove, PA 17870. *The Effects of the Artificial Sweetener Sucralose and the Natural Sweetener Stevia on 3T3-L1 Adipogenesis*.- Artificial and natural sweeteners have been marketed as a sugar substitute in order to help prevent obesity. However, a recent study has shown that the artificial sweeteners saccharin and acesulfame potassium can stimulate adipogenesis in vitro, independent of sweet taste receptors. In this study, 3T3-L1 cells will be exposed to either the artificial sweetener sucralose or the natural sweetener stevia. Sucralose is the primary ingredient in Splenda©, while stevia is derived from the Stevia genus. 3T3-L1 cells are a standard cell line for adipose research, and mimic the differentiation process of human preadipocytes. Using a combination of fetal bovine serum, 3-isobutyl-1-methyxanthine, dexamethasone, and insulin, 3T3-L1 fibroblasts can be differentiated into adipocytes. We hypothesize that the sweeteners will stimulate adipogenesis in the 3T3-L1 preadipocytes. We will test this hypothesis by treating 3T3-L1 cells with each of the sweeteners. 3T3-L1 cells will be chemically treated to differentiate while in the presence of each sweetener. The rate of adipogenesis will be compared to 3T3-L1 cultures using the standard differentiation procedure. Additionally, 3T3-L1 cells will be treated with sweeteners, with no differentiation protocol, to determine the effect of these sweeteners on 3T3-L1 cell growth and development. The treated cell cultures will

then be stained with Oil Red O to assess the quantity of lipids produced. It is expected that there should be some differentiation of the cells treated with just the artificial sweeteners when compared to untreated 3T3-L1 cells. In addition, there should be an increased rate of differentiation in the cells treated with both the differentiation chemicals and the sweeteners compared to cells differentiated in the absence of the sweeteners. The significance of this study is that while artificial sweeteners may have fewer calories than traditional sugar, they may still cause an increase in weight by stimulating the development of adipose tissue. (36)

Bryner, Naomi*, Kathleen Halligan and David Singleton. York College of Pennsylvania, York, PA 17403. *Isolation of Martinella obovata via flash column chromatography* – The alkaloids martinelline and martinellic acid have been isolated from the plant *Martinella iquitosensis* of the Bignoniaceae family. The scarce literature reports concerning these alkaloids describe potent antagonism of the bradykinin B1 and B2 receptors as well as weak bactericidal properties. The primary goal of this study was to isolate martinelline, martinellic acid and other interesting metabolites from the available *Martinella obovata* using flash column chromatography with solvents of varying polarity. Initial isolates have been characterized via IR, ^{1}H NMR and ^{13}C NMR spectroscopy. Bactericidal properties of metabolites have been quantified by determining minimal inhibitory concentration values using a use dilution test. One of several compounds extracted from *M. obovata* showed bactericidal properties, although the structure of said compound has been elusive. Future directions for this study would concern bradykinin receptor antagonism quantification by means of a binding inhibition assay. (177)

Cadwell, Tanina*, Katherine Cedillos, Luis Gomez, Khadeja Moses, Laura Trocchia and Laurie F. Caslake Lafayette College, Easton, PA 18042. *Microbial Contamination of Toothbrushes – Development of a Protocol for a Microbiology Lab* – Five individuals were provided a new toothbrush to use over a three-week period and asked to follow their normal hygiene procedure. After the three-week period, the heads of the toothbrushes were cut off, placed in a phosphate buffer saline, and vortexed. Following vigorous vortex, serial dilutions were plated on various types of selective or differential growth medium. The growth medium was chosen to assess the presence of streptococci, enterococci, *Escherichia coli*, pseudomonads, staphylococci, and various fungi. Plates provided evidence of a high number of streptococci, pseudomonads, and gram-positive microbial contamination. Future studies could use molecular tools, such as PCR, to test for organisms such as *Streptococcus mutans*, which is associated with the development of dental caries. This laboratory exercise in a first microbiology course, introduces students to the world of microbes around them as well as required microbiology skills, selective and differential media, and can be extended using molecular techniques. (50)

Carey, Maureen*, Eric S. Ho. Biology Department, Lafayette College, Easton, PA, 18042, USA. *A Transcriptome Analysis of Borrelia burgdorferi Infected Murine Heart and Brain Tissue.* Lyme disease is the most common vector-borne disease in the United States, with nearly 250,000 cases per decade. Most cases occur in the northeast, but with global climate change, it is likely that the region hospitable for Lyme transmission will expand. Thus, it is important to understand Lyme pathology. Our goal is to determine the difference in gene expression upon *Borrelia burgdorferi* infection in mouse heart and brain to elucidate *Borrelia*'s effect on these tissues. *Borrelia* causes acute systemic infection and rheumatic, cardiac, and neurologic complications. Lyme disease is usually curable with prompt antibiotic treatment, but nonspecific symptoms make early diagnosis difficult. Additionally, symptoms may persist after bacterial clearance in chronic cases. This is particularly interesting: indicating that infection may induce a self-perpetuating cascade of immunological responses. Because antibiotic treatment is not a panacea, understanding how *Borrelia* affects the body, especially heart and brain tissues, is crucial in reducing the burden of disease. Both host immune response and *Borrelia* itself influence the disease progression and severity. Even though B31 *B. burgdorferi* genome has been sequenced, the genome does not reflect any obvious virulent elements. Thus, a more 'downstream' analysis, looking at the transcriptome of infected cells rather than the bacterial genome, may help in understanding the pathogenesis. We propose to investigate the host transcriptional response by analyzing the differential gene expression in target tissues with RNA- Seq, which captures the transcriptional profile of all genes. Comparing transcriptomes of uninfected and infected tissue could reveal distinct gene expression differences, illuminating the immune and tissue responses induced by *Borrelia*. We infected six C3H/HeJ mice with B31 *Borrelia* subcutaneously in the mid-back and collected brain and tissue samples after 14 and 42 days post-infection. Total RNA was extracted and sequenced using Illumina HiSeq. A total of 233M reads were generated for transcription profile analysis. (49)

Casey, Abigail I.*, Briana N. Ferguson*, Courtney B. Godbolt*, Mehveen R. Qureshi, and Amy E. Faivre. Cedar Crest College, Allentown PA 18104. *Decline of Pollen Viability in Christmas cactus (Schlumbergera x buckleyi var. Magenta) Flowers Following Anthesis.*-Many factors influence the success of fertilization in plants, such as attracting pollinators, incompatibility systems, pollen viability and pollen tube growth. Pollen viability influences pollen performance (pollen tube germination and growth) and can be affected by temperature, humidity, and the

lapse of time pollen is exposed to the environment following anthesis. This study compared differences in pollen viability in one variety of Christmas cactus (*Schlumbergera* x *buckleyi* var. Magenta) in relation to flower age. Christmas cacti are the result of a hybridization of *S. truncata*, and *S. russelliana*, two species native to southeastern Brazil, and the propagation of the hybrid species has led to the production of more than 100 varieties of Christmas cacti. In this study samples of pollen grains were collected from flowers one, two and three days following anthesis and grown *in vitro* for 24 hours on nutrient agar plates. Pollen tube germination was recorded for first, second, and third day old pollen. When data for pollen viability was pooled by age and analyzed, pollen viability was significantly different for each day following anthesis ($p < 0.00001$). First day flowers had an approximate mean of 53% pollen viability, whereas second flowers had an approximate mean of 33% pollen viability and third day flowers had an approximate mean of 23% pollen viability; clearly pollen viability declined following flower anthesis. These results will be added to the growing data set on *Schlumbergera*, a genus of great interest in the horticultural trade. (167)

Chelius, Ben*, Amandeep Kaur, Timothy Hoffman, Kimberly Challenger, Sara Duryea, Michael A. Steele, and William J. Biggers. Wilkes University, Wilkes-Barre, PA 18766. *Investigations into the Endocrine Regulation of Larval Diapause in Acorn Weevils*--Acorn weevils (*Curculio sp.*) undergo a mandatory larval diapause in the ground lasting for one year, but however can also undergo a prolonged diapause lasting for an additional one or two years. In efforts to understand environmental and biological factors regulating the length of this diapause in acorn weevils, we have investigated the possible roles of juvenile hormone (JH) and ecdysone which are known to regulate pupal and larval diapause in other insects. Treatment of the acorn weevils with 20-hydroxyecdysone did not stimulate metamorphosis to the pupal stage, however injection of precocene I, which causes the destruction of the corpus allatum in insects, stimulated metamorphosis into pupae after one month compared with controls which did not metamorphose. Exposure of the larvae to cold temperatures or warm temperatures also did not advance metamorphosis. These results may indicate the involvement of juvenile hormone in the maintenance of larval diapause in acorn weevils. In future studies we will assay the levels of JH that occur in the developing larvae and in the diapause state. (189)

Cheng, Sze*, Natalie Cardenas*, Robert Kurt. Lafayette College, Easton, PA 18042. *Evaluating the presence of inflammasomes in 4T1 cancer cells by comparing gene expression between 4T1 cells and dendritic cells.* Inflammasomes, protein complexes, form part of the inflammatory signaling cascade in white blood cells. Inflammasomes are triggered when pathogens bind to toll-like receptors on the surface of the cell. The signaling cascade triggered by inflammasomes leads to an inflammatory response which helps to fight infection. Three major inhibitors of the inflammasome cascade, NLR C3, NLR P6, and NLR P12, have also been shown to be present in white-blood cells (dendritic cells) and could play a role in stopping inflammation. This project tested the levels of specific genes known to inhibit inflammation as well as genes in the three major types of inflammasomes, NLR P3, NLR P1, NLR C4, in 4T1 breast cancer cells and dendritic cells. 4TI cells found in mice were used because of their similarities to human breast cancer cells, and inflammasomes have been previously shown to hurt or help cancer progression. Dendritic cells were used as a control due to their ability to detect pathogens and their ability to initiate response to infections. The purpose of this project was to see whether certain inflammasomes were present in 4T1 cells, and to better understand their possible contribution to inflammatory responses. The results showed an overexpression of the inhibitors in 4T1 cells relative to dendritic cells, indicating that inflammation may be inhibited in these tumor cells. The reduced expression of inflammasomes NLR P3 and NLR P1 suggests that these inflammasomes were absent in 4T1 cells. (24)

Ciraku, Lorela* and **Steven James**. Gettysburg College, Gettysburg, PA 17325. *Epigenetic down-regulation of* $snxA^{Hrb1}$ *rescues G2-M cell cycle defects* – At the G2/M transition, eukaryotic cells enter the mitotic phase of the cell cycle by condensing chromosomes and reorganizing the microtubular cytoskeleton to form a spindle apparatus. These events are driven by the activation of the *cdc2/cyclin B* kinase (CDK1) whose localization to the nucleus governs many of the structural changes that occur at G2/M. Heat-sensitive mutations in the *Aspergillus nidulans* $nimX^{cdc2}$ and $nimE^{cyclinB}$ proteins arrest the cell cycle in late G2 phase and thus prevent mitotic entry at the non-permissive temperature of 42^{o}C. To identify genes that interact with $nimX^{cdc2}$, extragenic suppressors of the $nimX2^{F233L}$ allele were generated. Two mutations in the *snxA* gene, *snxA*1 and *snxA*2 (<u>s</u>uppressor-of-<u>n</u>im<u>X</u>), suppress the heat sensitivity of the $nimX2^{cdc2}$ mutant, and by themselves confer a cold-sensitive G1 phase arrest (McGuire *et al*., 2000). *snxA* is the *Saccharomyces cerevisiae* ortholog of *Hrb1*, a nucleocytoplasmic shuttling mRNA binding protein belonging to the serine-arginine Rich (SR) protein family. Surprisingly, no DNA mutations occur in *snxA1* and *snxA2* coding regions, nor were mutations found in the 5' and 3' regulatory regions. Furthermore, we discovered that <u>*non-overlapping*</u> DNA fragments covering different portions of the 5' regulatory region were able to complement, or partially complement *snxA*1 and *snxA*2 cold-sensitivity. Finally, deletion of the $cclA^{Bre2/Ash2}$ H3K4 methyltransferase, an epigenetic activator of gene expression, strongly enhanced the cold-sensitive growth defects of *snxA*1 and *snxA*2. Together, these observations suggest that epigenetic

chromatin modifications in the 5' regulatory region may repress *snxA* expression and account for the *snxA*1 and *snxA*2 loss-of-function phenotypes. Consistent with this idea, *snxA* protein levels were reduced dramatically in *snxA*1 and *snxA*2 mutants. In summary, we have discovered a novel G2/M inhibitory mechanism, acting through $snxA^{Hrb1}$, in which *snxA* down-regulation appears to result from stable epigenetic modifications. (37)

Conant, Gabrielle*, Audrey J. Ettinger, and K. Joy Karnas. Cedar Crest College, Allentown, PA 18104. *Effects of Retinoic Acid on Development of GABAergic Neurons*.— Neuron transplantations are a potential treatment for psychological diseases that stem from neuronal disruptions or deficiencies. One such deficiency can result from a lack of in vitamin A during prenatal development causing a shift in neuron growth and therefore decreasing GABAergic neurons. GABAergic neurons are responsible for reduction of anxiety and anger, and low numbers can contribute to the presenting of anxiety, schizophrenia and other psychological disorders. All-*trans*-Retinoic acid (RA), a derivative of Vitamin A, has been demonstrated to be a morphogen for the differentiation of GABAergic neurons from stem cells. This study explores three methods of inducing and acquiring healthy neurons using RA treatments. The first experiment involved exposing embryonic chicken neurons *in ovo* to RA and comparing the number of GABAergic neurons in control and treated samples using neuronal primers in q- rtPCR. In parallel, a second approach exposed cultured primary embryonic chicken neurons to RA to be followed by cell survival and differentiation assays. As a third approach, an immortalized chicken lymphocyte cell line (DT40) was cultured and treated with RA, and used as a model for exploring overall cell health and ion channel expression via electrophysiology. (34)

Corpus, Larry* and **Barbara McCraith**. Misericordia University, Dallas, PA 18612. *Identification of larval chironomids (Diptera: Chironomidae) from Trout Brook, Luzerne County, Pennsylvania*--To establish a baseline reference collection for future use in studying natural and anthropocentric effects upon Trout Brook's water quality, aquatic macroinvertebrates were sampled monthly from August 2012 through July 2013. This resulted in large numbers of macroinvertebrates from the stream that needed to be sorted, counted, and identified. Initial sorting efforts suggested that larval chironomids (Diptera: Chironomidae) were the most abundant benthic macroinvertebrates occurring in Trout Brook, with one group of riffles at one site yielding 347 chironomid larvae on one sampling date. Because of the large numbers of chironomids collected during the study and their difficult taxonomy, a faster method of separating and identifying them had to be developed. A modified process involved sorting larvae in 70% ethanol under a dissecting microscope, then grouping them based upon head capsule and general body habitus. From these sorted individuals, four to six 4^{th} instar larvae were selected, transferred to water, their body walls punctured with a minuten insect pin, and then placed into separate porcelain dropping plate depressions with 10% KOH for 24 hours to clear soft tissue from the head capsules, thoraces, and abdomens. When adequately cleared, each larva was placed onto a glass slide in two drops of eye drop solution (glycerin, hypromellose, and polyethylene glycol), covered with a round cover slip, and viewed under a compound microscope. While there are important taxonomic features of the larval thorax and abdomen, the most important identifying characters are those found associated with the head capsule. Thus far, three subfamilies (Chironominae, Orthocladiinae, and Tanypodinae) and six genera *(Ablabesmyia*, *Chironomus, Cricotopus, Dicrotendipes*, *Procladius* and *Tanytarsus)* have been identified using this method. (104)

Crawford, Marla*, Edwards, Shawnna*, Walter, Cynthia. Saint Vincent College, Latrobe, PA 15650. *The Effects of Contact Lens Solutions on Bacterial Growth and Human Cell Metabolism in Culture* - The increased use of contact lenses raises questions on proper lens care and the impact of lens solutions on eye tissues. This study was designed to test the effectiveness of contact lens solutions to control growth of *Staphlococus aureus* and cytotoxicity for human epidermal cells in culture. We measured optical density values at 600nm before and after bacterial incubation for 24 hours at room temperature. Results indicate that only CLS1 and CLS3 had statistically significant linear relationships of decreasing bacterial growth with increasing log of dose (Regression $P<0.02$). If we use the criteria that inhibiting 90 % of bacterial growth is considered a desirable outcome, CLS3 provided this at a concentration of 12.5-25% and CLS1 required a 50% solution in media. For CLS2, however, the maximum dose (50%) was ineffective in inhibiting bacterial growth. After exposure to different contact lens solutions, human cells were analyzed with fluorescence to detect cellular activity using a Cell Titer Blue assay. The brand of lens solution had a highly statistically significant effect on human cell metabolism in a 24 hours exposure to a 50% solution of CLS ($p<0.00005$ Two factor ANOVA). CLS2 severely decreased metabolism to only 6% (sd 0.02) of controls; the other two brands resulted in metabolism at 32% (sd 0.09) and 32% (sd 0.1) of control cells. These results indicate contact lens solutions differ and some may fail to suppress bacteria during contact lens storage. Also, if a certain contact lens solution decreases proper human cell function, it can decrease the patient's ability to defend against potential pathogens that may be found on the contact lens itself. Future experiments could analyze the effects of lens solutions on human corneal or conjunctival cells for a more realistic view of the eye, making the research more relevant to eye care professionals. (46)

Custer, Gordon*, Tammy Tintjer, and **Julie Belanger**. King's College, Wilkes-Barre, PA 18711. *Assessment of Protection of Host Tissues by Vertically Transmitted Fungal Endophytes*− This research was undertaken in order to determine if different tissues of host plants are protected to varying degrees. The experimental plants, *Festuca arundinacea, Agrostis hyemalis and Ipomea asarioli,* are all infected by vertically transmitted endophytic fungi, such that the survival and reproduction of the endophyte is reliant on the survival and reproduction of the host. Optimal Defense Theory (ODT) states that an organism only has access to a limited supply of resources and that the organism will allocate those resources to protection as well as any other process needed to sustain life. Via ODT the organs and tissues that will be most protected are the ones most important for survival and reproduction. By applying ODT to the endophyte we hypothesize that the seeds will be the most protected. The protection provided by the endophyte comes in the form of alkaloids. An example of which, cattle grazing on endophyte infected *Festuca arundinacea* are known to exhibit symptoms of fescue toxicosis. These alkaloids are secondary metabolites of the plant's associated endophyte. These alkaloids are known to have a toxic effect on herbaceous insects and mammals. After acidic extraction of the alkaloids from several different plant tissues, alkaloid levels will be quantified using the Van-urk reagent, thin layer chromatography, and a tryptophan standard for the presence of alkaloids, which will be confirmed by spectrophotometry and quantified relative to the tryptophan standard. The results that will support the ODT are the highest levels of alkaloids in the seeds of all three plant species. Additional support for the ODT will come from high levels in the above-ground tissues, as they directly produce the seeds, when compared to the below ground tissues. (169)

Damore, Nicole[1]*, Graham D. Fairhurst[2] and **Michael W. Butler[1]**. 1-Lafayette College, Easton, PA 18045, 2-University of Saskatchewan, Saskatoon, SK, Canada S7N 5E2. *Corticosterone levels correlate with white plumage coloration in mallard ducks*- Many studies have focused on the effects on melanin-based coloration from immune challenges during development and found that birds exposed to stronger immune challenges generally have more melanin deposited in their feathers than those exposed to weaker immune challenges. Immune challenges may also affect white coloration, or lack of pigmentation, in avian plumage. An organism's natural variation in corticosterone levels (CORT; a hormone up-regulated in response to stressors) may reflect immune challenges, which could affect white coloration. In this experiment, we measured three metrics on the feathers of mallard ducks, *Anas platyrhynchos*, and examined whether immune challenges, a type of stressor, had an impact on plumage pigmentation or CORT levels in the feathers. Sheep red blood cells were injected at different stages of duckling development: before, during, and after feather growth. At adulthood, the feathers were collected and we measured the width of the white region along the rachis on the exposed part of the feather (side visible to other ducks and not hidden under other feathers) and the unexposed part of the white region along the rachis. Immune challenges did not have an effect on the unexposed or exposed white band width or total area of the white region. However, we found that CORT levels were lower in feathers with wider white bands, but only on the exposed side of the feather. Our results suggest that the negative relationship between CORT and the width of the exposed white region may act as an honest signal to other birds of previous stressors, allowing for honest signaling. (191)

De Young, Sheila* and Justin Ward* Suquehanna University, 514 University Avenue, Selinsgrove, PA 17870, *An Immunocytochemical Analysis of the Signaling Pathway blimp-1 in Sea Urchins Embryos Treated with Thalidomide* - Human embryos exposed to thalidomide exhibit many different teratogenic outcomes. First used in the late 1950's to relieve morning sickness, the drug was quickly removed from the market when it became apparent that embryo exposure, especially during the first trimester, resulted in teratogenicity. In 1998, the USFDA approved thalidomide for limited clinical use. Today, clinicians prescribe thalidomide to treat numerous diseases due to its anti-inflammatory and anti-angiogenic properties. Despite intensive research and many proposed theories, there is no consensus on the teratogenic mechanism of action. Previous work in this laboratory demonstrated that sea urchin embryos cultured with thalidomide exhibit a range of malformations, including abnormal gastrulation and spicule development, both of which are products of endomesoderm specification. The blimp-1, or B lymphocyte-induced maturation protein-1, gene has a critical role in eliciting transcription factors for both early and late endomesoderm specification. Using immunocytochemistry, the effect of thalidomide on the blimp-1 signaling pathway was observed. Sea urchin embryos obtained using standard spawning and fertilization techniques were cultured in three separate solutions; seawater, dimethyl sulfoxide (DMSO), and 400 μM thalidomide. The cultures containing seawater and DMSO served as controls, since thalidomide solubility in aqueous solutions is limited. In preparation for immunocytochemistry, we fixed embryos at four different times post-fertilization (1h, 6h, 12h, and 18h). The fixed embryos were incubated for one hour with the primary antibody, goat polyclonal anti-blimp-1, then washed and incubated for one hour with secondary antibody, donkey anti-goat labeled with Alexa fluor. Stained embryos were examined using fluorescence microscopy. An altered fluorescence pattern in controls compared to embryos exposed to thalidomide could indicate alterations in the blimp-1 signaling pathway. (35)

DiCasoli, Richard*, Samantha Moyer. King's College, Wilkes-Barre, PA 18711. *The Effects of Retinoic Acid on trkB.t1 Expression in SH-SY5Y cells*. – Brain Derived Neurotrophic Factor (BDNF) is a neurotrophin that enhances neuroplasticity, regulates cell survival, and can reverse injury. BDNF activates two trkB receptors: TrkB.tk^+ (full-length) and trkB.t1 (truncated). Upon binding of BDNF, trkB.tk^+ is autophosphorylated, which then activates intracellular pathways through its cytoplasmic domain. TrkB.t1 is thought to be responsible for neurite outgrowth and influences intracellular signaling cascades, which are important in the study of neurodegeneration. We use SH-SY5Y neuroblastoma cells for our in vitro model of degeneration because these cells can mature into a dopaminergic neuronal phenotype. SH-SY5Y cells express the trkB receptors and respond to treatment with BDNF. SH-SY5Y cells express trkB.tk^+ optimally after 6-7 days incubation with retinoic acid (RA). Optimal expression of trkB.t1 is unknown, but we hypothesize that its peek expression will occur following and RA incubation period of 0-7 days. The purpose of this experiment is to determine the time course of optimal trkB.t1 expression. Current studies are measuring trkB.t1 expression, post RA treatment, via western blot analysis. Future experiments will confirm the western blot results with immunofluorescence microscopy. Once we know when trkB.t1 is optimally expressed in SH-SY5Y cells, we can use the cells to study trkB.t1 function. Ultimately, we are interested in understanding the role of trkB.t1 in the neuronal response to BDNF. (28)

Ditty, Danielle* and Hillary Martin.* Susquehanna University, Selinsgrove, PA 17870. *Role of JNK in Sea Urchin Cleavage Stage Cell Division* - The cleavage stage of development involves rapid mitotic divisions with no dependence on growth factor signaling, paralleling the division of cancer cells. We are interested in the c-jun N-terminal kinase (JNK) pathway which phosphorylates downstream target proteins that regulate the cytoskeleton. To study the role of JNK in early development, we used Lytechinus pictus sea urchin embryos. We began by using the ATP competitive inhibitor SP600125 to inhibit JNK following fertilization. This inhibition prevented entry of the embryos into the two-cell stage, demonstrating that JNK activity is necessary to undergo first cleavage. When JNK was inhibited after the two-cell stage, the embryos were unable to progress to the four-cell stage, suggesting an ongoing role for JNK activity in early cleavage. We chose to test the effect of JNK inhibition on three events of cell division dependent on cytoskeleton: pronuclear fusion, chromosome separation, and cytokinesis. To test JNK's role in microtubule dependent pronuclear fusion, we added the JNK inhibitor to the eggs prior to fertilization and stained the nuclei using NucBlue. The nuclei of the sperm and egg fused normally. In order to test JNK's role in spindle formation and chromosome separation, we inhibited JNK in fertilized embryos and fixed them at various time points and stained for microtubules using a fluorescent anti-tubulin antibody. We found that in JNK-inhibited embryos, spindle formation was delayed, and that the abnormal spindles that formed failed to separate the chromosomes. We plan to further characterize the defects in spindle formation by confocal microscopy. We also plan to stain actin filaments in inhibited embryos in order to determine if JNK assists with the organization of the contractile ring during cytokinesis. In conclusion, JNK activity is required for cleavage stage cell division in the sea urchin and plays a role in spindle assembly and chromosome separation. (69)

Dooley, Lynette* and Dr. Mel Zimmerman, Lycoming College, Williamsport, PA 17701. *Water Quality Assessment of the Lower West Branch-Susquehanna River*--The object of this study was to describe and determine water quality at 12 sites on the lower West Branch of the Susquehanna River between Lock Haven and Milton. Summer water chemistry (pH, alkalinity, nitrate nitrogen, nitrite nitrogen, dissolved oxygen, temperature, conductivity, orthophosphate, total phosphorus, TDS, and turbidity) are presented from 2005 to 2013. Macroinvertebrate kick samples were collected from sample sites in summer 2013 and compared to data collected in 2005. These data were subjected to the EPA Rapid Bioassessment Protocol II (RBA-Family Level), Hillsenhoff Biotic Index and Shannon-Wiener Diversity Index to determine water quality. Data suggests that the overall quality of the water appears to have improved. Implementation of new standards for sewage treatment plants that have been or are currently being upgraded will allow for future advancement and improve Pennsylvania's commitment to improve the Chesapeake Bay. (97)

Dwyer, Matthew* and **Rebecca A. Urban**. Lebanon Valley College, Annville, PA 17003. *Asexual reproductive strategies of an invasive macrophyte compared to native species*-- The introduction of invasive aquatic plants may lead to the decline of native species and changes to ecosystem processes. *Utricularia inflata* is a rootless, carnivorous, invasive macrophyte that has spread to lakes in the northeastern United States, as well as Washington State. *Utricularia vulgaris* and *U. purpurea* are two closely related species that are native to the same Adirondack mountain lakes where *U. inflata* has invaded. Two greenhouse experiments were conducted comparing the asexual reproduction of all three species after fragmentation. Specimens were cut into 1 cm and 9 cm fragments—where the 1 cm fragments contained an original apical meristem, while the 9 cm fragments did not contain a visual apical meristem. Upon harvest, *U. inflata* had the greatest final biomass, as well as chlorophyll a, chlorophyll b, and carotenoid concentrations compared to *U. purpurea* and *U. vulgaris*, for both experiments. At the end of the 9 cm fragmentation experiment, *U. vulgaris* had significantly greater total length ($P<0.01$); however, *U.*

inflata had the greatest number of new branches (P<0.001). These results suggest that the two species have a different asexual reproductive strategy. Considering that each new branch has the ability to develop into a new clone as the original fragment degrades, this may partially explain why *U. inflata* is a successful invader. (165)

Esbenshade, Jannah*, and **Benjamin van Ee**. Geneva College, Beaver Falls, PA 15010, Black Hills State University, Spearfish, SD 57799. *Comparison of genetic and morphological identification of Phragmites australis subspecies in Northern Michigan* - Correct identification of native *Phragmites australis* subsp. *americanus* and nonnative *P. australis* subsp. *australis* is crucial for management and eradication of the invasive reed, but the morphological similarity of the subspecies can make identification difficult. Genetic identification is much more definitive. In this study, we compared subjects' morphological identification of sterile *Phragmites australis* specimens to the plants' genetic identification. We used chloroplast markers *rbcL-psaI* and *trnT- trnL* and nuclear gene *GBSSI* to identify each plant. All surveyed subjects assessed their own experience with plants on a scale of 1 to 5 and identified eleven reed samples using a provided key. The mean percent correct identification was 40% ± 20% standard deviation and was no different from the correct identification expected from random chance, with no significant relationship between experience and correct identification. These results show the necessity for genetic identification and the need for extreme care when attempting to morphologically differentiate the two subspecies. (163)

Eyer, Amanda*, Susquehanna University, Selinsgrove, PA 17870. *Application of water and soil analysis in relation to Habitat Suitability Index for Bald Eagles* - Determining locations of endangered species has been important since the late 20th century due to destruction of habitat and introduction of harmful chemicals into the environment that impact animal species. The Habitat Suitability Index (HSI) has been used to determine if an area can be successfully populated by a specific type of organism. A Bald Eagle HSI was applied to the Susquehanna River Corridor in Union, Snyder, and Perry counties. Nutrient analysis and elemental chemistry were completed to supplement the forging index which was based solely on water conductivity in the existing HSI. Water samples were collected to determine phosphate, nitrate, ammonia, organic carbon, and inorganic carbon Concentrations to gage the productivity of the river water. X-ray defractometry and x-ray fluorescence of soil samples collected near nesting sites to evaluate terrestrial productivity. The water analyses suggest a trend of increasing nitrate and decreasing phosphate levels in the water over time since the beginning of the trial. Elemental soil composition from the x-ray defractometry and the x-ray fluorescence suggest that the soil is silica rich which is beneficial for aquatic life. Soil and water analysis can accurately be applied to the HSI of Bald Eagles. The HSI for Bald Eagles could be applied to other areas within the United States near river basins such as the Mississippi River, the Delaware River, and the Columbia River because the HSI correlates to Bald Eagle density within the Susquehanna River Corridor. (126)

Fetherolf, Sarah* and **Peter J. Petokas**. Lycoming College, Williamsport, PA 17701. *A Comparison of Population Structure, Density, and Stability in Two Populations of the Eastern Hellbender Salamander in North-Central Pennsylvania* – We assessed population structure, density, and stability in two metapopulations of the eastern hellbender (*Cryptobranchus alleganiensis*) in a tributary of the Susquehanna River West Branch in north-central Pennsylvania. In each of two stream sections, located ca. 8 km apart, all movable rocks >0.5m length and width were lifted to capture resident hellbenders during June-August 2013. Captured adults and juveniles were sexed, measured, weighed, and tagged with passive integrated transponders as part of an 8-year-long study of population dynamics. We then compared our results with data collected from the two populations during the summer of 2011. Population density (number per linear meter of stream length) did not change between sample years and was nearly identical for the two populations. Sex ratios changed from favoring males to an increased proportion of females at both locations. The number of juveniles captured also increased between years at both sites, possibly reflecting increased recruitment. Population size structure is similar between populations, and did not change in the downstream population between sample years. However, mean total body length was significantly smaller in the upstream population in 2013 compared to 2011. Two upstream movements between the populations were observed –a young adult female and a young adult male. Such movements are important for gene flow, but also confound attempts to estimate population size. Continued population monitoring should permit us to detect any distinct trends leading to population declines, as have occurred in other nearby watersheds. (118)

Force, Rebecca,* Shui Chen,* Emily Fortier, Emily Rowlands, Jean Heneks, and GeneiveE. Henry. Susquehanna University, Selinsgrove, PA, 17870. *New spirocyclic acylphloroglucincols from hexane extract of Hypericum pyramidatum* - The *Hypericum* plant genus consists of over 450 species scattered in warm-temperate areas throughout the world. The genus is widely known as a source of biologically active natural products, including xanthones, flavonoids, naphthodianthrones and acylphloroglucinol derivatives. *Hypericum ascyron ssp. pyramidatum (H. pyramidatum)*, is one of nineteen *Hypericum* species growing in Pennsylvania. A subspecies of *H. ascyron* growing in China is used for the treatment of wounds, swelling, headache, nausea and abscesses. Prior phytochemical study of the Chinese species yielded a series of cytotoxic acylphloroglucinol derivatives. *H. pyramidatum*

was investigated to compare its chemical constituents to those of the Chinese *ascyron* plant species. Interestingly, the chemical profiles of the two plants are similar, but not identical. Four new acylphloroglucinol derivatives, named pyramidatones A-D, have been isolated from the hexane extract of *H. pyramidatum*. The compounds were purified using a variety of chromatographic techniques, including HPLC, and their structures were determined based on 1D and 2D-NMR spectroscopic data. (172)

Fortier, Emily*, Dalyna Ngo, Jean Heneks*, Rebecca Force, Shui Chen, and **Geneive Henry.** Susquehanna University, Selinsgrove, PA, 17870. *Polyene and polyphenolic compounds from acetone extract of Hypericum pyramidatum* - For centuries, St. John's wort (*Hypericum perforatum)* has been used externally to treat wounds, burns, skin conditions, and inflammation, and internally to treat insomnia, hysteria, and depression. In recent years, a growing number of studies of several species of the *Hypericum* genus, including *H. perforatum*, have identified a wide range of biologically active natural products from the napthodianthrone, acylphloroglucinol, flavonoid and xanthone classes. Several members of these classes of natural products show anti-HIV, anticancer, antioxidant, antibacterial, anti-inflammatory, and antidepressant activities. As part of an ongoing study to isolate new biologically active compounds from *Hypericum* species growing in Pennsylvania, the acetone extract of *H. ascyron ssp. pyramidatum* was purified to afford polyphenolic xanthones and flavonoids, in addition to a polyene. The compounds were obtained by a combination of normal phase silica gel column chromatography and reverse-phase HPLC using a C-18 column. The structures of the compounds were elucidated on the basis of ultraviolet (UV) and 1D/2D nuclear magnetic resonance (NMR) spectroscopic data. (173)

Frampton, Alycia*, William G Dougherty, Susquehanna University, Selinsgrove, PA 17870. *The Synthesis, Characterization, and Electrochemical Properties of Tris(3-tert- butlypyrazolyl)borate Nickel Complexes* - A *tert*-butyl substituted trispyrazolylborate ligand (Tp^{tBu}) was synthesized from sodium borohydride and 3-*tert*-butylpyrazole using a melt method in a 63% yield. This Tp^{tBu} ligand was reacted with nickel nitrate hexahydrate in methanol to synthesize $Tp^{tBu}NiNO3$ in a 75% yield. From this complex, nitrate was substituted with different anionic ligands yielding a series of complexes with varying metal environments. These complexes were characterized using ^{1}H-NMR spectroscopy, infrared spectroscopy and small molecule X-ray crystallography. Results of NMR spectroscopy indicate paramagnetic behavior with peaks ranging from -20 to 100 ppm. The infrared spectra exhibit a characteristic B-H stretch near 2500 cm^{-1}, which is a higher energy than the B-H stretch of the free ligand. X-ray crystallography revealed the structures of these complexes were pseudo-tetrahedral with the Tp ligand capping one triangular face. The redox properties of each complex were analyzed using cyclic voltammetry and the trends are consistent with the donor properties of the ligands. (181)

Fryer, Henderson W.* and **Jessica Nolan.** York College of Pennsylvania, York, Pa 17403. *Determining Basking Habits of Native and Invasive Freshwater Turtles in Lake Marburg (Hanover, PA)*-- Basking is a common behavior for aquatic turtles to regulate body temperature, which is necessary for metabolic activation. Many factors influence this complex behavior and have yet to be fully understood. The objective of this study was to determine the effects of environmental and physiological factors on basking length of the three species: red-bellied turtles (*Pseudemys rubriventris*), painted turtles (*Chrysemys picta*), and red-eared sliders (*Trachemys scripta elegans*). The potential for competition between native and invasive turtle species was also assessed. At Lake Marburg in Hanover, PA, basking habits of native and invasive turtle species were observed while recording air and water temperature, light intensity, and disturbance. Surface-to-volume ratios of each species were also calculated to compare thermal inertia. Results indicated that there was no relationship between basking length and turtle size ($P > 0.05$). Air temperature and disturbance were two factors contributing to basking length ($P < 0.0001$). No relationship between turtle size and basking length may be a result of variation between optimum body temperatures of each species. The observed aggressive behavior of red-eared sliders toward red-bellied turtles shows the potential for interspecific competition. (116)

Gagne, Jeaneva*[a], M. Dana Harriger[a], Laura F. Altfeld[a], Kurt D. Hankenson[b], and **Julie Engiles[b].** [a]Wilson College, Chambersburg, PA 17201 and [b]New Bolton Center, School of Veterinary Medicine University of Pennsylvania, Kennett Square, PA 19348. *Effectiveness of Fecal Bacterial Population Enumeration and Analysis as a Preventative Method for Equine Endocrinopathic and Inflammatory Laminitis*- Laminitis is a condition of the equine digit that is characterized by inflammation of the laminar tissue and rotation of the third phalanx; resulting in lameness and permanent hoof alteration. Diets high in non-structural carbohydrates have been identified as an initiating factor in the development of laminitis and are also associated with an alteration in the microbiome of the equine hindgut, from a largely cellulolytic population to one that is predominately lactic-acid producing. The objective of this study was to utilize bacterial culture techniques both *in vitro* and *in vivo* to determine if alterations of carbohydrate sources in the equine hindgut result in a change in population of *Fibrobacter intestanillis*, *Ruminococcus flavefaciens*, *Lactobacillus mucosae*, and *Streptococcus bovis* and if this trend could be observed using fecal samples from both healthy and laminitic horses. The findings from this study have the potential to contribute to the development of a

laminitis preventative tool. Such a tool would essentially monitor the microbiome of an animal by regularly culturing fecal samples, the results of which could detect the early onset of laminitis before resulting in permanent damage. (48)

Galperin, Michael*, Jasmeen Saini, Mary J.S. Roth and Laurie F. Caslake. Lafayette College, Easton PA 18042. *Quorum Sensing is Necessary for Biofilm Formation by Pseudomonas fluorescens MIC102L in Sandy Soil* – Pseudomonads are known to produce strong biofilms, which can reduce the permeability of soil environments. By engaging in a process known as quorum sensing, Pseudomonads "talk to each other" to build these biofilms. We were interested in investigating the effects of a known quorum sensing inhibitor, (Z-)-4-Bromo-5-(bromomethylene)-2(5H)-furanone [e.g., furanone 56], on the development of soil biofilms. The effects of this inhibitor were tested using civil and geotechnical engineering tools. *Pseudomonas fluorescens* strain MIC102L was grown in acrylic rigid columns filled with Ottawa 50-70 sand, a fine-grained silica sand, with and without furanone 56 for 15 days. A constant head permeameter was used to run permeability tests at five-day intervals followed by sand sample examination using confocal microscopy and scanning electron microscopy. We observed a decrease in permeability in the columns of *P. fluorescens* MIC102L with no quorum sensing inhibitor. The results indicate that furanone 56 is effective in reducing biofilm formation in a soil environment. (51)

Gegaris, Carissa* and Frank Varriale. King's College, Wilkes-Barre, PA 18711. *Investigating Functional Differences Between Premaxillary and Maxillary Teeth in the Ceratopsian Dinosaurs Archaeoceratops and Liaoceratops* – Microscopic wear patterns (microwear) on premaxillary, maxillary, and dentary teeth from the ceratopsian (horned) dinosaurs *Archaeoceratops* and *Liaoceratops* were analyzed to explore functional differences in the use of these teeth that may have occurred during life. The premaxillary dentition is morphologically distinct from that of the maxillary/dentary set in both taxa, suggesting a functional difference in their use. Dental microwear was examined by molding and casting teeth in epoxy resin. Micrographs of casts were taken using an AMRAY 1810 scanning electron microscope and wear features were quantified and analyzed using various statistical software packages (Microwear 4.02, MiniTab 16, Oriana 2.0). In both taxa, significant differences were not found among premaxillary and dentary/maxillary teeth for lengths and widths of scratches. There is also no significant difference between the pit ratios (width/length) on each tooth in *Archaeoceratops*. Rao's spacing tests revealed a preferred direction for orientation of microwear striations on each tooth. In *Archaeoceratops* striation orientation of premaxillary teeth is significantly different from those on dentary/maxillary teeth. Within a taxon, striation orientation among premaxillary teeth is not significantly different. In *Liaoceratops* orientation on premaxillary teeth showed the greatest difference from dentary/maxillary teeth. There is also a pattern of increasing difference in orientation on teeth that are located further apart. Comparison of mean length, width, and pit ratio does not support a functional difference between premaxillary and maxillary/dentary teeth. This may be due to the dependency of these features on diet and that all teeth encounter the same food when it was chewed. However, differences in striation orientation between tooth sets do support our hypothesis, suggesting that the head was held at a different angle when food contacted premaxillary teeth or the lower jaw impressed food into the tooth sets differently. (188)

Getz, Amy*, Kaitlyn Bailey, Fred J. Brenner, Heather Barton, Arleigh McRae, Luke Latario, and **Stacey Senter.** Grove City College, Grove City, PA 16127. *DNA fingerprinting of the White-Tailed Deer* – DNA fingerprinting of short tandem repeats (STRs) in nuclear DNA from white-tailed deer (*Odocoileus virginianus*) was investigated as a means of determining breeding patterns within deer herds in Presque Isle State Park in Pennsylvania as well as in two metroparks in Dayton, Ohio. Previously obtained liver tissue samples from a total of 38 deer were selected for study beginning in June, 2013. Isolated nuclear DNA from liver tissue and nine fluorescently labeled primers for DNA were used in polymerase chain reactions to amplify the STRs of nuclear deer DNA. Products of PCR reactions were then confirmed using gel electrophoresis in 2% agarose gel and photographed under UV light using a Bio-Rad imaging unit. Successful PCR products were then analyzed using an Applied Bio Systems 310 single capillary automatic DNA sequencer with GeneScan software to accurately measure STR length. This process was used to begin to create a unique DNA "fingerprint" of each deer based on the STR size and frequency, a procedure analogous to forensic identification of human DNA. Three analysis programs known as GenePop, FSTAT, and Arlequin were used to determine potential gene flow within the sample population, which yielded results consistent with Hardy- Weinberg equilibrium. It is suspected that a more exhaustive study will produce results displaying increased heterozygosity, which would suggest a lack of inbreeding and that bucks move in and out of the different herds. This information will contribute to determining more clearly paternal genetic history and infer the breeding behavior among white-tailed deer herds in Presque Isle and Dayton, OH. (134)

Giblin, Shelby*, Evelyn Neunteufel. Misericordia University, Dallas, PA 18612. *Does heterospecific size affect the feeding behaviors of Black-capped Chickadees* (*Poecile atricapillus*)*?* – The purpose of this study is to determine whether the body size of heterospecific birds present at a feeder affects the behaviors of black-capped chickadees.

It is believed that a heterospecific larger than a chickadee will be a threat, but a smaller heterospecific will not be a threat to the chickadees while they are trying to feed. In a residential neighborhood in Dallas, PA and in Honesdale, PA chickadees with one or more other bird species present and chickadees alone at the feeder were video-recorded. Sessions with chickadees and only one heterospecific bird present, as well as chickadees alone, were analyzed. Behaviors such as number of seeds taken while at the feeder alone, number of seeds taken when a heterospecific was present, whether the chickadee stayed at the feeder or left the feeder when a heterospecific arrived, etc. were recorded on an ethogram. Preliminary analyses showed no differences in the number of seeds per second taken by either the chickadee at the feeder alone or by the chickadee with a heterospecific. Further analyses are in process. (131)

Gomes, Jenelle*, Chad Freed, and Stephen Madigosky. Widener University, Chester, PA 19013. *The Spatial Distribution of Environmental Attributes for DeShong Park in Chester, PA to support a Sustainable Development Plan* -- Alfred O. DeShong, a wealthy Chester industrialist bestowed his 27-acre estate, mansion, and art museum to the people of Chester, PA in 1913 to be used as a park. Currently, the park is abandoned and has not been maintained by local government for over 25 years. In general, the park suffers urban decay and both the museum and mansion on the property exist in a dilapidated condition with structural damage and graffiti. Although the park is accessible to the public it is not used for public events. This project provided a baseline spatial assessment of the current environmental attributes of DeShong Park. These environmental attributes include the geology, hydrology, biological habitats, and biology of the existing trees, some of which were planted over 100 years ago. Using methods developed by the United States Forest Service and selected attributes of the trees, ecosystem services and tree replacement values were calculated. All of the attribute information was georeferenced and imported to a geographic information system (GIS). This information was combined with remote sensing data for spatial modeling and visualization. The spatial modeling results are used to support future restoration and conservation of the park and sustainable development plans that are being created as part of the Obama Administrations Strong Cities Strong Communities Program (SC2). These sustainable development plans integrate business development and land development site layouts that result in taxable revenue to the community while maintaining the original intent of Alfred DeShong to maintain the property as a biodiverse urban park. (113)

Good, Clayton*, Cory Trego and Dr. Mel Zimmerman. Lycoming College, Williamsport, PA 17701. *Contribution of Lycoming College CWI to the PFBC Unassessed Waters Project (2010- 2013)***--** The primary threat to unassessed waters is inadequate water quality protection. Without knowledge of the aquatic communities inhabiting these unassessed waters it is difficult to properly protect these waters during the permitting process. Ever increasing urbanization into PA's rural regions and the recent expansion of Marcellus Shale Extration throughout the North Central regionhas highlighted the importance of proper stream classificationand its role in the permitting process. Much of the information provided in this project focuses on coldwater aquatic communities as these tend to be the most fragile. This is the fourth year that Lycoming College CWI has participated in the Unassessed waters project. To date a total of 311 streams have been completed in the Loyalsock, Lycoming, and Pine Creek watersheds by CWI. This past summer four additional watersheds in North Central Pa where sampled and of the 83 assessed streams, a total of 12 supported no fish because they were dry, 7 support fish but no trout, 13 were class A trout streams, 13 were class B, 11 were class C, 27 were class D, and 19 were class E. Data for this project has been logged into the PFBC Unassessed Waters Data set for consideration of trout stream protection. The number of class A, B, C, D and E streams in each watershed will be presented. Over 200 additional streams need to be assessed in these watersheds in the future. (109)

Gordon, Brian*, Quentin Reinford, Dr. Mel Zimmerman. Lycoming College, Williamsport, PA 17701. *Farm BMP Project 3rd Year Update, Summary of Nutrient and Sediment Load*-- The goal of the joint project between the Lycoming College Clean Water Institute, Lycoming County Planning Commission and the Lycoming County Conservation District to monitor the implementation of agricultural best management practices (BMPs) on four farms in North-central, PA. The collection of water chemistry for nutrient and sediment load is taken on a monthly basis and supplemented with storm events to create a baseline comparison for the progress of the BMP's affects. In June of 2012, on an unnamed tributary of White Deer Hole Creek, Elimsport, PA, three collection sites were picked: Rt44, Ulr, & Orgf; as named from downstream to upstream. Nutrient load data for Nitrogen and Phosphorus continues to show an increase from the upstream to downstream sites due to agricultural runoff. This is found by pairing a stream volume calibration and Solinst Levelogger data with the aforementioned regularly collected water samples. A preliminary discussion of the effectiveness of the best management practices on nutrient and sediment load reductions will be presented as well macroinvertebrate and fish population results. Plans for future study. (107)

Gordon-Sandweiss, Alexander *, Rebecca LaRosa, James R. Dearworth Jr., and Megan Rothenberger. Lafayette College, Easton, PA 18042. *Seasonal Frequency of the Red-eared Slider Turtle in the Lehigh Valley* — The red-eared slider turtle (*Trachemys scripta elegans*) is an invasive

species present in the Lehigh Valley. This study investigated the seasonal frequencies of different species of turtles and correlated their presence with environmental parameters to better understand the reasons for the red-eared slider's invasiveness. Water sampling and trapping were conducted at the Bushkill Creek both below and above the Bushkill Dam (40.695251˚, -75.211126˚), as well as the Hope Road Canal (40.643596˚, -75.277629˚). Environmental measures included oxygen levels, pH, air and water temperature, salinity, total dissolved solutes, nitrate, phosphorous, turbidity, and conductivity. The numbers of turtles at each site and different species were noted. Data were analyzed using non-metric multidimensional scaling ordination using PC ORD v. 5.0. In general, turtles (especially red-eared sliders) were more abundant when oxygen concentrations and pH were lower. Turtles were also most visible during high temperature measures for both air and water. Consequently, few turtles were seen or caught at the Bushkill Creek as high levels of oxygen with high pH and both low air and water temperature were observed here. Significantly fewer total turtles were seen and caught in the winter months than in the summer. Snapping turtles (*Chelydra serpentina*) were present mostly in the early summer months; the eastern painted turtles (*Chrysemys picta picta*) were more prevalent during the fall. Red-eared slider turtles were most visible during the late summer into the fall period. Interestingly, red-eared sliders were easily observed, however, in comparison to the others were not caught in traps. Further study is necessary to determine the significances of the difficulty in catching red-eared sliders, the varying activity periods among different species, and the correlation of red-eared slider turtles in waters having low levels of oxygen, low pH, and both high air and water temperatures. (114)

Grady, Rebecca B.*, Jessica Kline, and Dr. André P. Walther Cedar Crest College, Allentown, PA 18104. *The Development of a novel qPCR assay to measure Homologous Recombination in the budding yeast Saccharomyces cerevisiae.* – One of the major underlying causes of cancer is the accumulation of mutations that result from unrepaired or misrepaired DNA damage. All human cells experience DNA damage due to normal cellular processes and when exposed to DNA mutagens from the environment. In normal, healthy cells, different types of DNA damage are usually recognized and repaired efficiently by specific cellular repair mechanisms. One such DNA repair mechanism is homologous recombination (HR), which involves multiple proteins that recognize and repair of double stranded breaks in the DNA. Defects in a large number human homologous recombination repair proteins have been linked to an increase in the incidence of cancer. The high level of similarity in homologous recombination mechanisms between humans and fungi make the budding yeast *Saccharomyces cerevisiae* a strong model organism to understand this repair process. To better understand homologous recombination, we have been developing a novel real time PCR (qPCR) assay to measure the formation and repair of a single double-strand break that is generated at the Mating Type Locus located on Chromosome III during the process of Mating type switching in *S. cerevisiae*. Haploid yeast cells can exist as either MATa or MATα mating types, and the haploids can switch from MATa to MATα through a site directed homologous recombination event to repair a single double strand break caused by the enzyme HO endonuclease that is under the control of an inducible promoter. We have been validating this assay by examining homologous recombination in yeast strains containing mutations in known homologous recombination proteins such as the single-stranded DNA binding protein Replication Protein A (RPA). We hope to use this novel assay to gain further insights into the mechanism of homologous recombination in yeast and humans that may lead to novel therapies for cancers linked to defects in homologous recombination. (39)

Graves, Elizabeth* and **Kelly Orlando.** Immaculata University, Immaculata, PA 19345. *Morphological Changes in Candida glabrata Inhibited by Anti-Fungal Agents-* Nosocomial, or hospital-acquired, yeast infections are caused by several different strains of yeast, including *Candida glabrata.* Morphogenesis from a non-pathogenic form lacking hyphae to a pathogenic form with hyphae and the excretion of biofilm are thought to allow yeast to cause disease. These experiments seek to find a way to eliminate or inhibit the growth of biofilm and hyphae and ultimately decrease the number of nosocomial yeast infections. Hyphal growth and biofilm formation was induced through nitrogen starvation; using both nitrogen rich and nitrogen deficient medium and the anti-fungals garlic, aspirin, and terbinafine, morphology was microscopically observed and calculated using ImageJ. The samples were grown on plates and in broth. The flasks provided a surface for adhesion of biofilms, which was stained with crystal violet and provided a side-by-side visual comparison. The biofilm formation was also indirectly measured through clumping of the *C. glabrata*. Samples from the broth were taken and the absorbance was measured in a spectrophotometer over time to track the speed at which clumps fell from suspension. The larger clumps fall faster, showing a greater change in absorbance and indicating a greater amount of biofilm. The anti-fungals were diluted in ethanol and applied to discs that were placed atop a lawn of *C. glabrata* on the plates. Samples were taken from the outer edges of the zone of inhibition for microscopic analysis of the effects of the drugs on biofilm formation. Data from the control, garlic, aspirin, and terbinafine plates and flasks are still being analyzed. (47)

Griffiths, Heather * and **David Singleton.** York College of Pennsylvania, York, PA 17404. *Effects of a thermal effluent on the bacterial community of the Susquehanna River* –A thermal effluent created by the steam conversion of a coal-

fired power plant creates a unique microbial community in the Susquehanna River in York Haven, PA. This thermal effluent provides a unique opportunity to study the effects of unseasonably warm water on presence and patterns of bacteria, particularly coliforms. Coliforms enter the river upstream from wastewater treatment facilities as well as agricultural run-off. Water was collected and temperature was measured at approximately 30-day intervals over the course of nine months at the thermal effluent site, as well as sites upstream and downstream for comparison. Selective and differential media was used to enumerate coliforms collected from each site in triplicate. Bacterial rDNA was amplified via polymerase chain reaction using highly conserved 16S rRNA primers for gel analysis and DNA sequencing. Temperature and coliform counts showed distinct trends. Temperature of the thermal effluent appeared to negatively affect coliform count. The greatest coliform counts were found in summer months at the control site, upstream from the effluent, with consistently lower monthly water temperatures. The lowest overall colony counts were obtained from all test sites during autumn months. Seasonally, coliform counts at the control site varied greatly but decreased downstream from the effluent. Overall, the lowest coliforms counts were found at the site of the thermal effluent and downstream. (55)

Gustin, Jessica* and Bradley Rehnberg. York College of Pennsylvania, York, PA 17403. *The Behavioral Effects of Diphenhydramine on CD-1 Female Mice (Mus musculus) Consuming Caffeine*--The depressant, diphenhydramine, is a popular sleeping aid that is often counteracted by the stimulant caffeine. The objective of this study was to assess possible synergistic activities when mice are exposed to caffeine and diphenhydramine at the same time. This study used an animal activity tracker to record the ambulatory time, stereotypic time, resting time, and distance traveled of female CD-1 mice in six experimental groups. Each mouse was placed in a solitary cage overnight with the option to consume water (control) or caffeinated water at 0.30 mg/mL (low) or 0.50 mg/mL (high). The next day, test mice were given an intraperitoneal injection of either physiological saline or 25 mg/kg of diphenhydramine and immediately transferred into the tracking device. Results from this study showed that the high dose of caffeine increased the effects of diphenhydramine more than the low dose of caffeine, which suggested that diphenhydramine slowed the metabolism of caffeine. Resting times differed significantly (one way ANOVA, p-value = 0.0037) among the six experimental groups. Our data showed a limited synergism between diphenhydramine and caffeine. The greater effectiveness that diphenhydramine had at increasing the resting behavior and decreasing the ambulatory behavior on the mice that consumed caffeine revealed the synergistic effects between the two drugs. (194)

Halsor, Kyla*, Katrina Toporcer*, and Kenneth Klemow. Biology Department, Wilkes University, Wilkes-Barre, PA 18766. *Investigating the Ethanol Biofuel Potential of Cattail (Typha latifolia) Biomass* - Biomass energy is viewed as a potential alternative to fossil fuels. The U.S. currently derives approximately 4% of its energy from biomass, particularly as ethanol from corn, sweet sorghum, or sugar cane, or as cellulose from switchgrass or fast-growing woody plants. Critics of biomass point to an unfavorable energy yield, as well as the diversion of plants from food production to energy. One potentially overlooked source of biomass energy is cattail (*Typha latifolia*), an emergent wetland herb commonly found throughout the U.S. Studies conducted in the 1960s - 1990s showed cattail rhizomes contain up to 60% starch and leaves up to 20% sugar. Despite those promising yields, cattail is not used as a source of biomass, and little research into its potential has been conducted in the past decade. To that end, we are examining the biomass-producing ability of cattail on a per plant and per area basis. Approximately thirty representative plants are being harvested from each of two non- jurisdictional wetland sites in northeastern PA, taking care to keep the rhizome intact. After being transported to the lab, plants are processed by separating above and belowground parts. Half of the rhizomes are being placed in pots with potting soil in the Wilkes greenhouse, promoting the growth of new shoots. The other rhizomes are dried and weighed. Each rhizome is then ground in a Wiley mill, producing a powder that is subject to enzymatic degradation to convert starch to sugar. The sugar content is then determined using a Brix meter. Leaves are also juiced and Brix sugar content determined. Those values will be converted to calculate starch content - and ethanol potential - both per plant and per area - and compared to those for other biomass plants. (170)

Hendry, Nicholas R*, Timothy Kennedy, Michael Pheasant, and **Barbara McCraith**. Misericordia University, Dallas PA 18612. *Comparison of two species leaf litter breakdown in Trout Brook, Luzerne County, Pennsylvania*--The degradation of plant material falling into streams plays a significant role in the overall ecosystem function. Decomposition is a complex process involving not only physico-chemical processes, but also macroinvertebrates, fungi, and bacteria. The purpose of this study was to compare the decomposition of the leaves from the two dominant species of trees in Trout Brook's riparian zone, *Quercus bicolor* (swamp oak) and *Acer rubrum* (red maple). To assess the physico-chemical nature of the stream we measured the flow, depth, width, dissolved oxygen, pH, conductivity, and temperature. We placed coarse artificial leaf packs (mesh 10 mm) and fine leaf packs (mesh 500 μm) in three riffles in Trout Brook to determine decomposition by benthic macroinvertebrates and microbes. We collected the leaf packs at intervals of two, four, eight, and twelve weeks. Our preliminary results indicated that red maple leaves

in the coarse leaf packs decomposed at a faster rate than both the oak leaves and the mixed species. The oak leaves remained the most intact. Our results also indicated that the decomposition of the leaves is mainly due to microbial activity. It is likely that the cold temperatures, causing the creek to freeze, slowed decomposition rates, which affected benthic macroinvertebrate colonization of the leaf packs and thus decomposition of coarse organic particulate matter to fine organic particulate matter. (98)

Herting, Jennifer* and Wendy L. Ryan. Kutztown University of Pennsylvania, Kutztown PA 19530. *Analysis of Submersion Patterns in Steller Sea Lions (Eumetopias jubatus) and Beluga whales (Delphinapterus leucas) in an Artificial Habitat*--Beluga whales (*Delphinapterus leucas*) and Steller sea lions (*Eumetopias jubatus*) were studied at Mystic Aquarium (Mystic, CT) as an inexpensive and reliable opportunity to expand our understanding of how several environmental cues may influence the dive duration of animals who are protected by the Marine Mammal Protection Act and are therefore important, but somewhat difficult to access. This study focused specifically on the submergence patterns of these marine mammals as a behavior reflective of the animals' unique physiology that can be relatively easily monitored and quantified. The animals are kept in outdoor exhibits where external environmental cues such as time of day and seasonal variations have the potential to influence their diving behavior, while additional confounding variables such as foraging, predation, and migration are absent. It was hypothesized that the submergence behaviors of both the beluga whales and the Steller sea lions would reflect both seasonal changes and time of day. The dive durations for each animal were recorded in groups of five dives repeated three times a day starting upon arrival (9-11am), then at mid-day (12-2pm), and before closing (3-5pm) approximately once a month over a three-year period. Analysis of the data suggests that neither time of day nor time of year had a significant influence on the submergence durations of the beluga whales, while both seemed to influence the submergence times for the Steller sea lions. As a result our hypothesis was partially refuted, since only the submergence durations for the Steller sea lions appeared to respond to seasonal and daily external environmental cues. This may reflect differences in the lifestyles of these two animals, with the whales being fully aquatic mammals in contrast to the semi-aquatic lifestyle of the sea lions. Examination of additional representative species could further clarify if these are actually intrinsic differences. (127)

Hile, Jessica* and Amy Reese, PhD. Cedar Crest College, Allentown PA 18104. *Domesticated Canines as Fungal Reservoirs for Rhodotorula species* – As the number of individuals living in an immune-deficient state increases worldwide, the more important it is to understand the potential risks for secondary diseases and how they can be prevented. Opportunistic fungi such as *Cryptococcous neoformans* and *Rhodotorula* species have been emerging as clinical pathogens in HIV/AIDS patients and other immunocompromised individuals. *Cryptococcous neoformans* has a special characteristic that separates it from other fungal yeasts; it has a polysaccharide capsule which makes it virulent. *Rhodotorula* species share this same special characteristic and these strains are emerging more and more as pathogenic fungi. Where these patients are coming in contact with these fungi is sometimes a mystery. We know these fungi are found in the environment, but where else are they found? Could a family pet be a carrier of fungal spores much like how rats were carriers of the bubonic plague? A dog is often referred to as man's best friend, but what hidden dangers could they be carrying with them? In this survey, we will determine the prevalence of yeast-like fungi, specifically *Rhodotorula* species, in domesticated dogs. A medical history and general survey will be obtained for each dog. They will then be swabbed along the head and back multiple in a clinical setting to determine what potential organisms they may be carrying in their coat. Preliminary data suggests sample growth on Sabouraud agar cultured at 34°C may permit optimal yeast growth but reduce mold growth. *Rhodotorula* species colonies can preliminarily identified by their pink color and further genotypic methods will be used to identify which species are prevalent. In future directions, the survey could be opened up to other domesticated and household animals such as cats, rodents, and birds. (136)

Himmel, Anneliese C.* and **Carlos A. Iudica**, Susquehanna University, Selinsgrove, PA 17870. *Temporal changes in diversity and activity patterns of terrestrial vertebrates in central PA: Phase 1*--We are interested in gathering data that will help us to accurately portray the diversity and activity patterns of local terrestrial vertebrate species. We would like to explore the methodologies that may allow for the quantifying of individuals within populations of different species using noninvasive research protocols. Eight wildlife cameras, three brands, were set up on the Yoder Farm (CEER - part of SU campus in Selinsgrove, Pennsylvania) starting in summer 2013 and continuing during fall 2013-spring 2014. We are building a list of species that actively use the area based on recorded images on the cameras. Distinctive markings observed in the images are used to identify individuals so that we can eventually use "capture-recapture" methodologies to calculate relative abundances within species. Metadata (time, lunar phase, and temperature) is recorded for each individual captured. Nine species have been identified in the area with increased activity in the evenings over all. White-tailed deer represented the majority of the captures. Individuals of this species exhibit distinctive markings that may allow for future studies to identify individuals and family groups. Other species observed were gray squirrels, opossums, raccoons, domestic cats, grey

foxes, groundhogs, eastern cottontails, and chipmunks. These species were observed with less frequency than the white-tailed deer with the gray squirrel being the next most common species. During late fall 2013; we introduced scent stations in all camera trap stations hoping to provoke territorial behaviors in the resident carnivores. We plan to continue collecting and analyzing images/videos during the spring and summer 2014 and look for seasonal activity and patterns of spatial use by the observed species in the area of the farm. (121)

Hippeli, Steven* and **Tammy Tintjer**. King's College, Wilkes Barre, PA 18711. *The role of the endophyte Neotyphodium coenophialum in the invasive properties of Festuca arundinacea through soil community feedback* − The goal of this study was to determine the role of soil community feedback as a mechanism by which the fungal endophyte *Neotyphodium coenophialum* may enhance the invasiveness of the grass *Festuca arundinacea*. The endophyte is known to alter the grass root morphology and secondary chemistry, which may alter the soil microbial community in such as way that subsequent plant growth may be negatively affected. To test this effect, a mixture of grassland and woodland soil was conditioned for twelve weeks with *F. arundinacea* that was either positive or negative for infection with the endophyte. The plants were then removed from the soil, and *Trifolium repens* was planted into the same soil and grown for eight weeks. Soil conditioned with endophyte-infected *F. arundinacea* increased the number of nitrogen-fixing rhizobia nodules on the roots of the subsequent *T. repens* samples when compared to those grown in endophyte-free conditioned soil, and there was a significant effect on the nodule counts between the two soils ($p<0.05$). Soil conditioned with endophyte- infected *F. arundinacea* increased the both the above and below-ground growth of the subsequent *T. repens*, with a significant difference in above-ground growth when soil positive and negative for endophytic infection were compared ($p<0.05$). The biggest factors contributing to the growth of *T. repens* was conditioning with *F. arundinacea* regardless of endophyte infection having a microbial community present in the soil prior to conditioning. Changes in the soil community due to soil conditioning were also measured using Biolog Ecoplates to test for microbial diversity in the soil. (168)

Hoffman, Hunter R.*, and Courtney L. Thomas. Susquehanna University, Selinsgrove, PA 17870. *Identification of multisubunit complexes containing the Saccharomyces cerevisiae bud neck ring protein Elm1p* - Cell morphology and nuclear division in *Saccharomyces cerevisiae* are coordinated in part by proteins located at the bud neck ring structure. Research into the bud neck ring complex has identified interactions between Nap1p, Clb2p, and Gin4p with overexpressed Elm1p. A model for the association of these proteins has been proposed, however the endogenous protein interactions have yet to be verified. This study was conducted to elucidate the specific interactions of these proteins *in vivo* using fluorescence resonance energy transfer (FRET). Plasmids which coded for a cyan fluorescent protein (CFP) and yellow fluorescent protein (YFP) were amplified through *E. coli* and used to generate cassettes to integrate the fluorescent tags onto the C-terminus of the proteins of interest by polymerase chain reaction (PCR). These cassettes were then used to transform strains of *S. cerevisiae*, with verification by genomic isolation and PCR. Yeast strains were made containing one YFP tagged protein and one CFP tagged protein as well as a control YFP-CFP protein. FRET was then utilized to verify the interactions of these proteins *in vivo*. (61)

Hummel, Kody* and Carlos A. Iudica. Susquehanna University, Selinsgrove, PA 17870. *Activity and Diversity of PA Bat Species During Hibernation and Emergence at Woodward Cave* — Of the eleven species of bats living in Pennsylvania, six are found to hibernate in caves and mines. These six species can arouse a few times from hibernation during the winter, and then emerge in early spring. It is not well understood if and what environmental factors trigger their emergence from hibernation. Barometric pressure is known to fluctuate dramatically throughout a cave or mine. The purpose of this project is to understand what causes bats to exit hibernation in the spring, determine the frequency of bat activity during the hibernation period, identify the bat species utilizing the cave throughout the year, and to propose methods for passive ultrasonic acoustic recording inside a cave structure. (128)

Husek, Jakub* and William G Dougherty. Susquehanna University, Selinsgrove, PA 17870. The *Coordination Chemistry of the Janus-Head Ligand Phenylbis(2-pyridyl) phosphine with First Row Transition Metals* - One-to-one molar reactions of metal nitrate salts, M= Zn^{2+}, Ni^{2+}, Fe^{3+}, Cu^{2+}, and Co^{2+}, with the ligand in methanol produced coordination compounds in an average yield of 77% across the series. Small molecule X-ray crystallography was used to determine the solid-state structure of the complexes that were successfully crystallized. The Zn^{2+} and Cu^{2+} complexes exhibit octahedral geometry with one bidentate phosphine ligand and bound nitrate counter ions. The isolated Ni^{2+} complex is octahedral but two bidentate phosphine ligands and a bound nitrate anion fill the coordination sphere. The average M-N bond length of all crystallized complexes is 2.023(2) Å, which is consistent with similar complexes of this type. ^{31}P-NMR spectroscopy for the Zn^{2+} complex exhibits a resonance at -4.3 ppm, which is consistent with a N-bound, unoxidized ligand. IR spectroscopy was used to identify complexation of the ligands and all coordination compounds exhibit unique resonances at 1590 cm^{-1} and 1383 cm^{-1}. Investigation toward formation of bimetallic complexes was explored using an oxidized version of the

phosphine ligand. (182)

Johnson, T. Wade, Samantha Coons*, Patrick Erickson*. Susquehanna University, Selinsgrove, PA 17870. *Characterization of high reduction potential anthraquinones in the A1 site of Photosystem I* – The project's objective is to understand the structure function relationship of the electron transfer system in Photosystem I (PSI) and characterize changes in electron transfer rates. We will replace the native phylloquinone (PQ) with a set of anthraquinones (AQ) at the A1 site of PSI to determine the effect of high reduction potential compounds on the system. This involves specifically engineered *in vivo* modifications, including an *in vivo* insertion of the AQ into PSI, protein purification, and confirmation of AQ content by HPLC. The resulting samples will be characterized by extensive spectroscopic characterization. The PSI activity will be determined by terminal electron recombination lifetimes of $P70^{+}/F$ by 850 nm pulse probe laser system. Predicted effects include slowed A1 reduction as the AQ potentials approach that of the A0 donor, and a corresponding rate increase for the AQ reoxidation as the electron is transferred forward. (62)

Jones, Carli*, Samantha Evans, Robert Kurt. Lafayette College, Easton, PA 18042. *Comparing Expression of Genes in the TLR4 Pathway Between 4T1 and Dendritic Cells.* In our research we were trying to determine if there were any differences in the expression of genes in the Toll-Like Receptor 4 (TLR4) signaling pathway in murine breast cancer (4T1) cells and white blood cells (dendritic cells). Previous data demonstrated that 4T1 cells and dendritic cells responded differently when exposed to bacterial products such as lipopolysaccharide (LPS), so in order to better understand this difference in cell behavior we investigated the relative amounts of RNA coding for proteins in the TLR4 pathway in each cell. In order to do this, we used quantitative reverse transcriptase PCR (qRTPCR), which quantifies the amount of RNA present compared to a reference gene. After isolating RNA from 4T1 and dendritic cells, we created cDNA using the RNA as a template. The qRTPCR revealed that, compared to dendritic cells, 4T1 cells overexpressed *Fos* and underexpressed *Myd88*, *cRel*, *TLR4*, and *p65*. *Jun*, *p52*, and *p50* were expressed in comparable amounts in both cell types. These data helped to identify which genes should be investigated further in order to more fully understand the differences in the TLR4 pathway between the murine breast cancer model and white blood cells. Eventually, a better understanding of this pathway could allow us to manipulate the cells' responses. (25)

Kashnicki, Marisa* and Angela Latona*. King's College, Wilkes Barre PA 18711. *Accumulation of Oxidative Stress in the Mitochondria of SH-SY5Y cells*—Oxidative stress is a major mechanism of neuronal injury in many neurodegenerative diseases. Oxidative stress in the mitochondria is caused by an imbalance of oxidants and antioxidants, leading to an accumulation of reactive oxygen species (ROS) in the cell. While glutamate is the major excitatory neurotransmitter in the brain, it induces excitotoxicity at high concentrations. For our experiments, we developed a novel protocol to study glutamate-induced oxidative stress in the mitochondria of SH-SY5Y cells. After inducing oxidative stress, the mitochondria of the cells are isolated and ROS accumulation is determined using a fluorescent compound, H2DCFA. Hydrogen peroxide was used as the ROS control that reacts with H2DCFA. Preliminary studies show that cells treated with 25mM to 150mM of glutamate for 6-18 hours induces cell death. To study oxidative stress, we use concentrations of glutamate that are below 150mM. Currently, we have not seen detectable levels of ROS in isolated mitochondria. We believe this is most likely due to insufficient quantities of mitochrondrial starting material. Therefore, current studies are increasing the original density of cells to maximize the amount of mitochondria for our experiments. We propose that once we have enough mitochondria, we will be able to detect ROS levels using the H2DCFA assay. (26)

Kennedy, Timothy A*, Nicholas Hendry, Michael Pheasant, Barbara McCraith. Misericordia University, Dallas PA 18612. *Benthic Macroinvertebrate Diversity in Different Detrital Environments*--Benthic macroinvertebrates act as an energy converter in stream ecosystems, breaking down allochthonous organic matter to allow microbes and other aquatic macroinvertebrates to feed on detritus. We used leaves of the two most dominant tree species, *Quercus bicolor* (swamp oak) and *Acer rubrum* (red maple), in the Trout Brook, Luzerne County riparian zone. We placed 25 single species artificial leaf packs containing either maple or oak, along with 25 leaf packs with both species, in three riffles of Trout Brook. We retrieved leaf packs after 2, 4, 8, and 12 week periods. We measured pH, dissolved oxygen, flow, depth, width, conductivity, and temperature each time leaf packs were collected. Preliminary observations indicated that the mixture of both maple and oak leaves had greater benthic macroinvertebrate diversity than either the single species of maple or oak. (99)

Keppel, Brandi, Dustin Lowry, Nicole Nicholson, Bridget Pettit, Alyssa Arnold and Gregory Paulson*. Shippensburg University, Shippensburg, PA 17257. *Testing the Efficacy of Three Fly Repellents for Controlling Biting Flies in Horse Paddocks* - Bite Free Stable Fly Traps™ were used to monitor biting fly populations, especially Horse Flies (*Tabanus* sp.), Stable Flies (*Stomyx calcitrans*), House Flies (*Musca domesticus*) and mosquitoes. The traps, designed to attract biting flies through color and light refraction, were treated with one of three repellent products; Bronco Equine Fly Spray™, Ultra Shield Green™, or Oak Hill Farm Naturals™. Bronco is an inorganic synthetic permethrin based product. Ultra Shield and Oak Hill Farm are natural,

plant oil based products. Control traps were treated with water since all of the products are aqueous solutions. Treatments were applied using label recommendations. The traps were distributed near a large paddock and indoor arena in arrays of 4 traps, one for each treatment and the control. The traps were checked at regular intervals for 3 weeks. During each inspection, trapped insects were classified, counted, and removed from the traps. ANOVA was used to analyze our results. (184)

Kerns, Peter M.*, Joseph W. Lafferty and Dr. Swarna Basu. Susquehanna University, Selinsgrove PA 17870. *A LabVIEW-based fluorescence detection system* - A fluorescence detection system has been developed using a National Instruments PCI-6251 data acquisition (DAQ) board that is driven by LabVIEW Signal Express. The signal is collected using a collimator and transported to the DAQ board using a fiber-coupled detector. The same detection system can be incorporated into an inverted microscope that has been fitted with internal dichroic mirrors to allow for fluorescence detection from the slide. The detection system has been calibrated using various fluorescence standards and has been used to measure fluorescence intensity, laser power (pulsed Nd^{3+}:YAG and continuous-wave Ar^{+}-ion) and fluorescence lifetimes of various systems. Standard deviation, and signal-to-noise ratios have been determined for different applications. (60)

Khan, Asra* and Meda Higa. York College of Pennsylvania, York, PA 17403. *Determining how glycosylation of hantavirus glycoproteins affects infection of Vero E6 cells.* - Hantaviruses (family *Bunyaviridae*) are carried by rodents and can infect humans through aerosolized feces. Hantavirus infection results in Hemorrhagic Fever with Renal Syndrome and Pulmonary Syndrome, which can in turn lead to death in the host. Glycoproteins Gn and Gc are two surface proteins encoded by the hantavirus genome. Both Gn and Gc are involved in the virus-host interactions and contain putative N-linked or O-linked glycosylation sites. Some of these sites aid in the process of protein folding as well as virus-host interactions, however the function of the glycosylation sites within these proteins remain unclear. To study this role, we used pseudovirions by expressing the glycoproteins on the surface of a Vesicular Stomatitis Virus (VSV) core modified with the reporter gene, luciferase, but lacking the ability to replicate in its entirety. These pseudovirions were then enzymatically deglycosylated and infection rates were determined by fluorescence. In addition, the pseudovirions were introduced to a mannose competition. Concentrated mannose media was incubated on the Vero E6 cells prior to viral infection. Our studies suggest that there were no changes in infection rates with deglycosylated glycoproteins, however viral competition with mannose resulted in lower infection rates. This suggests that the virus needs to bind to the mannose sites on the host cell in order to gain entry into and cause infection. (30)

Khan, Rizwan* and Matthew H. Persons. Susquehanna University, Selinsgrove, Pennsylvania 17870. *Female Pardosa milvina wolf spiders increase silk advertisements when in the presence of silk from courting males*--Female wolf spiders deposit silk to attract male conspecifics. Males of the wolf spider *Pardosa milvina* also deposit silk while performing courtship displays. We examined if female silk deposition behavior changes when encountering silk produced from a courting rather than a non-courting male. Male *P. milvina* were placed in one of two environments for a 30-minute period: 1) a container with an unmated adult female behind a transparent barrier (courting male treatment), or 2) an empty container without a female present (non-courting male treatment). Females were then exposed to one of the two substrates or a third control substrate that never had a male present. We measured the quantity of three different types of silk deposited by females across these substrates (dragline silk, cord silk, and attachment disks). Females significantly increased attachment disk deposition in the presence of silk from a courting male compared to a non-courting male. Females also showed elevated dragline deposition in the presence of male silk but whether or not the male was courting had no effect on dragline deposition. Female cord silk deposition did not vary across treatments. Courting males produced significantly fewer attachment disks than non-courting males while dragline and cord silk deposition did not vary. We conclude that females can discriminate between silk from courting or non-courting males and increase attachment disk deposition in the presence of courting males. The number of male attachment disks deposited may be one mechanism by which females can discriminate between silk produced by courting rather than non-courting males. (185)

Khan, Rizwan*, Nicholas Van Nest*, Matthew Persons, and **Lou Ann Tom.** Susquehanna University, Selinsgrove, PA 17870. *Preliminary Identification of a Volatile Silk-based Sex Pheromone of the Wolf Spider (Tigrosa helluo)*--Spiders communicate chemically through a combination of volatile cues and silk draglines. These semiochemicals are known to reduce herbivory in crop pests and are also used as sex pheromones during mating. Given the dual role of these compounds, they could be used in the development of novel arrestants, repellents, deterrents, and antifeedents to manipulate insect pest behavior while also attracting predators to the area. Despite their potential for chemically-mediated biocontrol, of the 44,540 spider species, only six spider pheromones have ever been identified. Silk and volatile odorants from females of the wolf spider *Tigrosa helluo* have been shown to act as a repellent and reduce feeding in a variety of crop pests. We screened volatiles produced from the silk of adult male and female *T. helluo* (n=20) . Mature females were individually placed in glass

vials for twelve hours during which they were exposed to visual courtship displays of conspecific male spiders (n=20) and allowed to deposit silk. A serial wash using methylene chloride was performed on vacated vials (n=20) followed by characterization using gas chromatography/mass spectroscopy (GC/MS). A long-chain alkene appears to be unique to the female silk when compared with rinses of male silk, control vials, and peat moss in which the spiders are reared. In a separate method of sample collection, solid-phase microextraction (SPME) is being used to collect headspace samples of female spiders allowed to inhabit vials for twelve hours. These samples will be analyzed using GC/MS and compared with the previous results. (186)

Korpics, Samantha *, Julia Kelly*, and Amy Reese, PhD. Cedar Crest College, Allentown PA 18104. *Overexpression of alpha-1,3-glucanase in Cryptococcus neoformans using two different cloning approaches* – *Cryptococcus neoformans* is a pathogenic fungus that affects immuncompromised individuals worldwide, especially those with HIV/AIDS. The exceptional virulence of *C. neoformans* comes from its polysaccharide capsule, which allows the cells to evade phagocytosis by the immune system in the human body. The capsule is anchored to the cell by cell wall alpha-1,3-glucan and the enzyme which regulates cell wall alpha-1,3-glucan is hypothesized to be alpha-1,3-glucanase (*AGN)*. There are four *AGN* genes in *C. neoformans,* but the role of each is not known. Two molecular cloning approaches have been implemented to investigate the role that *AGN* gene and gene products play in capsule attachment in *C. neoformans*. The first approach involves the overexpression of *AGN* genes in a yeast system to generate a protein reagent for subsequent treatment of cryptococcal cells to degrade cell wall alpha-1,3-glucan and remove capsule. For this approach, the genes will be overexpressed in *Kluyveromyces lactis* using the pKlac2 vector. Currently one of the four *AGN* genes (*AGN3)* has been successfully cloned into the pKlac2 vector and protein expression experiments are being evaluated. The second cloning approach involves overexpression in the *C. neoformans* cells themselves, to be able to monitor the impact that too much alpha-1,3-glucanase has on the cells. In this approach, the *AGN* genes will be overexpressed using the inducible plasmid pCTR4-2, in which transcription can be regulated by the amount of copper in the surrounding media. By increasing the amount of *AGN* produced in *C. neoformans*, the roles of *AGN* genes and their products may become clear, and a new potential target for anti-fungal drugs may be identified. (41)

Kosak, Zachary J.* and **Jeramia J. Ory**. Department of Biology, King's College, Wilkes- Barre, PA 18711. *Exploring Microarray Data from Cryptococcus neoformans to Identify Novel Cryptococcal Meningitis Virulence Indicators* - *Cryptococcus neoformans* is an opportunistic human pathogen, causing cryptococcal meningitis in patents with compromised immune systems. Left untreated, cryptococcal meningitis is 100% lethal; up to 25% of treated cases are still fatal. Many studies have suggested virulence indicators, including signaling networks that influence melanin production, fungal capsule development, and tolerance of the 37ºC environment within potential human hosts. Observations such as these have provided promising avenues for examining how *C. neoformans* infects immunocompromised humans. Our objective is to perform microarray analysis on *C. neoformans* strains isolated from patients and compare our findings with their associated clinical data. We hope to correlate more severe clinical characteristics with particular gene expression profiles. cDNA was generated utilizing a 3DNA Array 350 Kit (Genisphere, Hatfield, PA). cDNA was hybridized to the microarray slides with the Genisphere kit, and 3DNA hybridization was performed per protocol. Microarray slides were scanned, and image normalization was performed utilizing the print-tip lowess methodology in the Goulphar program. Significance analysis of normalized microarray data was performed to identify genes with significant results that correlated with clinical data. Preliminary findings indicate that host gender and age may correlate with clinical symptom severity, but further study is currently underway to determine whether these results are statistically significant. Identifying these pathways may provide novel treatment targets for healthcare providers and pharmaceutical companies attempting to treat those infected with cryptococcal meningitis. (44)

Kraker, Laura and Kinley Hardy. Susquehanna University, Selinsgrove, PA 17870. *Microbial Ecology of the Centralia, Pennsylvania Mine Fire: The Study of Thermophilic Actinomycetes* – The Centralia, Pennsylvania mine fire that started in 1962 has had a major impact on the overlying soil environment. The underground fire vents gases upward through gaps in the soil, causing significant changes to the chemical and physical composition of the soil and to the microbial communities surrounding the vents. Previous research has demonstrated the presence of thermophilic actinomycetes around these vents, some of which may be capable of producing antibiotics. In order to extend this research soil samples were collected from around the vents at temperatures of 32˚C, 48˚C and 65˚C, diluted in sterile water, and used to inoculate glycerol yeast agar plates at 55°C. Six unique colonies were isolated and visualized microscopically using a Gram stain where potential actinomycetes (Gram positive, filamentous growth) were observed. Genomic DNA was extracted from these isolates using a MoBio UltraClean DNA Isolation Kit. The 16S rRNA genes were then amplified using PCR and sequenced. Preliminary results identified these isolates as *Brevivacillus sp.*, *Bacillus fumariolo*, *Streptomyces sp.*, and *Bacillus gelatini*. Further research is being performed to identify additional isolates, and to perform antimicrobial testing on the previously identified isolates. (57)

Krall, Joshua W. * and Angela L. Asirvatham. Misericordia University, Dallas, PA 18612. *Circadian Rhythms in College Students* - To determine the importance of biological rhythms in college students, data on heart rate, body temperature, time estimation, arithmetic speed and fine movement was collected from 32 healthy individuals aged between 18 and 22 years over 16 consecutive days at five different times (8:00 AM, 12 PM, 4:00 PM, 8:00 PM and 12 AM) of a 24 –hour day. Students were also required to keep a record of the time spent awake and sleeping on a sleep/wake chart. Fast heart rate, high body temperature, accurate time estimation, and fast arithmetic and fine movement speeds were observed throughout the middle of the day and early evening hours (noon, 4:00 P.M., 8:00 P.M.), with slightly slower heart rate, lower body temperature, less accurate time estimation, and slower arithmetic and fine movement speeds occurring at midnight. The slowest heart rate, lowest body temperature, least accurate time estimation, and slowest arithmetic and fine movement speeds were recorded at 8:00 A.M. Although the average values for each measured parameter seemed to follow a circadian rhythm throughout the day, it was determined by statistical analysis that the means were not significantly different from each other ($p < 0.05$). Mean values of the measured parameters display that, on average, the 32 colleges students that participated in the study were "evening-type" people. Additional studies must be conducted in the future to better understand the effects of having an evening-type circadian preference on academic and athletic performance. (63)

Kreider, Erin V.*, **Paul T. Stathis***, and **Daniel Klem, Jr.**, Muhlenberg College, Allentown, PA 18104. *Gross anatomy and histology of Cooper's (Accipiter cooperii) and Red-tailed (Buteo jamaicensis) hawks alimentary tracts* – The basic constituents of the avian alimentary tract are: esophagus, proventriculus, ventriculus, small intestine, caeca, and large intestine; in general these organs are similarly structured in most species of birds. The anatomy and histology of alimentary organs are known to be influenced by the diet of the organism. This study compares the gross anatomy and histology of the alimentary tracts of two avian predators that primarily feed on other birds and mammals. Comparison of the gross anatomy revealed the Cooper's Hawk had proportionally longer proventriculus and small intestine while the Red-tailed Hawk had a larger esophagus and ventriculus. Comparison of the histology revealed Red-tailed hawk had a greater proportional representation of epithelium in each of the alimentary organs while the Copper's Hawk had a greater proportional representation of muscular tissue layers throughout. (193)

Kretovics, Sean* and Cynthia Walter. Saint Vincent College, Latrobe, PA 15650. *The Effect of Phytochemical Extracts from Solanum lycopersicum on Larvae of the Mosquito, Aedes aegypti*- Mosquitoes are one of the most important groups of insects with regard to public health. This experiment focused on the mosquito, *Aedes aegypti*, one of the most prolific mosquitoes in North America, and killed it with the most commonly homegrown plant, the tomato, *Solanum lycopersicum*. A larvicide was made from tomato leaves after they were dried, ground and mixed with methanol at a ratio of 1g dry weight : 9 ml, incubated at room temperature overnight and centrifuged. The mosquito culture was raised until the 3rd or 4th in-star stage before the larvicide was added. Mosquitoes were raised in groups of three or four in three separate 250 Erlenmeyer flasks per treatment group. The larvae were exposed to the larvicide and methanol alone at concentrations up to 1% of culture water and observed for nine days until larvae hatched or died. After 24 hrs., the LD-50 for methanol was 1% and 0.37% for larvicide. After 72 hrs., the LD-50 decreased to 0.34% for methanol and 0.21% for larvicide. Concentrations from 0.12 -1% were tested on *Daphnia*, organisms often found with mosquitoes. They are a good indicator of whether or not the phytochemical extract will negatively affect invertebrates other than mosquitoes. Preliminary results indicate these crustaceans survive and successfully release young during four days of observation after a single dose of tomato extract and/or methanol at concentrations up to 1% of culture water. Natural phytochemical extracts are the future of pesticides. They provide a less toxic way of managing pests, and will hopefully be more environmentally friendly to non-target organisms. (106)

Lachhab, Ahmed, Matt Beren*, and Brian Zuidervliet. Susquehanna University, Selinsgrove, PA 17870. *Middle Creek Water Assessment using Water Quality Index (WQI)* - Water quality Index (WQI) provides a single value that is used to express the overall quality of water based on a number of measurable parameters. WQI was calculated based on 10 data sets collected during the period between June and July of 2012 and July of 2013 in an effort to assess the water quality of Middle Creek (MC) (Snyder, CO. PA). MC is a 2nd order tributary stream flowing into Penn's Creek, before joining the Susquehanna River. In this study, eleven sites were selected along MC between the head waters and its confluence with Penn's Creek. Physical properties were measured in the field and grab-samples were tested for P, $NO2^-$, $NO3^-$ and NH3 in addition to BOD5, COD and TSS. WQI was measured based on the above mentioned elements and was found to be 89.71, indicating that MC is in good condition regarding water quality and is capable of buffering nutrient and chemical runoff. Results have shown that certain parameters such as T^O, COD or BOD, can be used for forecasting. Due to their correlation with WQI values, T^O, COD and BOD were found to be parameters which could be used in order to evaluate water quality within a short period of time. In this study T° and COD were found to be the best forecasting parameters, followed by BOD. (110)

Lafferty, Joseph, Peter Kerns, and Dr. Swarna Basu. Susquehanna University, Selinsgrove, PA 17870. *Cross-linking of proteins using laser excitation of various photoactivators* - Three- dimensional free-form fabrication, also known as cross-linking or photo-polymerization, of proteins (bovine and human serum albumins, fibrinogen and lysozyme) has been carried out using a pulsed Nd^{3+}-YAG laser as the excitation source. Cross-linking is carried out by the direct excitation of various photoactivators (ex. Rose Bengal, Methylene Blue and 9-fluorenone-2- carboxyic acid). These cross-linked structures can serve as models for various applications including drug delivery and tissue engineering. Optimal laser exposure dose for cross-linking has been determined. Cross-linking was observed on proteins that had been heated to 60 °C but not higher due to denaturation. Cross-linking of proteins that had been involved in other processes (binding to transition metal complexes) was carried out and the cross-linking efficiency was drastically reduced as the tryptophans that are typically involved in cross-linking had limited accessibility. Finally, fluorescence experiments were carried out to monitor cross-linking, determine bioactivity and measure fluorescence recovery within these structures following photobleaching. (176)

Laird, Amber* and **Garrett Barr.** King's College, Wilkes-Barre, PA 18711. *Tracking Digestion in Larval Two-Lined Salamanders with Fluorescently Marked Prey* – Recent research on day and nighttime feeding of stream salamanders relied on an assumption that prey items pass through the foregut of larval salamanders within 8 hrs. To test this assumption, we measured the time it took fluorescently marked water fleas (*Daphnia magna*) to pass through the foregut of larval two-lined salamanders (*Eurycea bislineata)*. To track the digestive rate of the salamanders, water fleas were marked by placing them in a suspension of GloGerm; water fleas readily consumed the GloGerm. When water fleas were fed to salamanders, the GloGerm was visible under Epi Blue light with a Sybr Gold filter using a gel documentation system. We captured digital images every hr for 9 hrs after each salamander consumed 1 water flea. We measured the location of the brightest spot using ImageJ. We also dissected a subset of salamanders to test the reliability of our measurements. Results suggest that most prey items exit the foregut of larval salamanders within 8 hrs. However, dissections identified more than expected variation in the shape of salamander digestive tracts, suggesting patterns may differ between size classes of salamanders. Our non-lethal technique for tracking digestion rates in salamanders seems promising, and we are continuing to analyze results to more effectively measure the time it takes prey to exit the foregut of salamanders. (119)

Landis, Sarah *, Brittany Smith, and Edward P. Levri. Penn State Altoona, Altoona, PA 16601. *The geotactic behavior of different clones of the invasive the New Zealand mud snail in response to fish odor*--The New Zealand Mud Snail, *Potamopyrgus antipodarum,* is known to exhibit geotaxis, which is the vertical response to light and gravity, and this behavior has been demonstrated to vary between different genotypes of the snail. The snail is also known to alter its behavior when it detects the presence of fish predators. The purpose of this experiment was to determine if there is also clonal variation in the geotactic response to the presence of predator- scented water. Both US invasive and native New Zealand clones of the snail were assessed for their geotactic behavior in the presence and absence of fish odor under both light and dark conditions. The snails were placed in a glass tube, oriented vertically, and timed for 2 minutes. After the allotted time period, the distance traveled was measured and the direction of snail movement was recorded (up or down). The data demonstrate that the highly invasive US1 clone displayed positive geotactic behavior when exposed to predator-scented water, but displayed negative geotactic behavior when exposed to plain water. The other non-native (and less invasive) clones (US3 and Ontario) exhibited negative geotaxis in both plain and predator- scented water. Native New Zealand clones also behaved differently than the US1 clone. These results suggest that differences in behavior may influence the invasion success of different genotypes of this species. (133)

Lazzeri, Amanda*, Evelyn Neunteufel. Misericordia University, Dallas, PA 18612. *Caching Behavior of the Eastern Gray Squirrel (Sciurus carolinensis) in Northeastern Pennsylvania*-- Do foraging eastern gray squirrels use perishability as a factor in deciding which nuts to cache and which nuts to eat immediately? Our hypothesis is that squirrels will cache intact, whole hazelnuts more often than hazelnuts with no shell or a cracked shell, because whole, intact hazelnuts will be less perishable in caches. Our prediction is that squirrels will cache whole, intact hazelnuts the most, followed by nuts in cracked shells (more perishable), with the least amount of caching instances occurring for nuts with no shell (the most perishable). Individual squirrels in the Kirby Park region in Edwardsville, PA were each provided with a single hazelnut either with an intact shell, or with a cracked shell or with no shell. We expected caching decisions in eastern gray squirrels (*Sciurus carolinensis*) to be determined by whether the nut is perishable (cracked shell or no shell) or not perishable (intact shell). Results showed that generally more hazelnuts were eaten than cached; 35% of the whole nuts offered were cached, but only 12% of the cracked nuts were cached and 18% of the nuts without a shell were cached. These preliminary findings indicate the importance of perishability in caching decisions since the least perishable nuts were cached the most often. Additional data will be collected in order to determine whether results

are significant and to analyze how different seasons may affect caching behavior in eastern gray squirrels. (129)

Maake*, Connor, Erika Hernandez*, Megan Rothenberger. Lafayette College, Easton, PA 18042. *Using data from a multiyear monitoring effort as a tool for assessing dam removal* – Increasing concerns about the environmental and economic impacts and public safety hazard of aging small dams have led to growing interest in dam removal as a means of river restoration. While the physical removal of the dam structure itself can be a relatively straightforward process, careful planning is necessary to limit the risk of impact on aquatic species. Although over 500 dams have been removed in the United States over the past two decades, there is relatively little information available to guide resource managers through a small dam removal project. In July 2010, shortly after the City of Easton submitted a proposal to the federal "2010 Open Rivers Initiative" for the permitting of several small dam removals along the lower Bushkill Creek, Lafayette students began collecting monthly data on water quality and macroinvertebrate assemblages above and below the three dams proposed for removal as well as three upstream control sites. The objectives of this study are to 1) continue pre-removal monitoring at these six sites and 2) analyze spatial and seasonal differences in water quality and macroinvertebrate abundance and diversity. Analysis of these preliminary data has indicated that dissolved oxygen, macroinvertebrate species richness and biodiversity, and disturbance-sensitive taxa are significantly more abundant in the shallow, high velocity waters of the sites below the dams. Analysis of seasonal changes in macroinvertebrate composition indicates that overall abundance is significantly higher in summer, but there is no significant difference in biodiversity among the seasons. The data collected as part of this multiyear monitoring study will be used to explore opportunities and make recommendations to reduce the impact of dam removal on aquatic life. (101)

Mackey, Matthew* and Cynthia Walter. Saint Vincent College, Latrobe, PA 15650. *Assessment of Physical, Biological, and Chemical Niche Features of Rosa multiflora in a Temperate Deciduous Forest in Southwestern Pennsylvania* - *Rosa multiflora*, or multiflora rose (RM), is an invasive plant of Japanese descent that is of particular interest in the eastern United States because of its ability to dominate forest understories. In order to study some parameters of its ecological niche, thirteen 314m^2plots of mature second growth forest were selected in Powdermill Nature Reserve (PNR) based on preexisting RM abundance data from a 2006-2008 vegetation survey conducted at PNR. Plots were studied in late summer and early autumn of 2013. Canopy cover densities were collected using a convex densiometer. Soil samples were analyzed at Penn State University's Agricultural Analytical Services Laboratory for soil chemistry, including pH and nutrient content. To judge whether RM is indeed excluding native plants, a vegetation survey of plant abundance was conducted in each study plot. Plant abundance was measured by counting individuals, and health was quantified by scoring herbivory and visible necrosis in terms of percent leaves affected. Using current canopy cover data, we obtained nearly a statistically significant relationship (P=0.06) using a linear regression model and determined that canopy cover density ranging from 64%-94% can explain 31% of the variation in RM abundance. *R. multiflora* displayed no sensitivity to pH across a tight range of 4.1 to 5.6. Regressions involving soil nutrient content showed that RM abundance did not respond to varied levels of nitrogen, potassium, and calcium. Specifically, the shrub showed no trend when it experienced a twenty-fold spread of soil calcium content (147 lb/A to 2744 lb/A). Likewise, RM showed no response to total basal area or total abundance of canopy species within each site. These results may have implications for management of RM in forested areas affected by the shrub's invasion. (125)

Madden, Shelby* and Garrett Barr. King's College, Wilkes-Barre PA 18711. *Effects of Marking Larval Salamanders on Their Survival in the Presence of Trout and Crayfish* – Mark- recapture is among the few techniques for effectively measuring the density of wildlife. However, the assumptions of mark-recapture techniques frequently remain untested. To test the assumption that marking salamanders does not affect survival in the presence of common stream predators, we measured the survival of unmarked two-lined salamander (*Eurycea bislineata*) larvae to those marked with a Visible Implant Elastomer (VIE). Our experiment included 5 replicates of 2 predator treatments: 1 brook trout (*Salvelinus fontinalis*) or 1 crayfish). Each 38 L tank contained 19 L of stream water, a natural mix of stream substrate collected with a 1 ft^2 Surber sampler, three marked salamanders, three unmarked salamanders, and one predator. After 1 week, we removed predators and carefully searched tanks for surviving salamanders. Marked salamander survival was higher in the presence of trout, and survival of marked salamanders was higher than unmarked salamanders in the presence of crayfish. Our results suggest that studies using VIE to mark salamanders may under estimate salamander density in streams with crayfish. Further research should address whether marks affect predation because of changes in salamander or predator behavior. (120)

Manchanayakage, Renuka, and **Janelle Geist*.** Susquehanna University, Selinsgrove, PA 17870. *Application of olefin metathesis in the synthesis of polyconjugated compounds* - Organic compounds with polyolefinic structure are frequently found in living systems. In the course of making some of these natural products, we were

interested to develop a practical synthesis for the preparation of polyenes which possess 1,3,3-trimethylcyclohexene as part of the molecule. The olefin metathesis using Grubbs ruthenium-based catalysts is widely and successfully applied in the synthesis of biologically active complex molecules. A series of starting compounds for olefin metathesis was prepared using Barbier-type allylation reaction. The beta-cyclocitral was reacted with different allyl halides using tin or zinc as the metal in various solvent systems. The tin-mediated allylation of beta-cyclocitral afforded the hydroxyl-elimination compound as the major product in good yields. These products were purified by flash column chromatography and characterized by NMR spectroscopy. The elimination products from Barbier reactions were then subjected to olefin cross metathesis using Grubbs first and second generation catalysts. (179)

Manchanayakage, Renuka, Hannah Kronenwetter*, and **Brian Etz*.** Susquehanna University, Selinsgrove, PA 17870. *Synthesis and applications of chiral pyrrolidinium-based ionic liquids* - Asymmetric synthesis is one of the most important areas of organic chemistry. The use of chiral solvents as the sole inducer of enantiomeric excess in organic reactions is a strategy that has been investigated previously. The difficult syntheses of chiral solvents and modest enantioselectivities often precluded their use. An attractive alternative to such solvents is chiral ionic liquids. Ionic liquids are nonvolatile, nonflammable materials with low or nonexistent melting points. Also, a significant transfer of chirality when used as a solvent in chemical synthesis can be expected due to their high degree of organization. This project focuses on developing efficient, economic and simple ways to prepare chiral ionic liquids. A series of pyrrolidinium-based chiral ionic liquids was prepared. The chirality was introduced by the lactate anion and the compounds were characterized by spectroscopic methods. The prepared chiral ionic liquids were then used in asymmetric Diels Alder reactions. (178)

Manchanayakage, Renuka, Dalyna Ngo*, and **Mbelu Kalala*.** Susquehanna University, Selinsgrove, PA 17870. *One-pot synthesis of chalcone epoxides: An environmentally benign protocol* - Chalcone derivatives are known for their antimicrobial activities. Epoxides of chalcones are important precursors for many organic transformations. The multi-step synthesis of chalcone epoxides have been reported previously. However, in recent years there has been an increased effort to introduce green chemistry principles into organic synthesis. Waste minimization is a very important aspect of an environmentally benign protocol. One-pot multicomponent processes and one-pot consecutive processes have been discovered that allow compounds to be prepared without having to isolate and purify the intermediates. A one-pot synthesis for chalcone epoxides has been developed. In this project, various chalcone epoxides were synthesized from benzaldehyde and acetophenone derivatives by one-pot consecutive reactions of aldol condensation and epoxidation. A low concentration of hydrogen peroxide was used as the epoxidizing agent. The final products were recovered in good yields. The epoxides were characterized by melting point analysis and IR and NMR spectroscopic methods. (180)

Manmiller, Sarah M. * and David R. Singleton. York College of Pennsylvania, York PA 17403. *Isolation of Sulfate Reducing Bacteria from Estuarine Water for the Bioremediation of Cadmium* - The purpose of this study was to isolate sulfate-reducing bacteria (SRB) for the potential bioremediation of cadmium. Humans are exposed to cadmium through heavy metal leaching from incinerator ash concrete and by ingesting crustaceans harvested from polluted ocean waters. Cadmium is particularly harmful to the kidneys and has been implicated to increase the risk of cancers and other diseases. In this study, we isolated five potentially novel SRB that most closely relate to *Clostridium* spp. These bacteria would be preferential for the bioremediation of cadmium since they have been shown to resist heavy metal toxicity at high concentrations and are able to render cadmium insoluble. In addition, these bacteria are anaerobic and therefor would be able to remediate contaminated mud. DNA sequences from these species can also be further analyzed for known and new cadmium resistance and remediation genes. (56)

Matthews, Stephen* and **Ronald Kaltreider,** York College of Pennsylvania, York, PA 17403. *Heat induced expression of a protein similar to HSP70 in size, found in* Hyphantria cunea *(Lepidoptera:Arctiidae)* – Heat Shock Protein 70 (HSP70) is a ubiquitous member of the HSP family noted to be involved in the thermotolerance of a host of organisms. *Hyphantria cunea* has been observed to successfully withstand temperatures exceeding that of their optimal range. The goal of this study was to determine the method behind the thermotolerance of *H. cunea*. We hypothesized that there would be a presence of HSP70 in *H. cunea* directly related to changes in temperature. This study was conducted by subjecting groups of live *H. cunea* to controlled environments experiencing different temperatures, ranging from 25ºC to 48˚C, to possibly induce HSP70 expression. Electrophoresis gels containing standardized samples of homogenized *H. cunea* were ran and subsequently stained with Coomassie Blue. The gels indicate a heat-induced expression of a protein that matches in size to HSP70. This observed protein gradient appears to be related to temperature in a direct fashion, increasing in concentration as the temperature increases. The gene expression of HSP70 was also examined through RT PCR, with forward and reverse primers made from HSP70 sequences conserved between two closely related species, *Manduca sexta* and *Lymantria dispar*. The results of this study provide links indicating HSP70 could be responsible for the thermotolerance of *H. cunea*. (32)

Melnyk, Alysha*. Susquehanna University, Selinsgrove, PA 17870. *Microbial Ecology of the Centralia, Pennsylvania Mine Fire: The Study of Sulfur-Reducing Bacteria* - In 1962, a mine fire began in Centralia, Pennsylvania that is still burning to this day and has the capacity to burn for decades more. The fire covers approximately three hundred acres, and has drastically modified both the local landscape and ecosystem. Soils overlying the fire have been shown to have elevated temperatures and sulfur levels due to the venting of hot, sulfur-rich gases from the fire below. Since the fire expands slowly, newly impacted microbial communities have the opportunity to adapt and evolve as the environment changes. Evolutionary studies of the microorganisms that reside in hot soils indicate that they are highly representative of the overall ecological impacts of the fire. This study is especially interested in the roles that local bacteria play in the biogeochemical cycling of the sulfur released by the mine fire, and the metabolic strategies these sulfur bacteria possess while surviving in this extreme environment. Preliminary studies show that the surviving microbial communities include sulfur-reducing bacteria, and thus it is hypothesized that Centralia could serve as an important source for industrially important sulfur-reducing bacterial isolates. Surface soil samples were collected adjacent to active vents and were used to inoculate both a Sulfate API Broth and a Sulfate-Reducing Medium with Lactate. Single colonies were isolated and are currently being identified using microscopy and 16S rRNA gene sequencing, while their capacity to metabolize sulfur will be analyzed via PCR with primers specific for genes involved in sulfur cycling. Metagenomic DNA isolated directly from the soil samples is also being analyzed using these primers. It is hoped that these culture- independent studies will lead to greater insight regarding the various species of sulfur-reducing bacteria dwelling in Centralia. (58)

Meyer, Alexandra* and David Singleton. York College of Pennsylvania, York, PA 17403. *Diversity of Bacterial Species Present in a Mouse Model throughout the Decomposition Process within Different Environments* - Valuable information can be obtained from a carcass during the decomposition process. This becomes especially true in the examination of a forensic investigation, as the main component in solving the crime is to first use this information to determine the time of death of the victim. Bacteria grow and thrive off of decomposing organisms, allowing microbial diversity and complexity to become a plausible method in estimating the time since death. The objective of this research was to investigate the diversity of the bacterial species present within tissue samples collected from decaying mice placed within two diverse environments. Bacterial DNA within the tissue samples was purified and analyzed using a specific DNA isolation protocol, polymerase chain reactions (PCR), agarose gel electrophoresis, and temperature gradient gel electrophoresis (TGGE). TGGE demonstrated a notable trend in that the bacterial species diversity progressed with the succession of each decay stage. Currently we are determining the species of bacteria via DNA sequencing. This study established a preliminary understanding of the progression of the bacterial diversity throughout decomposition, however much more comprehensive research needs to be completed in order to allow bacteria to become a forensic tool that can assist pathologists in accurately pinpointing the time of death. (54)

Minier, Sarah * and Dr. Garret Barr. Kings College, Wilkes-Barre PA 18711. *Chronic and Episodic Acidification of Fishing Creek: Effects on Two-lined Salamanders*-- Episodic and chronic acidification are persistent problems in many streams throughout the northeastern US due to acid deposition and poor buffering capacity in some watersheds. Acidification often results in reduced diversity and density of aquatic organisms. The Fishing Creek watershed located in Columbia and Sullivan counties is affected by episodic and chronic acidification, and our study focused on the degree to which acidification affects the presence and abundance of larval salamanders. We sampled five headwater tributaries of the East Branch of Fishing Creek and seven headwater tributaries of the West Branch of Fishing Creek in PA State Game Lands 13. We measured the pH of each tributary and captured larval two-lined salamanders (*Eurycea bislineata*) for 0.5 person hrs. Regression analysis showed an inverse relationship between pH and salamander abundance ($p = 0.025$, $R^2 = 0.41$). No salamanders were found at sites with a pH lower than 5.5. We find it interesting that the relationship between salamander presence and elevation is different in the 2 tributaries of Fishing Creek. Salamanders are present of the lower tributaries in the East Branch and the higher tributaries of the West Branch. Our initial impressions are that these patterns are related to differences in buffering capacity that are caused by the geology of the Fishing Creek watershed. We are continuing our investigation of the water chemistry and geology of Fishing Creek to develop a better understanding of their relationships to salamander abundance. (117)

Moyer, Brian*, Julia Eckenrode, Maureen A. Levri, and Edward P. Levri. Penn State- Altoona, Altoona, PA 16601. *Current versus future reproductive effort in Mountain Laurel (Kalmia latifolia)* – Trade-offs are predicted between traits that may compete for resources within an individual. Mountain laurel (*Kalmia latifolia*) produces variable numbers of inflorescences per plant and variable numbers of flowers per inflorescence. The purpose of this study was to determine the relationship between the size and number of inflorescences produced in a given year to the size or number produced subsequent years. One hundred twenty-five plants were utilized in the Seminar Forest on the Penn State Altoona campus. The number of inflorescences and the average

number of flowers per inflorescence were determined for each plant over the course of three consecutive years. The data from each year was correlated with each other year. The data comparing 2011 to 2012 and 2012 to 2013 suggests that increased floral output by a plant the previous year results in a decreased floral production the following year, and smaller floral output the previous year yields a greater floral production the following year. In addition, there was a significant positive correlation between reproductive efforts between 2011 and 2013. (166)

Mrozek, Christine* and **Dr. Jodi L.Yorty.** Elizabethtown College, Elizabethtown, PA 17022. *Recovery of Splenic Dendritic Cell Populations of C57BL/6 Mice after Treatment with Corticosterone*- The ability of the immune system to protect organisms from infection and the formation of tumors, can be adversely affected by the presence of stress hormones such as glucocorticoids. Dendritic cells, otherwise known as DCs, are a small population of immune cells that play an integral role in the immune response by activating T cells, and have been shown in previous experiments to be reduced in number by the glucocorticoids. These studies investigated the effects of the glucocorticoid, corticosterone (CORT), on the DC populations in the spleen of C57BL/6 mice. Mice were exposed to 150 μg/ml CORT for 24 hours. Spleens were either harvested immediately or on varying days post-CORT removal. Spleens were processed, analyzed via cell count, and DC populations were quantified by flow-cytometry. Results suggest that DCs are sensitive to CORT since exposure to this hormone decreased all splenic DC populations in comparison to control mice. All DCs demonstrated gradual recovery over a five- day period post-CORT removal, and recovery kinetics varied between subsets. Notably, the cross-priming subset of DCs appeared to recover the fastest, and the percent of this DC subset exceeded baseline levels present in control mice by day five. The percentage of all DCs recovered to baseline levels by 10 days post-CORT removal. At this time the percentage of T cells and other splenocytes had not achieved a full recovery. Some studies have suggested that elevated levels of DCs correlate to increased survival rates in certain transplant surgeries, and there has been use of DCs for immunotherapy trials. Knowledge of recovery rates could in theory help to determine when treatment times would be most successful. (29)

Nguyen*, Jacquelyn D. and **Eric P. Ingersoll.** Penn State Abington, 1600 Woodland Road, Abington, PA 19001. *Expression of Matrix Metalloproteinases by Invasive Breast Cancer Cells* – According to the American Cancer Society, breast cancer is the most common cancer in women. As with any cancer, breast cancer becomes most dangerous when the cancerous cells acquire the ability to invade into surrounding tissues. This invasion later leads to metastasis and an increase in the severity of the disease. One of the main tools that cancer cells use to mediate their invasive behavior is matrix metalloproteinases (MMPs). MMPs are a group of metal- containing enzymes that degrade many extracellular matrix proteins allowing cancer cells to invade, enter the circulation, and eventually spread and form tumors at other locations in the body. We have investigated the expression of MMPs in two breast cancer cell lines using RT-PCR. One is a non-invasive breast epithelial cancer cell line, the other is an invasive cell line derived by derived from the first by mutagenesis and selection. We have found that both cell lines express several MMPs and some differences in MMP expression are evident between these two cell lines. In addition, we examined the effects of exposing cells to specific MMP inhibitors on their invasive activity. We will present our data on MMP expression and the role of MMPs in the invasive behavior of these breast cancer cell lines. (23)

O'Donnell, Scott*, Nikki January* and Jane E. Huffman. East Stroudsburg University of Pennsylvania, East Stroudsburg, PA 18301. *Population Genetics of Wood Turtles (Glyptemys insculpta) in The Delaware Water Gap National Recreation Area, U.S.*A-- Wood turtles are listed under the International Union for Conservation of Nature (IUCN) as an endangered species. They are particularly sensitive to habitat destruction as they have a wide home range, which includes both aquatic, riverine habitat as well as terrestrial habitat depending on the time of year and their migratory patterns, while having limited mobility. A population of wood turtles in the Delaware Water Gap National Recreation Area (DWGNRA) has been monitored for several years and a current construction project required an updated study of this population. Blood samples were collected from nine turtles from the subcarapacial sinus. Ten microsatellite markers were employed to investigate the genetic variation and population structure of wood turtles in the DWGNRA. The results from our study were compared to a genetic study of wood turtles conducted in the park in 2004. Of the three new loci that were analyzed, two showed allelic diversity. The primer B21 showed five unique alleles while primer D114 showed four unique alleles in a sample size of 9 individuals. This may indicate that there is high allelic diversity at these loci across populations. Further study of other populations using these loci could be beneficial in the further comparison of populations of wood turtles in Pennsylvania and New Jersey. (115)

Chibueze Onwunaka* Dr. Dan Ressler Susquehanna University, Selinsgrove, Pennsylvania 17870 *The New Carbon Cycle*-- Rapid changes in atmospheric carbon dioxide concentrations, particularly since the Industrial Revolution, suggest humans have disrupted the global carbon cycle. Biofuels represent a means of an energy source that could use atmospheric carbon rather than fossil carbon. A closed combustion system might feature exhaust collected directly to be used to grow a biofuel like

algae. Two different engines were run: a 4-cycle gasoline engine (a lawn mower) and a diesel engine (John DeereTM Gator) and their exhaust gas was run through piping and water to create bubbles to allow the exhaust carbon dioxide contact time with water to dissolve and create H2CO3 and other dissolved carbon substances. Preliminary results demonstrated that with the device attached to the mower we collected nearly 5% of the carbon inputted into the mower. Carbon collected in the water is used to grow algae along with a solution that provides additional nutrients used with liquid collected from the mower and gator. At 0, 10, 20, and 30 minute intervals of gas collection 24 bottles were used in the process of algae growth and the carbon from the exhaust gas becomes the limiting nutrient for the algae. By utilizing the carbon collected in the water, algae are grown along with a solution that provides additional nutrients. Algae grown in the exhaust enriched solutions were harvested to determine the carbon recovery rates. (171)

Ortiz, Michaela A.*, Chelsea Mahoney, and Dr. André Walther. Cedar Crest College, Allentown, PA 18104. *Identification of Proteins that Physically Interact with Replication Protein A in a Phosphorylation Dependent manner in the budding yeast Saccharomyces cerevisiae.* – Cancer is a serious disease that can arise from unrepaired DNA damage or by the incorrect repair of the DNA damage. Replication Protein A (RPA) is a single stranded DNA binding protein involved in processes such as DNA replication and DNA repair. To effectively function in a process such as DNA repair, RPA physically interacts with other proteins involved in these processes. Defects in these physical interactions with RPA are likely to lead to defects in the function of RPA in DNA repair and replication, and may lead to an increased likelihood of cancer. RPA can also become phosphorylated in a cell cycle dependent manner and in response to DNA damaging agents, and biochemical evidence indicates that phosphorylation of RPA can affect which proteins are capable of interacting with RPA. Therefore, this project specifically focused on identifying the proteins are interacting with RPA in a phosphorylation dependent manner. A yeast two-hybrid assay was used to screen for phosphorylation dependent protein- protein interactions in yeast RPA (RFA, Replication Factor A). So far there have been seven of ninety screened yeast proteins that have shown a phosphorylation dependent interaction. We are in the process of identifying these proteins, and have discovered one potential candidate (SIM1) that both interacts in a phosphorylation dependent interaction with RPA and may be involved in DNA replication. In the future these proteins, such as SIM1, will be investigated in more detail in order to potentially lead to a better understanding of the underlying causes of cancer. (38)

Allison Osborne*, Alicia Zook, Audrey J. Ettinger, and K. Joy Karnas. Cedar Crest College, Allentown, PA 18104. *Using a* Gallus gallus *cell line to Investigate the Effectiveness of Herbal Remedies in Preventing Cell Death.*— It has been suggested that the herbal supplement *Ginkgo biloba* may act as a neuroprotective agent to prevent neuronal apoptosis following ischemic stroke. Previous studies used glutamate to induce apoptosis in primary *Gallus gallus* neurons, and subsequently examined the ability of *Ginkgo biloba* to block this response. A drawback of these studies, however, is that differentiated neurons do not divide in culture, limiting the quantity of cells for experiments. For that reason, this study focuses on an established *G. gallus* cell line, DT40 cells, which were derived from immortalized lymphoblasts. DT40 cells were cultured and exposed to glutamate to induce apoptosis. After RNA isolation from treated and untreated cells, q-rtPCR was used to identify specific genes with altered expression. The second part of this study involved treatment with *Ginkgo biloba* in an attempt to rescue the cells from apoptosis, followed by assessment of differences in gene expression. Our long term goal is to apply information learned in DT40 cells to chicken neurons to better understand the efficacy of using *Ginkgo biloba* as an anti-apoptotic treatment following ischemic stroke. (31)

Paul, David*, Dr. Douglas S. Glazier. Juniata College, Huntingdon, PA 16652. *Effects of Temperature and Predation Regime on the Body-size Scaling of Activity in the Freshwater Amphipod Gammarus minus* - Previous work in our laboratory has shown that the scaling of resting metabolic rate with body mass in the freshwater amphipod crustacean, *Gammarus minus*, varies with temperature and predation regime. Surprisingly, the temperature-related variation did not completely conform to predictions of two different theoretical models of metabolic scaling. A possible explanation for this unexpected variation may be thermal stress, resulting in unseen increases in activity. If so, we may have measured active rather than resting metabolic rates, thus explaining deviations from metabolic scaling theory. To test this hypothesis, we determined the effect of temperature on the activity of *G. minus* from the previously tested populations. Activity, measured as body lengths moved per minute, was recorded from four populations of *G. minus*, factorially varying in predation (present/absent) and temperature (10/17 °C). Surprisingly, the data did not suggest a relationship between dry body mass and activity ($r^2 < 0.35$). When calculated independently of body size, a Kruskall-Wallis one-way analysis of variance suggested that activity positively correlated with temperature. This observation is similar to that seen in ant species (Shapely 1920). Activity did not appear to be affected by native temperature or predation regime. These data do not support the hypothesis that temperature- related variation in metabolic scaling is due to thermal stress. (190)

Perkins, Ashley G.*, Deborah S. Austin, Rebecca M. Smith. Wilson College, Chambersburg, PA 17201. *Quantitation of Epigallocatechin (EGC) and Epigallocatechin Gallate (EGCG) in Green Tea Supplements* - Due to the lack of FDA control and consistency of catechin levels in green tea supplements, analysis of various brands of green tea supplements was done via High Performance Liquid Chromatography (HPLC) and compared to the manufacturer's claims. Five different brands of green tea supplements with different quantities of green tea catechins were analyzed. Preparation of the green tea supplement samples consisted of dissolving 1mg from a capsule/tablet in 1mL of a solvent containing 1:1 methanol: 0.5% acetic acid. Samples were sonicated for 20 minutes to ensure a homogenous sample. Samples were filtered using a 25 micron filter, and then 20 microliters was injected into a Zorbax eclipse plus C18 column. Elution was done at a rate of 1mL/mL using a solvent system of 88% deionized water/0.5% acetic acid solution and 12% acetonitrile/0.5% acetic acid. Tryptophan was used as the internal standard and peak area ratios were determined. The Epigallocatechin (EGC) and Epigallocatechin Gallate (EGCG) quantities were consistently low in this study. In addition, an unexpected peak was detected in two of the brands, which was determined to be caffeine, even though the manufacturer made no claim that the supplement contained caffeine. The results of this study support the need for the FDA to regulate supplements and require standardized manufacturing practices and quality control methods, along with requiring complete and reliable labeling information provided by manufactures, in order to ensure the safety of consumers. (42)

Pheasant, Michael S.*, Nicholas R. Hendry, Timothy A. Kennedy, Barbara J. McCraith. Misericordia University, Dallas PA 18612. *Macroinvertebrate functional feeding group distribution and diversity in leaf packs of varying species*-- Functional feeding group distribution and diversity in different species of leaf litter can help determine the impact allochthonous input has on the benthic macroinvertebrate community. The functional feeding groups that were examined were filtering-collectors (FC), scrapers (SC), shredders (SH), gathering-collectors (GC), and predators (PR), found within *Acer rubrum, Quercus bicolor*, and mixed species leaf packs. Leaf packs of *Acer rubrum*, *Quercus bicolor,* and both species mixed were placed in Trout Brook in November 2013. The leaf packs were removed at 4 intervals (2, 4, 8, and 12 weeks) from November 2013 through January 2014. After preliminary analysis, a consistent pattern was found in the distribution of benthic macroinvertebrates in all three types of leaf packs. The dominant functional feeding group was the filtering collectors. High numbers of chironomid larvae contributed to the dominance of the filtering collectors. (100)

Pratt, Jessica L.* and Bradley G. Rehnberg. York College of Pennsylvania, York, PA 17403. *The Behavioral Effects of Aspartame Exposure to Black Planaria (Dugesia dorotocephala) – A*spartame is a popular artificial sweetener used in a large array of products. There is an ongoing debate among researchers whether aspartame causes developmental, behavioral, or neurological effects. This study investigated whether changes in behavior of the black planaria (*Dugesia dorotocephala)* occurred after periodic exposures to low (0.001 M) and high (0.01 M) aspartame concentrations. The control, low, and high concentration groups were kept in separate glass dishes and given fresh water every 3 days after a feeding. Exposures to aspartame or control water occurred in microcentrifuge tubes for 2 hours. This protocol proceeded for 29 days where single-blind observations were recorded every other day. Based on previous research, we observed head bopping, squirming, twitching, head swinging, and inch worming. There were no significant differences in head bopping, squirming, and twitching behaviors across the 3 groups and over the 29-day observation period. For head swinging behavior, there was no difference across the 3 groups but there appeared to be an increase in activity over time. The mobility of all groups steadily decreased from days 1- 29. In conclusion, aspartame at our test concentrations did not produce overall deleterious effects on the behavior of the planaria. (195)

Rebuck, Alexandra* and Tammy Tobin. Susquehanna University 514 University Avenue Selinsgrove, Pa 17870. *Identifying Novel Actinomycetes in Centralia Mine Fire Soils.* Mesophilic actinomycetes currently play critical roles in the development of antibiotic and antifungal drugs. However, the increasing number of antibiotic-resistant microbial strains dictates that novel antibiotics and treatment options will be needed in the future. Thermophiles may be particularly important sources of these new antimicrobials. Thus, our research will focus on the identification of novel actinomycete species in coalmine fire-affected soils. Last fall, three soil samples (taken from soils of 39.44˚C, 52.78˚C, and 62.78˚C respectively,) were removed from boreholes in Centralia, Pennsylvania. A MoBio Powersoil DNA Isolation Kit was then used in order to isolate DNA directly from the soil and to remove as many humic contaminants as possible. This spring, these soil samples will be analyzed for the presence of novel actinomycetes using PCR with primers specific for both the 16S rRNA genes and the polyketide synthase genes, which are involved in the biosynthesis of secondary metabolites, including antibiotics. The resulting PCR products will be sequenced to identify resident actinomycete species. These culture-independent analyses will complement the lab's ongoing culture-based efforts to isolate thermophilic actinomycetes. (59)

Reichart, Nicholas J.*, Bridgette E. Hagerty and Carolyn F. Mathur. Department of Biological Sciences, York College of Pennsylvania, York, PA 17403. *Rate of Biofilm Formation is Influenced by the Bacterial Composition in Mixed Cultures* – Biofilm formation involves many complex interactions that are influenced by the species of microbes present. In order to study these interactions, we compared the rates of biofilm formation using *Pseudomonas aeruginosa* (Pa), *Escherichia coli* (Ec), *Staphylococcus aureus* (Sa), and *Bacillus cereus* (Bc). We measured each bacterium alone and in paired combination with each of the other three organisms. Using staining procedures and spectrophotometry, biofilm growth was quantified at 0, 6, 24 and 48 hours. Absorbance (OD) was compared across bacteria and time using a two-way ANOVA followed by Tukey multiple comparisons. Pa was the most robust biofilm producer at 0.46abs/hr. In comparison, Ec biofilm production was 0.11abs /hr., followed by the weakest producers, Sa at 0.04abs/hr. and Bc at 0.03abs/hr. Pa significantly increased the rate of biofilm formation of individual Sa, Bc or Ec cultures when grown with each of them in combination. Sa and Bc significantly decreased the rate of biofilm formation of Ec. Pa rapidly formed biofilms, whether alone or in combination with other bacteria. The latter is probably due to the PA growing faster than the others in the mixed cultures. Explanations for the inhibition of Ec biofilm formation by either Sa or Bc is not so readily apparent and requires further studies. (53)

Rhodes, Alexander A.* and Lou Ann Tom, Ph.D. Susquehanna University, Selinsgrove, PA 17870. *Preparation of a molecularly imprinted polymer for the selective retention of the insecticide fenvalerate.* Several molecularly imprinted polymers (MIPs) were synthesized to selectively bind fenvalerate, an insecticide, for isolation and concentration in aqueous samples. The goal is to develop a polymer that can be used either in a solid phase extraction cartridge for the concentration of fenvalerate from dilute environmental samples, or for direct analysis of the compound by packing the solid into an HPLC column. One MIP was prepared using β- cyclodextrin and toluene-2,4-diisocyanate in dimethylsulfoxide with fenvalaerate as the target analyte. Using HPLC, an external standard curve was prepared and the amount of fenvalerate removed from the polymer by washing was determined to be 74%. This "test" polymer and an additional "control" polymer prepared without fenvalerate were evaluated for selectivity by adding fenvalerate in a water/ethanol mixture to each polymer placed in a small beaker. Solutions were stirred overnight, and the supernatant was removed for HPLC analysis to determine if the fenvalerate had remained in the imprinted "pockets" of the test polymer compared with the non-imprinted control polymer. No significant difference in the amount of fenvalerate in the supernatant of the two polymers was found. Similar results were found using other solvents for evaluation. A second set of MIPs was prepared using methacrylic acid as the monomer, ethylene glycol dimethacrylate as the crosslinker, and 2,2'-azobisisobutyronitrile as initiator in chloroform. This set of polymers is currently being evaluated for its ability to selectively retain the target compound when compared with the non-imprinted, control polymer. (43)

Rhodes, Bradleigh, Matthew Bruer*, and **Geneive E. Henry.** Susquehanna University, Selinsgrove, PA, 17870. *Chemistry of the hexane extract of Hypericum stragulum* - The *Hypericum* plant genus is well known as a source of biologically active natural products, with acylphloroglucinol derivatives being the most important class of compounds. *Hypericum hypericoides ssp. multicaule (H. stragulum)*, is one of nineteen *Hypericum* species growing in Pennsylvania. A subspecies of *H. hypericoides* growing in Jamaica produced a series of polycyclic polyprenylated acylphloroglucinol derivatives, which inhibit HIV infection and display cancer chemopreventive activity. The hexane extract of *H. stragulum* was investigated to compare its chemical constituents to those of the Jamaica *hypericoides* species. The isolation and structural elucidation of natural products from *H. stragulum* will be presented. (174)

Rhodes, Bradleigh*, Alexander Rhodes, and **Geneive E. Henry.** Susquehanna University, Selinsgrove, PA, 17870. *HPLC analysis of the phenolic constituents of Hypericum species from Pennsylvania* - The *Hypericum* plant genus contains over 450 species divided into 36 taxonomic sections. This study was aimed at determining the phenolic composition of methanol extracts of ten Pennsylvania *Hypericum* species, divided into five taxonomic sections: Hypericum (*H. perforatum, H. punctatum*), Brathys (*H. canadense, H. gentianoides*), Myriandra (*H. densiflorum, H. ellipticum, H. prolificum, H. stragulum*), Roscyna (*H. pyramidatum*) and Trigynobrathys *(H. mutilum*). The presence of eleven polyphenolic compounds of pharmacological importance (chlorogenic acid, caffeic acid, rutin, quercitrin, isoquercitrin, quercetin, hyperoside, luteolin, myricetin, kaempferol, apigenin) was evaluated by reversed phase high performance liquid chromatography. The data indicate that all ten species, contain quercitrin and isoquerictrin, with most species containing significant levels of both. Varying amounts of chlorogenic acid, caffeic acid, hyperoside and rutin were found in some species, but apigenin, luteolin, kaempferol, myricetin and quercetin were not present in significant amounts in any of the species investigated. (175)

Roche, Kathryn* and **Steven A. Bloomer**. Penn State Abington, Abington PA, 19001. *Is thioredoxin-1 protein expression altered in a model of aging and hyperthermia?*-- Increased levels of oxidative stress and a reduced capacity to tolerate common stressors are two hallmarks of aging. Environmental heat stress is a stressor associated with high

rates of morbidity and mortality in the elderly. The liver is particularly susceptible to hyperthermia, and oxidative damage to this organ results in liver dysfunction. The purpose of this study was to evaluate the effects of aging and heat stress on the expression of thioredoxin-1 (Trx-1) in the liver. Trx-1 is a protein that protects against oxidative stress, and little is known about its expression after heat stress in an aging model. Young (6 mo) and old (24 mo) Fischer 344 rats were exposed to a two- heat stress protocol, and livers were harvested at several times after the second heating bout. Hepatic expression of Trx-1 was evaluated by immunoblot and immunohistochemistry. By immunoblot, levels of Trx-1 were similar between age groups and were not affected by heat stress. In liver sections, Trx-1 was localized primarily to hepatic macrophages (Kupffer cells) and biliary epithelial cells (BEC), with low expression of Trx-1 in hepatocytes. Double-staining for Trx-1 and heme oxygenase-1 (HO-1; a macrophage marker) confirmed Kupffer cell expression of Trx-1. Similarly, double-staining for Trx-1 and cytokeratin-19 (CK-19) confirmed BEC expression of Trx-1. Overall, our results suggest that Trx-1 is not upregulated in this model of aging and hyperthermia. However, this study provides important information on the localization of Trx-1 in liver tissue. To our knowledge, robust expression of Trx-1 in BEC has not yet been reported. This study raises important questions as to the function of Trx-1 in BEC, and the significance of its pronounced expression in this cell type. (198)

Routson, Zachary J.*, Steven Jacob, and **Ronald Kaltreider.** York College of Pennsylvania, York, PA 17404. *Social Factors, Demographic Characteristics and Disease-associated Emotions and Effects on Diabetes Self-care and Nutrition Regime Adherence*-- Over 25% of Americans suffer from or are at risk of developing diabetes mellitus at a cost of over $245 billion dollars annually. Decreasing the occurrence of this highly preventable disease should be paramount in combatting the escalating costs that hinder access to health care. The purpose of this study was to identify factors that influence compliance and adherence of diabetic care plans and nutritional regimes. Understanding and highlighting these factors allow for the patient and physicians to overcome the obstacles that lead to lower than expected health outcomes and patient satisfaction. A survey was conducted using a questionnaire designed to collect responses from people with Types 1 and 2 diabetes mellitus within a primary care practice in South Central Pennsylvania. The questionnaire was designed to elucidate common social pressures and preconceived ideas of the disease, nutrition and fitness and how they affect the day to day management of diabetes mellitus. Chi-square analysis, word association and latent factor analysis were performed on survey data. We established relationships between demographic characteristics, social factors and disease-associated emotions on compliance and adherence to care plans, diet regimes, health outcomes and overall patient satisfaction. These relationships should be considered by dieticians, primary care physicians and diabetic educators when establishing individual diabetic care plans to improve patient outcomes. Understanding the factors that influence disease progression, other than medical factors, can lead to improved health outcomes and increased patient compliance and satisfaction. While our study suggested a relationship between specific social and demographic characteristics and disease management, more data are needed to develop these relationships in greater depth. (64)

Ruck, Rachel,* and Diane Bridge. Elizabethtown College, Elizabethtown, PA 17022. *Production of chimeric Hydra to examine effects of gamete precursors on aging* -- Existing data suggest that *Hydra vulgaris* do not show increased mortality with age. In contrast, members of the related species *Hydra oligactis* have a limited lifespan following reproduction. Adults of both species have extensive regenerative ability. They possess stem cells termed interstitial stem cells, which give rise to nerve cells, gametes, and stinging cells. In other animals, signaling by germ cells affects lifespan. In *Hydra*, it is possible to eliminate interstitial cells from one individual and repopulate its tissues with interstitial stem cells from a donor individual of the same species. To investigate the role of cells which form gametes in *Hydra* aging, we are working to produce *H. vulgaris* with interstitial cells from *H. oligactis*, and *H. oligactis* with interstitial cells from *H. vulgaris*. We are using colchicine and hydroxyurea to selectively eliminate the rapidly dividing interstitial cells from recipient animals. Treated *Hydra* of one species are grafted to untreated animals of the other species to allow interstitial cells to migrate into the body of the previously interstitial-cell-free animal. To date, we have not found that *H. vulgaris* interstitial cells are able to survive in host *H. oligactis*. Should production of chimeric *Hydra* be successful, numbers can be increased through asexual reproduction, and animals will be examined to document the effect of the introduced gamete precursor cells on aging. (66)

Rummel, Shawn* and **Amy Wolfe.** Trout Unlimited, Eastern Abandoned Mine Program, Lock Haven, PA 17745. *Recovery of Native Brook Trout Populations and Benthic Macroinvertebrate Communities Following Treatment of Abandoned Mine Drainage Pollution* – Water quality degradation as a result of abandoned mine drainage (AMD) is prevalent throughout the native range of the Eastern brook trout. AMD impacts water quality primarily by decreasing pH and elevating toxic metal concentrations, creating conditions that are unsuitable for most aquatic life. In Pennsylvania and West Virginia alone, AMD pollutes over 8,000 miles of streams. The West Branch Susquehanna watershed is the largest of the six major subbasins comprising the Susquehanna River basin. The watershed is located in northcentral Pennsylvania and

includes some of Pennsylvania's most pristine waters, as well as over 1,200 miles of AMD polluted streams. Over the past 20 years, numerous restoration efforts have been completed throughout the watershed to mitigate AMD and restore native brook trout populations. The goal of this study was to monitor the aquatic biological community response to AMD treatment over time in the lower portion of the Kettle Creek watershed (approximately 50 square miles in area), a tributary to the West Branch Susquehanna River. Overall, dramatic improvements in water quality have been observed. In addition, benthic macroinvertebrate diversity has increased, including a shift from pollution tolerant taxa to the presence of pollution sensitive taxa. Brook trout populations have also demonstrated a significant increase in biomass and density following restoration. These results will aid in the prioritization of AMD restoration efforts and guide management of native brook trout populations in areas once polluted by AMD. (102)

Scalo, Christian* and Frank Martin. Immaculata University, Immaculata, PA 19345. *The Dynamics of Yeast Metabolism as Reflected through Changes in Hydrogen Ion Concentrations* - In the natural world, organisms typically use one of two main forms of respiration to convert the energy stored in chemical bonds into useable metabolic energy: aerobic (oxygen dependent) and anaerobic (oxygen independent) respiration. While some organisms that use anaerobic respiration can survive in the presence of oxygen, other organisms (such as humans) that utilize aerobic respiration cannot survive in the absence of oxygen. Yeast, however, is an exception found in the animal kingdom, and consequently, is capable of using both forms of respiration. Such an atypical characteristic appears to be demonstrated by the measurement of hydrogen ion concentrations (pH) in both the presence and absence of oxygen, within the confines of a carefully controlled system. In this presentation, we report on the results of a properly controlled investigation into the characteristics of yeast metabolism, with findings that demonstrate the dynamics of such respiration under aerobic and anaerobic conditions. (40)

Scholl, Logan*. Susquehanna University, Selinsgrove, PA 17870. *Measurements of ambient ammonia using an ion mobility spectrometer* - Ammonia is the predominant basic gas in the atmosphere and is emitted primarily from agricultural activities. After emission, gas phase ammonia can react with sulfuric and nitric acids to create ammonium sulfate and ammonium nitrate particles, which are harmful to human health. In addition, ammonia can be incorporated into rain, fog, and dew where it can neutralize acidic species and raise pH values. Removal of ammonia from the atmosphere through dry or wet deposition can influence biological activity and is a major source of nitrogen to some ecosystems. To learn more about ammonia, an ion mobility spectrometry (IMS) was used to measure ambient ammonia concentrations at 10 s intervals in Selinsgrove, PA starting in May, 2013. The IMS accuracy was evaluated by making comparisons with simultaneous denuder measurements of ammonia concentrations. Phosphorous acid coated denuders were used to collect ammonia over 12 hour sample periods which were followed by extraction and analysis by ion chromatography. Good agreement was observed between the denuder method and the IMS for concentrations up to 10 ppb. Above 10 ppb the IMS reported higher concentrations than the denuders. Based on the IMS data, higher ammonia concentrations were observed during the spring than during the summer or fall. The IMS data also showed a diurnal trend during some periods with higher ammonia concentrations during the day and lower concentrations at night. This trend may be caused by the removal of ammonia to dew covered surfaces at night. Chemical analysis of multiple dew samples showed that ammonium was the dominant ionic species in dew, supporting this theory and illustrating the significant role that ammonia plays in this region. (183)

Selby, Jessica* and **Bradley Rehnberg.** York College of Pennsylvania, York, PA 17403. *The short-term effects of green tea consumption on physical fitness through voluntary exercise of male CD-1 mice* – Green tea contains catechins that have been linked to increased longevity while additionally having short-term impacts. The short-term effects of basal metabolic rate (BMR) and voluntary running time were evaluated using mice for a 12-week period. Green tea was prepared at low (0.1%) and high (0.25%) concentrations and provided to 2 test groups, *ad libitum*, along with a control group given water. Mice were individually placed in a test container with free access to a running wheel and total distance run was recorded biweekly. Oxygen consumption, using indirect calorimetry, and body weight were taken weekly. The running distance by the high concentration group was greater than low and control groups by week 8. No significant differences were seen in BMR among groups. The low concentration group did not gain as much weight as high and control groups after week 7. As hypothesized, drinking green tea had beneficial effects on willingness to exercise and weight gain. These results likely happened through various pathways, not solely due to increased metabolic rate. The results of this study may ultimately have relevance to strategies for human diet and exercise programs. (196)

Shields, Tyler *, Ahmed Lachhab. Susquehanna University, Selinsgrove, PA 17870. *Application of Multiple Geophysical Method to track water table fluctuation at the CEER, Selinsgrove, PA* -- Electrical Resistivity Tomography (ERT) and Ground Penetrating Radar (GPR) were used to track water table fluctuations and compared to the ground water levels from five monitoring wells at the Center for Environmental Education and Research (CEER) at Susquehanna University. ERT and GPR are approaches that

have been used separately to investigate the level of water table in near surface investigation yet rarely combined. In this study, the following methods were used collectively to assess the water table levels and to determine which method or combination of methods is/are most effective to identify the water table in shallow groundwater aquifers. In this study, ERT and GPR results showed similar results. During the summer 2013, ERT was performed and data was collected for different water levels. Water level meter was used in all five observation wells to monitor water level depth while monitoring geophysical techniques were implemented. Multiple ERT surveys were completed at different electrode spacings which upon interpretation showed as the electrical spacing decreases (from 2 to 0.25m) the water table is detected accurately. Large electrode spacing (2m) provided a better overall site understanding including the local geology. (112)

Smith, Brittany *, Sarah Landis, Christina Lehman, and Edward P. Levri. Penn State Altoona, Altoona, PA 16601. *Diet associated with different habitats influences the growth rate of the invasive New Zealand mud snail (Potamopyrgus antipodarum)*--The invasive New Zealand mud snail, *Potamopyrgus antipodarum,* has been present in the Laurentian Great Lakes for at least 20 years. Recently, the snail has spread to streams that empty into Lake Ontario. In the deep waters of Lake Ontario, detritus is the common food source for the snails; while in streams periphyton becomes an important part of their diet. This experiment tests the hypothesis that a diet of periphyton will lead to a higher growth rate. Benthic sediment was collected from the bottom of Lake Erie. Periphyton was grown on small rocks collected from Spring Run on the Penn State Altoona campus. Eighty juvenile snails (0.6-1.0 mm in length) were placed individually into plastic cups of four treatments: control snails that were fed *Spirulina* powder, snail kept in lake sediment, snails reared on rocks with periphyton growth, and snails in a combination habitat of rock and lake sediment. After six weeks, the snails were measured again. Snails in the periphyton only treatment had the highest growth rate while snails in the detritus plus periphyton treatment had the second highest growth rate. The control snails and detritus only snails had a similar low growth rate. These results suggest that the movement of these snails from a lake to a stream environment may increase their individual and possibly population growth rates, thus increasing their invasion success. (132)

Smith, Cara* and Alissa Packer. Susquehanna University, Selinsgrove, PA 17870. *Aboveground and belowground interaction of hydrogen cyanide and extrafloral nectary expression in Lima bean (Phaseolus lunatus)*--Plants defend themselves by use of physical, chemical, and biotic defenses. These defenses can exhibit constitutive and induced expressions. There appears to be an evolutionary explanation for different patterns of expression with regards to trade-offs. Plants exhibit a higher reliance on constitutive defenses when attack probability is high and induced defenses when attack probability is low. Constitutive defenses require more energy, but are ready to protect plants. There are also links between aboveground and belowground damage and defense. Damage to leaves can cause a defense response in roots and vice versa. Lima bean (Phaseolus lunatus) was used to investigate the aboveground and belowground interaction of plant defense regarding hydrogen cyanide (HCN), a constitutive defense, and extrafloral nectaries, an induced and constitutive defense. Plants will receive either no damage, leaf damage, root damage, or both leaf and root damage. Hydrogen cyanide potential (HCNp) will be measured spectrophotometrically using a spectroquant cyanide test. Number of extrafloral nectaries will be observed in comparison to damage and HCNp. We expect higher levels of HCNp in leaves when leaves are damaged over root damage, and higher levels in roots when roots are damaged over leaves. Highest levels of HCNp when both leaves and roots are damaged, and there will be higher levels in leaves than roots. Number of extrafloral nectaries will be higher when roots are damaged over leaf damage.There also appears to be a trade-off between HCNp and number of extrafloral nectaries. As HCNp increases, there will be a lower increase in extrafloral nectaries. More investment is directed towards HCN production as it is a more immediate defense that does not involve a third party. (164)

Smith, Loretta*, Darya Dimchenko*, and **Steven A. Bloomer.** Penn State Abington, Abington PA, 19001. *Evaluation of SIRT3 and MnSOD protein expression with aging and environmental heat stress* - The liver is crucial in regulating homeostasis; therefore, damage to this organ can have an adverse effect on overall well-being. A stressor that can injure liver cells is environmental heat stress. With aging, the effects of heat stress become more severe; older organisms display more liver damage after hyperthermia than younger organisms. The production of reactive oxygen species (ROS) from the mitochondria is also increased with aging, which contributes to liver injury. Cells have many proteins that defend against ROS. One family of proteins implicated in stress defense and longevity are the sirtuins, which are deacetylase enzymes. Sirtuin 3 (SIRT3) is a mitochondrial deacetylase that indirectly reduces ROS by deacetylating and therefore activating the ROS-scavenging enzyme, manganese superoxide dismutase (MnSOD). The purpose of this experiment was to evaluate the expression of SIRT3 and MnSOD via immunoblot in young (6 mo) and old (24 mo) Fischer 344 rats after a two-heat stress protocol. At 2 and 24 h after the second heat stress, livers were harvested from each age group, and then mitochondrial samples were isolated. Nonheated animals served as controls.

There was an overall age effect, with old rats displaying higher levels of SIRT3 than the young rats. At 2 and 24 h

after heat stress, the levels of SIRT3 increased in both age groups. MnSOD also increased at 24 h after heat stress, but there was no difference with aging. Our results show a novel response to heat stress in young and old rats. Since SIRT3 and MnSOD are both protective, their induction after heat stress may represent an adaptive response that protects against heat-induced damage. (197)

Steinhauser, Paul* and Cynthia Walter. Saint Vincent College. Latrobe, PA 15650. *Cell Cytotoxicity and Antimicrobial Properties of Extracts from the plant, Tamarindus indica* - With the bourgeoning advancements in the world of synthetic pharmaceuticals, the use of herbal substances may sometimes be overlooked. *Tamarindus indica* (*T. indica*) is a large evergreen tree grown throughout the tropics. Different tree tissues are used to treat different ailments ranging from gastrointestinal issues to surface wounds and infections. The antimicrobial properties of *T. indica* have been researched, yielding more than supportive results; however, this does not prove its practicality or safety in real world scenarios. The purpose of this study was test antimicrobial properties of extracts using different antibiotic resistant strains of *Staphylococcus aureus* bacteria, standard strain (SSSA) and methicillin resistant (MRSA), as well as human cell cytotoxicity. Fruit pulp and seeds (PS) and leaves (L) were boiled in water for 1 minute and extracts were macerated, centrifuged and passed through a 0.2 um filter. Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) assays were performed for SSSA and MRSA to ensure antimicrobial activity in a 24 hrs. exposure to extracts. Results showed significant antimicrobial activity for concentrations of both PS and L exceeding 16.56 mg/µL. Cytotoxicity testing of human dermal fibroblast cells treated before undergoing a Cell-Titer Blue Assay, a measure of mitochondrial metabolism, showed cell tolerance for PS concentrations of 6.22 mg/µL or below. At that dose, cell metabolism, when compared to controls, was decreased by 10% after 18 hrs. incubation and 62% after 24 hrs. In summary, more testing must be done regarding the practicality of *T. indica* application and the time frame needed to ensure effectiveness and safe use. (52)

Szczytkowski-Thomson, Jennifer*[1], Christina Lebonville[2] and Donald Lysle[2]. [1]Messiah College, Grantham, PA 17055; [2]The University of North Carolina at Chapel Hill, Chapel Hill, NC 27599. *Opioids prevent the expression of fear in an animal model of post-traumatic stress disorder*--Post-traumatic stress disorder (PTSD) is a chronic and debilitating anxiety disorder characterized by exaggerated fear and/or anxiety that may develop as a result of exposure to a traumatic event. The current study utilizes the stress enhanced fear learning (SEFL) animal model of PTSD to investigate the pharmacotherapeutic use of opioids as a preventative treatment for PTSD. Rats are exposed to a severe stressor (15 foot shocks) in one environment (Context A) and then subsequently exposed to a milder form of the same stressor (single foot shock) in a different environment (Context B). Animals that did not receive prior shock treatment exhibit fear responsiveness to Context B in line with the severity of the single shock given in this context. As with previous studies, animals that had received prior shock treatment in Context A exhibit an exaggerated fear response to Context B. Furthermore, animals receiving a single dose of morphine immediately following the severe stressor in Context A continue to show an enhanced fear response in Context B. However, animals receiving repeated morphine administration (three injections separated by 24 hours) after exposure to the severe stressor in Context A or a single dose of morphine at 48 hours after the severe stressor did not exhibit an enhancement in fear learning to Context B. These results indicate that morphine treatment following a severe stressor may be useful in preventing or reducing the severity of PTSD in at- risk populations. (67)

Thomas, Sean*, Connor Zale*, Luke Dombert, Kristopher Krawchuk and Lisa Kadlec, Wilkes University, Wilkes-Barre, PA 18766. *Investigation of novel epidermal growth factor receptor target genes implicated in multiple aspects of Drosophila development* – The *Drosophila* epidermal growth factor receptor (Egfr) gene encodes a protein that impacts multiple aspects of development including determination of body axes during oogenesis and proper formation of wings and eyes in later development. Our research follows from microarray screens performed to identify downstream targets of the Egfr pathway in the *Drosophila* ovary. These screens compared gene expression in ovaries of flies in which activity of the pathway was reduced, normal, or constitutively active. RT-PCR has confirmed the up-regulation of a number of targets originally seen by microarray. We have been employing a variety of approaches to investigate the expression, biological function, and mechanism of action of several putative targets. Target genes of interest include a number of genes whose function is currently unknown (including CG13299, CG11381, CG13083 and CG14309). Screening for biological function using UAS-RNAi suggests roles for several target genes of unknown function in eggshell production and/or integrity, wing morphogenesis, or both. Several putative targets have been shown to exhibit developmentally regulated expression in the ovary, and in some cases this expression has been shown to be altered in response to changes in levels of Egfr signaling. We are currently using *in situ* hybridization and RT-PCR to investigate target gene expression in wing imaginal discs. A neutral red uptake assay was performed to further explore observed eggshell defects, and suggests defects in vitelline membrane integrity in compromised eggshells. Additionally, we are utilizing the UAS-RNAi system to attempt to identify candidate target genes which may play roles in the development of the eye. (65)

Tillquist, Richard*, Eric S. Ho. Lafayette College, Easton, PA 18042, USA. *A COncurrent Next GEneration Sequencing simulaTor – CONGEST.* Next generation sequencing (NGS) techniques allow for the sequencing of hundreds of thousands of pieces of DNA in parallel. This has drastically reduced the cost of sequencing DNA while simultaneously increasing the amount of data being generated. The accuracy of these methods depends in large part upon the composition and complexity of the genome being sequenced. A-runs and GC-repeats, for example, make sequencing more difficult and result in missing sequenced bases and lower phred quality scores. The quality of these reads is also dependent on the sequencing method used, i.e. reversible terminator from Illumina and proton sequencing from Ion Torrent. We aim to produce a NGS simulator as a means of creating realistic sequence data for use in analyzing currently available tools as well as for use in creating, building, and studying new algorithms. Our simulator provides user-specified parameters that mimic the output of real NGS results such as mean and standard deviation of normally distributed read lengths, the total number of reads, error rates, etc. For sequencing error handling, we model sequencing errors using a Poisson distribution. Short reads generated by our simulator are formatted in standard FASTQ file, which is fully compatible with downstream NGS analysis tools such as BWA, SAMtools, etc. As the new targeted sequencing method is widely used in cancer diagnosis, our simulator provides option for user to specify targeted genomic regions for sequencing, which is not available in existing simulators. As the generation of millions of short reads is a demanding task, our simulator expedites this processing by harnessing multiprocessors hardware system in which the whole simulation is split into multiple concurrent subprocesses. In the future, we plan to speed up this implementation further to allow for faster turnover in the analysis process. (45)

Van Dyke, Davis*, Ronie Stephan*, and Robert L. Hale. Shippensburg University, Shippensburg, PA 17257. *Relation of Antisocial Personality Disorder Symptoms to 2D:4D Finger Length among College Students* – The study was conducted to examine a theorized relationship between prenatal sex hormone exposure, measured with finger length ratios of the 2nd and 4th digits from the thumb, and Antisocial Personality Disorder (APD) symptoms. Studies have found that the ratios of the fingers digit 2:digit 4 in adulthood indicates the amount of exposure in utero to testosterone or estrogen. Additionally, high testosterone levels are connected to aggressive, criminal, and antisocial behaviors. Students were recruited for the study through SONA Systems, Shippensburg University's sign-up system for research, and had received extra credit for their participation. Participants completed on-line the Edinburgh Handedness Scale, Subtypes of Antisocial Behavior Questionnaire (STAB), Wechsler's 1994 survey, and a drug questionnaire. After this, measurements were taken from both left and right hands of each subject and from photocopies of their hands to generate 2D:4D ratios. Our research hypothesis was that students scoring higher on Antisocial Personality Disorder (APD) symptoms, as measured by their STAB scores, would have higher in utero testosterone levels, as measured by their 2D:4D digit ratios. Multiple Regression analyses and MANOVA were used to our hypothesis. (68)

Trapolsi, Donald*, Meaghan Bird, Thomas F. Rounsville Jr., Shawqui Darwish, and JaneE. Huffman. East Stroudsburg University DNA Wildlife Lab, East Stroudsburg PA 18301. *Implementing a disease detection panel based approach to mapping tick borne pathogens using probe based qPCR* – The results of this study will be part of a continuing effort by the Northeast Infectious Disease Diagnostic Laboratory to characterize and map zoonoses carried by ticks and will focus specifically on *Ixodes scapularis*. The panel design includes *Babesia microti, Borellia burgdorferi, Borellia miyamotoi, Bartonella henselae, Anaplasma phagocytophilium,* Deer Tick Virus (Powassan Lineage II), and Powassan Virus. The goals of the study include building a panel to expand the amount of information being obtained through current diagnostic procedures, offsetting the cost and time required to gain data through operational efficiencies and gains in throughput, and build a framework for the inclusion and monitoring of emerging tick- borne zoonoses. (135)

Webber, Jessica*, Evelyn Neunteufel. Misericordia University, Dallas, PA 18612. *Flight Initiation Distance in Eastern Gray Squirrels (Sciurus carolinensis) Based on Different Characteristics of Human Predator's "Eyes"* – In order for prey to assess risk properly, it needs to be aware of many cues that a predator displays when predator and prey are in close contact. Studies have been conducted to determine what attributes prey attend to when assessing risk. This study aimed to determine the effects of eye coverings in predator-prey interactions. The hypothesis was that flight initiation distances would vary based on the type of eye coverings of approaching prey. We explored how humans exhibiting no eye contact, direct eye contact, eye contact wearing sunglasses, and eye contact wearing binoculars affected flight initiation distance (FID). The prediction was that the larger the eye coverings, the greater the FID would be in Eastern gray squirrels, with no eye covering having the smallest FID. Eastern gray squirrels (*Sciurus carolinensis*) located at Kirby Park in Kingston, Pennsylvania were approached by a human and their flight initiation distances were recorded. Preliminary results of mean FID were as follows: no eye contact: 4.80 m, direct eye contact: 4.52 m, eye contact wearing sunglasses: 4.38 m, and eye contact with binoculars: 3.62 m. Additional data will be collected and analyzed to determine the significance of these results. (130)

Wilk, Ryan* Susquehanna University, Selinsgrove, PA 17870. *Preferred forest density and tree species nesting conditions of Bald Eagles in central Pennsylvania* - The once abundant population of bald eagles in central Pennsylvania almost experienced a local extinction 30 years ago. Recently, however, recovery efforts by agencies such as the Pennsylvania Game Commission helped increase the number of local bald eagle nests so that there are now up to 250 in the state. Knowledge of the kind of environment that eagles live in will allow people to better help new eagles thrive in central Pennsylvania. This project has studied environmental conditions such as tree height, species, and forest density at 5 different nest locations along the Susquehanna River. A clinometer and a range finder were used to find the tree height, and the four-point method was used to find the surrounding forest density. The results show that the trees with nests in them have been between 27 and 32 meters high, the total tree density has been between 250 and 400 Hectares, and eagles seem to prefer to nest in sycamore trees compared to other species. Since tall sycamores in dense forests appear to be the preferred nesting site for Susquehanna River eagles, increased protection of these trees may be a first step in assuring suitable nesting sites in the future. (123)

Wingard, Katherine*, Micah Richardson, Elisabeth Stewart, Fred J. Brenner Ph.D., and Durwood Ray, Ph.D. Grove City College, Grove City, PA 16127. *LD-50s of Resveratrol and Quercetin in a Cancerous Mouse Cell Line* – The purpose of this study was to determine the LD- 50s of two natural compounds in a cancerous cell line. LD-50, or lethal dose 50%, is the amount of a substance required to kill 50% of the test population. The compounds tested were resveratrol (3, 4', 5-trihydroxy-trans-stilbene), a phenolic phytoalexin, and quercetin (2-(3, 4- dihydroxyphenyl)-3, 5, 7-trihydroxy-4H-chromen-4-one), a flavonoid. The cell line used in these experiments was Grove City College's T3-HA hepatic mouse cancer cell line. T3-HA cells were plated 3 days prior to the start of the experiment so that the average confluency of the cells on day 1 was approximately 1-10%. Confluency refers to the amount of the cell culture dish that is covered by cells. Quercetin and resveratrol were dissolved in DMSO and then prepared in media such that all solutions had a final DMSO concentration of 0.1%. T3-HA cells were treated with either resveratrol or quercetin in a range of concentrations from 0-300μM. Photomicrographs were taken of six randomly preselected $2mm^2$ regions on days 1-5. LD-50s for each compound were calculated using the average number of adherent cells. The LD-50 of resveratrol on T3-HA cells was 63±12μM (std dev, n=4) on day 4, and the LD-50 of quercetin on T3-HA cells was 8.9±4.7μM (std dev, n=3) on day 4. In conclusion, both resveratrol and quercetin had a dose-dependent cytotoxic effect on T3-HA cancer cells. Normal cells were not killed within the tested concentration range. The potential synergistic effect of combining resveratrol and quercetin will be tested in future studies. (22)

Zuidervliet, Brian*, **Ahmed Lachhab**. Susquehanna University, Selinsgrove, PA 17870. *Lateral Mixing of the North and West Branches of Susquehanna River at Hummels Warf, PA*-- The mixing zone of the north and west branches of the Susquehanna River at a site downstream from the merging point (Sunbury, PA) was studied to understand how these two streams and the rain events, associated with their corresponding watersheds are affecting this lateral mixing. Continuous data sampling from the Shady Nook site was used to collect multiple transects from August 2009 to August 2013 to identify the transition zone between the west and north branches. The specific conductivity of the water yielded the strongest correlation to the two branches' mixing zone and provided accurately tracking of the lateral shifting during both wet and dry conditions. Based on this correlation, predictions can be made to explain movement of pollutants and their mixing. Precipitation and discharge data was examined to study the influence of rain events on the location of the mixing zone. Results have shown that as the discharge of the mainstem increases, the mixing zone shifts lateral away from the Shady Nook shoreline until it reaches a threshold discharge of $12300ft^3/s$, and then the mixing zone shifts backward as the discharge increases beyond this threshold discharge. (111)

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Selinsgrove, PA

(Arranged in alphabetical order of first authors or presenters)

Akers, Natalie* and Amy Reese, PhD. Cedar Crest College, Allentown PA 18104. *Phenotypic and genotypic characterization of Rhodotorula strains* – Fungi are eukaryotic organisms that are found in our everyday environment. *Rhodotorula* are a species of fungi that can cause serious health problems in immunocompromised individuals. There is currently little information known about this fungus and the effects it can have. Our goal is to characterize our set of clinical and environmental strains both genotypically and phenotypically. To evaluate strains genotypically, we have previously amplified and sequenced the ITS region, and have compared the sequence data to known sequences from GenBank. From this data, we have concluded that the majority of our strains are *Rhodotorula mucilaginosa*, with some being classified as *R. dairenensis* and *R. glutinis,* among others. We now plan to develop a taxonomic tree to relate the various *Rhodotorula* species, as well as determine any historical name changes of strains that may affect our characterizations. To have a more complete picture, we wish to compare this genotypic information with phenotypic characterizations. Preliminary phenotypic data suggest the strains differ in their shapes from round, to oval, to more rodlike. We can induce capsule size using Dulbecco's Modified Eagle's Medium and calf serum, demonstrating that this capsule-inducing method for *Cryptococcus* also works for *Rhodotorula* species. We now plan to further our analysis of capsule size, evaluate the various pink shades of *Rhodotorula* colonies, and evaluate urease production. By combining our genotypic information with new and previous phenotypic data, we hope to provide a more accurate method of analyzing *Rhodotorula* within the medical and research setting. (78)

Alvarez*, Dennis C. and Carl R. Pratt. Immaculata University, Immaculata, PA 19345. *Microclimatic conditions among Trees in Parking Lot "Islands"*-- These results are part of an ongoing analysis to determine the microclimatic conditions experienced by trees placed in potentially stressful conditions such as automobile parking lots and sidewalk areas. Environmental parameters (soil surface temperature, air temperature, wind speed, relative humidity) and physiological parameters (leaf-xylem potential, leaf temperature) were compared among red maple trees (*Acer rubrum*) growing on two adjacent sites: one set of trees was in confined planting bed within a parking lot surrounded by asphalt and the other site contained similar trees (trunk diameter, stature, and age) planted along a lawn area. Wind speed, air temperature, and relative humidity were measured using a hand-held Kestrel 4500 Pocket Weather Tracker. Environmental surface and leaf temperatures were determined using a Fluke IR thermometer (model 561). Leaf potentials were measured at approximately 2:00 PM once a week during the summer of 2013 using a Pressure Chamber (PMS model 600). Trees on the parking lot site experienced significantly higher mean leaf potentials [7.50 $\pm$ 0.24 mBar] as compared to those trees in lawn area [5.94 $\pm$ 0.27 mBar] as determined by ANOVA and student t-test. Leaf potentials increased during the summer from May through August in both sets of trees, reaching a maximum in August. These measurements suggest trees in the parking lot islands were subject to potential drought stress as compared to trees in the lawn. Mean surface temperatures on the parking lot surface beneath trees [36.6 $\pm$ 1.9 °C] were significantly higher than those beneath trees on the lawn site [23.9 $\pm$ 1.1 °C]. However, mean leaf surface temperatures did not differ significantly among trees on the two sites [parking lot: 24.3 $\pm$ 0.4 °C; lawn: 23.1 + 0.35 °C]. (122)

Anthony, Andrew*, Michael Bilger, Katherine Guild and **Jack Holt** Susquehanna University, Selinsgrove, Pa. 17870. *An Assessment of the Susquehanna River Upper Main Stem by Interpreting Different Methods of Sampling Benthic Macroinvertebrate Communities Over a Two-Year Period (2012-2013)*-- The benthic macroinvertebrate communities have been sampled for the past five years in an attempt to evaluate the state of the Susquehanna River, the primary source of the Chesapeake Bay, at the upper main stem, the portion of the river below the confluence of the North and West Branches at Sunbury, Pennsylvania. Our protocols involved collecting samples in a wide transect seven kilometers below the confluence (the Byers Island Transect). The plumes of the two branches are only poorly mixed and maintain their chemical and physical signatures (e.g. the West Branch is influenced by abandoned mine

drainage while the North Branch is influenced mainly by agriculture). Our comparisons were made between a site in the West Branch plume (WBP) and a site in the North Branch plume (NBP) in the transect. During the period of 2012 to 2013, we collected macroinvertebrates by active methods (D-net and Surber samplers) and passive methods (rock baskets and Hester-Dendy multiplate samplers) to evaluate their usefulness on large rivers such as the Susquehanna. To that end, we applied common metrics [%Ephemeroptera-Plecoptera-Trichoptera (%EPT), Shannon Diversity (SDI), and Hilsenhoff Biotic Index (HBI)] to the interpretation of our macroinvertebrate collections, which were identified to the family-level for 50 taxa. The metrics were very inconsistent depending on the sampling method used for in-site comparisons. For example, HBI results described the WBP as having some organic pollutants (5.14, active methods) and as having slight organic pollution (3.10, passive methods). While the application of HBI to NBP collections indicated slight organic pollution for both sampling methods (3.93 for active methods and 3.58 for passive methods). Our results suggest a need for re-evaluation of sampling methods to assess large river systems. (105)

Astor, Michael*, Samantha Gleich* and **Michael W. Butler.** Lafayette College, Easton, PA 18042. *Mid-life immune challenges affect melanin deposition in male mallard feathers*—Immune challenges can affect the quantity and distribution of melanin within integument. Although the effects of greater melanin production can be beneficial in birds, the consequences of using energy to produce melanin in avian plumage could be costly when energy is limited. Specifically, the effects of energetically expensive immune challenges early in life on subsequent melanin-based feather color are currently unknown. In order to determine if immune challenges during development would affect adult plumage coloration, we raised male mallards (*Anas platyrhynchos*) and presented them with the same immune challenge (injections of sheep red blood cells) at different times during early, mid-, and late stages of development. The control group consisted of birds that did not receive immune challenges. At adulthood, the same feather from each mallard was removed and analyzed through picture analysis by measuring the areas and lengths of black and white feather regions. Ducks that faced immune challenges in the middle of their development had a thinner black band (section of black between the white distal end and the medial iridescent section) than those that received immune challenges at other points in life, suggesting less melanin production. At 8-10 weeks of age, young mallards are preparing to fly for the first time as they fledge from their nest. As birds prepare to leave their mothers, energy conservation is extremely important as young mallards are now responsible for their own nutrition and well-being. Without a nest of family members to rely on for food and protection, these developing mallards may not have extra energy to expend on melanin production if presented with other difficulties such as immune challenges. (192)

Augustine, Stephanie H.*, Amy E. Faivre and Lindsey A. Welch. Cedar Crest College, Allentown, PA 18104. *Assessment of plant species composition and soil characteristics in barren areas on Blue Mountain in Palmerton, PA* -Until the New Jersey Zinc Company closed in the 1980s, smog from the smelters turned the forested slopes of Blue Mountain into a rocky slope devoid of vegetation. In recent years, the land has been restored to form many acres of rich grassland due to the reseeding efforts organized by the Lehigh Gap Nature Center. Yet areas with minimal vegetation persist, scattered across the hillside. These barren patches appear to consist of a loose, powdery soil, black in color. Five barren patches were identified as study sites, and for each site, comparable-sized quadrats of surrounding grassland were surveyed. The distribution and dominance of plant species differed between the study sites and the sampled quadrats. Within each barren site, at least 20% of the vegetation coverage was sandwort (*Minuartia patula)*, which was rarely found in the accompanying quadrats. In addition to vegetation comparisons, soil was collected inside and outside of the sites to test for concentrations of zinc. Acid digestion of soil samples and analysis by atomic absorption spectroscopy was used to determine metal concentrations in units of parts per million (ppm). Inside the sites, the concentration of zinc ranged from 9,000 – 23,000ppm, and outside ranged from 9,500 – 29,000ppm. One site was tested for lead and cadmium, and yielded 1,700ppm Pb and 270ppm Cd. The high variability in metal concentrations both inside and outside of the study sites suggests that additional factors such as erosion and wind following reseeding may have influenced the plant species composition and distribution across the mountainside. (140)

Baier, Richard F.*[1], Vijayalakshmi Gabbeta[2], Amal Dakka[2]. York College of Pennsylvania[1], York, PA 17403. PTC Therapeutics[2], South Plainfield, NJ 07080 - *Evaluating the Effects of Small Molecule Drugs on Correcting Alternative Splicing of SMN 2 mRNA in Spinal Muscular Atrophy*- Spinal Muscular Atrophy (SMA) is an autosomal neuromuscular disorder, which causes degeneration of the alpha motor neurons in the spinal cord. A Deletion of the housekeeping gene Survival Motor Neuron 1 (ΔSMN1) results in Spinal Muscular Atrophy. However, there is a second Survival Motor Neuron called SMN2. SMN2 has a splicing mutation in exon 7 that prevents correct splicing of exon 7. This mutation results in a truncated protein that is not sufficient for proper biological function. The focus of this study is to test PTC_{TM} small molecule drug compounds in GMO 3813 skin fibroblast patient cells, and transgenic mice. The goal of the study was that the small molecule drugs would improve positive splicing signals in the area of exon 7 in SMN2. In both studies, mRNA was isolated and

amplified in a PCR reaction. The PCR products were then analyzed on a 4% agarose gel. Compounds RB-302 and RB-808 showed an increase of Full-length SMN mRNA and a decrease of exon Δ7 at the lowest concentration. In the mice study, compound RB-119 and RB-247 were mildly effective at a higher concentration. These compounds seem to be enhancing the positive splicing signals in the area of exon Δ7 causing inclusion of exon 7. The future outcome of this research is to hopefully make it to human trails and be first drug of its kind to be brought to humans. If this research leads to an approved drug, many individuals that suffer from SMA will benefit from this research by the correction of the alternative splicing of SMN2. (33)

Bair, Nathan. Susquehanna University, *Selinsgrove, PA, 17870. The Risks Associated with Male Exposure to Thalidomide and the Potential Mechanism of Action*--During the late 1950's thalidomide came onto the market as an anti-emetic and sleep aid. It was used heavily in Europe by pregnant women to combat morning sickness. Exposure to thalidomide in the first trimester of pregnancy accounted for thousands of birth defects and the drug's removal from the market. Thalidomide returned to market in 1998 gaining approval from the FDA for treating leprosy, followed by approval for treatment of other diseases such as multiple myeloma, and subsequently AIDS symptoms. The FDA outlined strict policies regulating administration of thalidomide to women of child-bearing age, but rules concerning male exposure are less stringent. Thalidomide can be found in semen following oral dosing. Earlier work in this laboratory demonstrated that developing sea urchin embryos are sensitive to thalidomide exposure in culture. Prior to fertilization 125uL of sperm were incubated for one hour with either 2uL of sea water, DMSO, or a 25uM stock solution of thalidomide. After fertilization embryos were observed at blastula stage, 24 hours, gastrula stage, 48 hours, and pluteus stage 72 hours. At 72 hours the average malformation rate of the sea water control group was 6%, compared to 51% in the thalidomide treated group; T-Tests show a significant increase of malformations in thalidomide treated groups compared to all control groups (p value < 0.05). Embryonic malformations observed include gut abnormalities, exterior with excessive pigmentation, unusual cell masses, and lack of integral skeletal structure. Previous work demonstrated that thalidomide does not permanently adhere to the sperm and in all likelihood is not being carried into the egg suggesting the potential for an epigenetic mechanism of action. Ongoing experiments focus on sperm DNA isolation and analysis to determine if methylation of DNA could be altered during sperm and thalidomide interactions. (70)

Baker, Jenna* and Dr. Mel Zimmerman, Lycoming College, Williamsport, PA 17701. *Wilson Creek Riparian Demonstration Project – seventh year update*--The goal of the project was for the Tioga County Conservation District with the help of Babb Creek Watershed Association, Pine Creek Headwaters Protection and Lycoming College CWI to address a section of Wilson Creek that was classified as agriculturally impaired and placed on the DEP 303 list. With the help of two farms, Smith Farm and Coolidge Farm, riparian buffers were planted and best management practices (BMPs) were put into place along impaired sections of Wilson Creek in 2006. Pre-monitoring though backpack electrofishing, macroinvertebrate identification and water chemistry was done in 2006. The two farm sites were compared to a reference site, Broughton Hollow. Post monitoring was done by Lycoming College Clean Water Institute in 2007, 2008 and 2013 to see how much the Riparian Buffers and BMPs have helped the water quality. The water chemistry data from 2013 compared to 2007 shows that the water quality at the farm sites has improved slightly. The macroinvertebrate data shows that the stream quality has gone from severely impaired to moderately impaired. The effectiveness of the riparian buffer and BMPs appears to be compromised because the farmers still allow livestock access to the stream periodically. (108)

Bartoli, Claudia*, Jennifer Elick, Dan Ressler. Susquehanna University, Selinsgrove, PA 17870. *Evaluating the Habitat Suitability of the Bald Eagle Haliaeetus alascanus Along the Susquehanna River* -In the summer of 2013, five bald eagle nests were identified along the Susquehanna River from Bloomfield County to Union County. In order to properly assess the habitat locations of these nests, a habitat suitability index (HSI) model was applied to each of the nest locations. The four main components in the HSI are measures of food availability, reproduction, and human disturbance. To determine food suitability, the use of the morpheodaphic index, variable 1 (SIV1), displays values of 0.2 – 0.4 for all five nests, while the percentage of open water and wetlands, variable 2 (SIV2), reveals values of 0.1-0.3. It was found that the amount of open foraging area increases from the northern to the southern nest locations (ranging from 11.1% to 3.19%). Regarding the reproductive suitability, variable 3 (SIV3) all of the nest locations display available mature forest for the bald eagles, and all the nests are located in trees ranging from 30.3- 44.7 feet tall. Through the use of aerial photography, the human disturbance component, variable 4 (SIV4), reveals a value of 1.0 for four locations, and 0.6 for one location. Preliminary results suggest that the environment of the nest locations is ideal as evident by the occurrence of a 15% growth rate of bald eagle populations in PA within the past 30 years (Gross, 2011). This would likely indicate an overall high HSI value for each of the five nest locations. Despite decreasing numbers of bass and migratory ducks within the area (Blazer et al. 2012), there are other environmental factors that are allowing the population of bald eagles to thrive. (124)

Bedsaul, Jacquelyn R.,* and Jeffrey P. Thompson. York College of Pa, 441 Country Club Rd. York, Pa 17403. *The Design and Creation of Fusion Protein, hIL-13.E11Y-KillerRed: A Photoactivatable Ligand Designed to Target and Kill Human Glioblastoma*. Human Interleukin-13 is a cytokine involved in inflammation and, when mutated, binds with greater affinity to a decoy receptor, known as receptor hIL-13alpha2, which is overexpressed on human glioblastomas. KillerRed is a newly engineered fluorescent protein that is not only used in research to fuse to other proteins and provide visual location, but also to emit damaging reactive oxygen species when it is excited by 585 nm light. While the specific binding to, and killing of, human gliomblastoma is the ultimate goal, the current objectives of this experiment were to design, create, and purify the fusion protein, hIL-13.E11Y-KillerRed in a prokaryotic expression system. The most effective methods to create the expression vector were using PCR and Gibson Assembly to recombine multiple DNA fragments. Transformation was performed for both hIL-13.E11Y-KillerRed and KillerRed control using SHuffle T7 Competent *E. coli* to increase the likelihood of accurate protein folding. Low-pressure column immobilized metal-ion affinity chromatography was used for protein purification. Fluorescence microscopy images verified the folding accuracy of KillerRed protein in control and fusion; they also verified the presence of control and fusion within the *E. coli* and on Ni-NTA resin beads. Sodium Dodecyl Sulfate Polyacrylamide Gel Electrophoresis and linear regression analysis confirmed KillerRed and hIL13.E11Y-KillerRed were created and isolated. This fusion protein presents new opportunities in research, including future studies pertaining to interleukin-13 and the destructive nature of KillerRed. The hIL-13.E11Y-KillerRed fusion may one day be used as a novel photodynamic therapy to treat human glioblastoma because of its dual abilities to bind with high affinity to the glioma-associated receptor and to emit damaging free radicals. (27)

Blocher, Benjamin K.* and **Paul Rothrock.** Taylor University, Upland, IN 46989. *Current Condition of Wetland Swales in the Indiana Dune and Swale Region and the Potential for Restoration* – Invasion by monoculture forming hydrophytes, as well as human activity, has degraded many wetlands of Indiana's Dune and Swale region on the southern shore of Lake Michigan. This study seeks to document the extent and impact of that invasion based upon Floristic Quality Assessment (FQA) analysis. Two different datasets have been collected in this region. The first is a qualitative assessment of most extant swales (83 sites) collected over two years beginning in 2007. The data consisted of species lists and estimates of species cover. The second dataset is a quantitative tracking of changes in floristic quality after restoration, i.e., removal of invasive hydrophytes. Thirteen sites were sampled shortly after restoration (2011) via transects with 15 1-m^2 quadrats and resampled two years later (2013). From the 2007 data, sites not dominated by monocultures (control sites) had a mean species richness of 30 and a mean-C of 4.4. Monoculture forming hydrophytes dominated 44 of the 83 sites (53%). *Phragmites australis* alone dominated 35% of all sites and lowered species richness. Other monoculture species, namely *Cephalanthus occidentalis* and *Typha angustifolia,* also depressed some FQA metrics. Overall, sites dominated by a monoculture had a mean-C of 3.6 and a species richness of 22. The 2011 versus 2013 data showed improvement of species composition on a case-by-case basis. These results will be contextualized by benchmarks established through a panel of regional ecologists. Prospects for future restoration success will be discussed. (142)

Boyd, Nathan R.* and Matthew H. Persons. Susquehanna University, Selinsgrove, Pennsylvania 17870. *Recognizing predators before you are born: The effects of prenatal and perinatal predator cue exposure on wolf spiderling antipredator responses*-- Early predator recognition is critical for effective antipredator responses but may take time to learn, leaving the prey vulnerable beforehand; therefore, it may be adaptive to program or prime offspring prior to birth to exhibit appropriate defensive behavior when born into predator-rich environments. The female wolf spider, *Pardosa milvina*, which responds to silk and excreta from the larger predatory wolf spider, *Tigrosa helluo*, may mediate predator cue exposure of their offspring both prior to (prenatal) and following (perinatal) egg sac production by selectively occupying substrates with these cues. Here, we tested whether predator cue exposure of the eggsac and/or mother prior to eggsac production primes offspring for more effective antipredator behaviors after eggsac emergence (eclosion). Mated female *Pardosa* were exposed to one of four substrate treatments (n = 10/treatment): 1) exposure to predator cues after mating but before eggsac production (prenatal only), 2) after eggsac production but before eclosion (perinatal), 3) both prenatally and perinatally, or 4) a control group without predator cue exposure. Three-day old spiderlings from each of the four treatments were then given a choice test of substrates containing cues from an adult female *Tigrosa* or a blank sheet of paper. Duration of time on each substrate, time spent immobile, and mean speed were measured on each substrate for 20 spiderlings from each clutch. Another 20 spiderlings from each treatment were placed in containers with substrates containing predator cues from adult female Tigrosa as well as a live predator. Survival time of each spiderling was recorded across the four treatments. Preliminary results suggest females exposed to predator cues prior to eggsac production were less likely to produce an eggsac and eggsacs that were produced tended to be lighter with fewer offspring. Additional results will be discussed. (187)

Brenner, Fred, Heather Barton, Garrett Herald*, Lauren McGarvey, and Lydia Rittenhouse. Grove City College, Grove City, PA 16127. *Genetic Analysis of Brook Trout from Isolated Populations in the Western Branch of the Susquehanna Watershed* - The brook trout (*Salvelinus fontinalis*) is the only trout species native to the streams of Pennsylvania. Abandoned mine drainage (AMD) has been discharged into streams throughout the West Branch of Susquehanna for at least a 100 years that has resulted in the isolation of brook trout populations due to these acidic discharges that prohibited fish movement within these streams. As a result of this limited movement brook trout population became isolated resulting a lack of gene flow among these populations. In order to determine the extent of genetic diversity in these isolated populations, fin samples were collected from brook trout populations in headwater streams receiving AMD throughout the West branch of the Susquehanna watershed. Nucleic DNA was then isolated from these samples and primers were designed to amplify microsatellites in the DNA sequence. Using gene scans, the amount of heterozygosity and homozygosity was determined for each fish within each population. The amount of homozygosity within each the population would indicate that there was limited or no migration of trout within the stream system and the extent of isolation of these population. The amount of genetic diversity may also reflect the length of time that these populations were isolated and or the amount of genetic diversity within these populations prior to their isolation. If it is confirmed that there is a lack of genetic diversity in these populations then plans may be developed to mitigate the AMD discharges and restore the stream system. This is a joint study between Trout and Unlimited and Grove City College. (103)

Brenner, Fred J., Heather Barton, Durwood Ray, Kaitlyn Bailey, Arleigh McRae, Luke Latario, Stacey Senter, and **Amy Getz.**Grove City College, Grove City, PA 16127. *DNA fingerprinting of the White-Tailed Deer*- DNA fingerprinting of short tandem repeats (STRs) in nuclear DNA from white-tailed deer (*Odocoileus virginianus*) was investigated as a means of determining breeding patterns within deer herds in Presque Isle State Park in Pennsylvania as well as in two metroparks in Dayton, Ohio. Previously obtained liver tissue samples from a total of 38 deer were selected for study beginning in June, 2013. Isolated nuclear DNA from liver tissue and nine fluorescently labeled primers for DNA were used in polymerase chain reactions to amplify the STRs of nuclear deer DNA. Products of PCR reactions were then confirmed using gel electrophoresis in 2% agarose gel and photographed under UV light using a Bio-Rad imaging unit. Successful PCR products were then analyzed using an Applied Bio Systems 310 single capillary automatic DNA sequencer with GeneScan software to accurately measure STR length. This process was used to begin to create a unique DNA "fingerprint" of each deer based on the STR size and frequency, a procedure analogous to forensic identification of human DNA. Three analysis programs known as GenePop, FSTAT, and Arlequin were used to determine potential gene flow within the sample population, which yielded results consistent with Hardy-Weinberg equilibrium. It is suspected that a more exhaustive study will produce results displaying increased heterozygosity, which would suggest a lack of inbreeding and that bucks move in and out of the different herds. This information will contribute to determining more clearly paternal genetic history and infer the breeding behavior among white-tailed deer herds in Presque Isle and Dayton, OH. (134)

Brey, Christopher and Jordan Sheagley*. Marywood University, Scranton, PA 18509. *Analysis of Fat Deposition in klf-3 MicroRNA injected Caenorhabditis elegans*-Krüppel-Like Transcription Factors (*klf*s) act as regulators for many important metabolic processes in animals, such as fat storage and fat transportation. *Klf-14* in humans has been linked to the onset of type-2 diabetes, so further investigation of *klf*s is of great interest to the scientific community. *Caenorhabditis elegans* have three *klf* genes, and both *klf-1* and *klf-3* have been shown to directly affect lipid deposition. It has been shown that the *klf-3* mutant (ok1975) has higher fat concentrations than the wild type. RNA interference studies have indicated that suppression of the *klf-3* gene in wild-types induces the same fat phenotype observed in mutant *klf-3*. Our goal was to test and endogenous microRNA that targets *klf-3* mRNA, and determine if it will produce the same effect as the *klf-3* double stranded RNA. To test this *klf-3* microRNA was introduced into the worms via microinjection and a fat staining assay (oil red o) was used to measure the deposition of lipid droplets in individual worms. Briefly, the stain was applied to starved injected wild-type and *klf-3* (ok1975) mutants, as well as un-injected controls. In addition to the fat deposition analysis, worm morphology and fecundity results will be presented at the meeting. (19)

Brittingham, Jacob* and **Thomas Peeler**. Susquehanna University, Selinsgrove, PA 17870. *The Effects of the Artificial Sweetener Sucralose and the Natural Sweetener Stevia on 3T3-L1 Adipogenesis*.- Artificial and natural sweeteners have been marketed as a sugar substitute in order to help prevent obesity. However, a recent study has shown that the artificial sweeteners saccharin and acesulfame potassium can stimulate adipogenesis in vitro, independent of sweet taste receptors. In this study, 3T3-L1 cells will be exposed to either the artificial sweetener sucralose or the natural sweetener stevia. Sucralose is the primary ingredient in Splenda©, while stevia is derived from the Stevia genus. 3T3-L1 cells are a standard cell line for adipose research, and mimic the differentiation process of human preadipocytes. Using a combination of fetal bovine serum, 3-isobutyl-1-methyxanthine, dexamethasone, and insulin, 3T3-L1 fibroblasts can be differentiated into adipocytes. We

hypothesize that the sweeteners will stimulate adipogenesis in the 3T3-L1 preadipocytes. We will test this hypothesis by treating 3T3-L1 cells with each of the sweeteners. 3T3-L1 cells will be chemically treated to differentiate while in the presence of each sweetener. The rate of adipogenesis will be compared to 3T3-L1 cultures using the standard differentiation procedure. Additionally, 3T3-L1 cells will be treated with sweeteners, with no differentiation protocol, to determine the effect of these sweeteners on 3T3-L1 cell growth and development. The treated cell cultures will then be stained with Oil Red O to assess the quantity of lipids produced. It is expected that there should be some differentiation of the cells treated with just the artificial sweeteners when compared to untreated 3T3-L1 cells. In addition, there should be an increased rate of differentiation in the cells treated with both the differentiation chemicals and the sweeteners compared to cells differentiated in the absence of the sweeteners. The significance of this study is that while artificial sweeteners may have fewer calories than traditional sugar, they may still cause an increase in weight by stimulating the development of adipose tissue. (36)

Bruns, Dale, Brian Naberezny, and Kenneth Klemow*. Institute for Energy and Environmental Research. Wilkes University, Wilkes-Barre, PA 18766. *Stream Macroinvertebrate Indicators Response to Land Use and Marcellus Shale Gas Development in the Susquehanna Basin of Northeastern Pennsylvania: a GIS Watershed Approach* -- Marcellus shale gas development may impact surface water quality due to potential effects of construction and contamination by hydrofracking and flowback fluids. To that end, in 2012 we examined water quality and macroinvertebrate community composition as a function of drilling and pipeline construction in 12-15 streams (sub-watersheds). Most were in the North Branch drainage of the Susquehanna River (PA), though two reference watersheds were in the Delaware Basin. Our study sites included first to third order streams with drainage areas ranging from 2.2 to 38.0 square miles, representing watersheds with no, low, medium, and high natural gas activities. Using GIS and land use classifications derived from National Land Cover Data (2006), we quantified number of wells, pipeline length, land use/land cover, area, and stream classifications, on a watershed basis for each sub-watershed and stream buffer zone (100m) in the study area. Preliminary multivariate regression analyses indicated that macroinvertebrate indicators (e.g., EPT richness) varied in response to land use vs. shale gas development on a seasonal basis: shale gas parameters (density of pads per sub-watershed) explained more variability for indicators in spring, in contrast to fall, when agricultural land use, and developed lands explained more variability in these indicators. In the fall, pipeline length in the stream buffer was also significantly correlated with a synthetic index of biological integrity. Additional research is needed to determine whether the patterns observed are maintained from year to year. (157)

Bryner, Naomi*, Kathleen Halligan and David Singleton. York College of Pennsylvania, York, PA 17403. *Isolation of* Martinella obovata *via flash column chromatography* – The alkaloids martinelline and martinellic acid have been isolated from the plant *Martinella iquitosensis* of the Bignoniaceae family. The scarce literature reports concerning these alkaloids describe potent antagonism of the bradykinin B1 and B2 receptors as well as weak bactericidal properties. The primary goal of this study was to isolate martinelline, martinellic acid and other interesting metabolites from the available *Martinella obovata* using flash column chromatography with solvents of varying polarity. Initial isolates have been characterized via IR, ^{1}H NMR and ^{13}C NMR spectroscopy. Bactericidal properties of metabolites have been quantified by determining minimal inhibitory concentration values using a use dilution test. One of several compounds extracted from *M. obovata* showed bactericidal properties, although the structure of said compound has been elusive. Future directions for this study would concern bradykinin receptor antagonism quantification by means of a binding inhibition assay. (177)

Butler, Meaghan *, Jane Huffman, and Thomas Rounsville Jr., East Stroudsburg University, East Stroudsburg, PA 18301. *Prevalence of Borrelia burgdorferi and Borrelia miyamotoi in Two Primary Reservoir Hosts and Two Potential Arthropod Vectors in New Jersey, Pennsylvania, and Connecticut - Borrelia burgdorferi* (Lyme disease) and *Borrelia miyamotoi* (relapsing fever) are tick borne pathogens. These pathogens are maintained within the environment through vertebrate reservoir hosts. This study examines multiple components of the *B. burgdorferi* and *B. miyamotoi* transmission cycles. The infection rates of recognized reservoir hosts, the white footed mouse, *Peromyscus leucopus*, and the eastern wild turkey, *Meleagris gallopavo,*were analyzed, as was the prevalence of infection in the principal vector, *Ixodes scapularis*, and a possible vector, *Amblyomma americanum*. *Peromyscus leucopus* were trapped throughout all four seasons of 2013 in New Jersey, Pennsylvania, and Connecticut. Splenic tissue was examined for the two pathogens. Blood and skin tissue samples from the eastern wild turkeys of NJ were also tested for the two pathogens. *Ixodes scapularis* and *A. americanum* were collected from various sources and tested for *B. burgdorferi* and *B. miyamotoi*. All samples were extracted using the MoBio Tissue and Cells DNA extraction kit and PCR was performed using a *Borrelia* genus specific primer that targets the intergenic spacer region of the bacterial genome. The results were then analyzed seasonally, regionally, and by vector life stage. (95)

Budsock, Andrew*, Chelsea Gowton, and David Matlaga. Susquehanna University, Selinsgrove, Pennsylvania 17870. *The effects of resource translocation on the success of the asexual offspring of Fallopia japonica*.--The primary mode of reproduction in *Fallopia japonica* and cause of invasiveness is clonal reproduction via its dense underground rhizome network. Rhizomes can extend laterally from the parent ramet and may be interconnected, making it difficult to distinguish which rhizome fragment belongs to which above ground shoot. Theoretically, two ramets could be the same individual, exchanging nutrients, so it is not known how removing neighboring shoots could impact the success of clonal recruits that may depend on nutrients from neighboring shoots. Rhizomes are important storage sinks for carbohydrates and other nutrients, with known temporal and potentially spatial patterns. Translocation of carbon and nitrogen from above-ground shoots to below-ground rhizomes occurs August-September; however, it is not known how translocation impacts the success of clonal recruits. By removing above-ground shoots, this study aims to measure the success of consequent clonal recruits in a greenhouse experiment. This experiment was conducted at two sites with dense stands of *F. japonica* along the West Branch of the Susquehanna River in Selinsgrove, Pennsylvania. There were 45 individual focal ramets per site and two treatment factors: times cut (0 and 1) and neighbor inclusion (0 m, 0.5 m, and 1.5 m). Shoots of the focal ramet received the treatment along with neighboring shoots within assigned radius around the focal ramet. Focal ramets were excavated, cut into rhizome fragments, and planted in a greenhouse. We expect the terminal leaf height to decrease with more times cut and when a greater area of neighboring shoots has also been removed. Understanding resource translocation could further inform management techniques to decrease the severity of invasion. (139)

Cadwell, Tanina*, Katherine Cedillos, Luis Gomez, Khadeja Moses, Laura Trocchia and Laurie F. Caslake Lafayette College, Easton, PA 18042. *Microbial Contamination of Toothbrushes – Development of a Protocol for a Microbiology Lab* – Five individuals were provided a new toothbrush to use over a three-week period and asked to follow their normal hygiene procedure. After the three-week period, the heads of the toothbrushes were cut off, placed in a phosphate buffer saline, and vortexed. Following vigorous vortex, serial dilutions were plated on various types of selective or differential growth medium. The growth medium was chosen to assess the presence of streptococci, enterococci, *Escherichia coli*, pseudomonads, staphylococci, and various fungi. Plates provided evidence of a high number of streptococci, pseudomonads, and gram-positive microbial contamination. Future studies could use molecular tools, such as PCR, to test for organisms such as *Streptococcus mutans*, which is associated with the development of dental caries. This laboratory exercise in a first microbiology course, introduces students to the world of microbes around them as well as required microbiology skills, selective and differential media, and can be extended using molecular techniques. (50)

Campbell, Michael J.* and **David S. Dropkin**. Mercyhurst University, Erie PA, 16546 and U.S. Geological Survey, Leetown Science Center, Northern Appalachian Research Laboratory, Wellsboro, PA, 16901. *Low densities of zooplanktonic prey for larval American shad may impair restoration of anadromous fish in the Susquehanna River basin* -- Reestablishing migratory passage of American shad to potential upstream spawning sites in the Susquehanna River basin is not likely the only accomplishment needed to restore self-sustaining populations of this fish. If adult shad find suitable spawning habitat, inadequate quantities of zooplanktonic prey for larval shad could result in significant mortality and failed recruitment. Zooplankton populations were sampled during June 1999 and 2000 at 154 sites along six major tributaries of the Susquehanna River above Holtwood Dam, including the Conestoga, Conewago, Swatara, Conodoguinet, Juniata, and Susquehanna West Branch. The observed total density of crustacean zooplankton at 98% of the sampled sites was less than $100/m^3$, below the levels needed to support larval shad growth and survival, and much lower than densities found in other U.S. rivers where American shad reproduction has been successful. These findings indicate a need to further investigate the availability of riverine zooplankton in the Susquehanna River basin as dam removal operations advance, and to consider additional restorative measures that would provide shad larvae access to their specialized prey. Changes to aquatic and physical features that may have historically served the forage needs of larval shad in the Susquehanna River watershed will be discussed. (159)

Carey, Maureen*, Eric S. Ho. Biology Department, Lafayette College, Easton, PA, 18042, USA. *A Transcriptome Analysis of Borrelia burgdorferi Infected Murine Heart and Brain Tissue.* Lyme disease is the most common vector-borne disease in the United States, with nearly 250,000 cases per decade. Most cases occur in the northeast, but with global climate change, it is likely that the region hospitable for Lyme transmission will expand. Thus, it is important to understand Lyme pathology. Our goal is to determine the difference in gene expression upon *Borrelia burgdorferi* infection in mouse heart and brain to elucidate *Borrelia*'s effect on these tissues. *Borrelia* causes acute systemic infection and rheumatic, cardiac, and neurologic complications. Lyme disease is usually curable with prompt antibiotic treatment, but nonspecific symptoms make early diagnosis difficult. Additionally, symptoms may persist after bacterial clearance in chronic cases. This is particularly interesting: indicating that infection may induce a self-perpetuating cascade of immunological responses. Because antibiotic treatment is

not a panacea, understanding how *Borrelia* affects the body, especially heart and brain tissues, is crucial in reducing the burden of disease. Both host immune response and *Borrelia* itself influence the disease progression and severity. Even though B31 *B. burgdorferi* genome has been sequenced, the genome does not reflect any obvious virulent elements. Thus, a more 'downstream' analysis, looking at the transcriptome of infected cells rather than the bacterial genome, may help in understanding the pathogenesis. We propose to investigate the host transcriptional response by analyzing the differential gene expression in target tissues with RNA-Seq, which captures the transcriptional profile of all genes. Comparing transcriptomes of uninfected and infected tissue could reveal distinct gene expression differences, illuminating the immune and tissue responses induced by *Borrelia*. We infected six C3H/HeJ mice with B31 *Borrelia* subcutaneously in the mid-back and collected brain and tissue samples after 14 and 42 days post-infection. Total RNA was extracted and sequenced using Illumina HiSeq. A total of 233M reads were generated for transcription profile analysis. (49)

Casey, Abigail I.*, Briana N. Ferguson*, Courtney B. Godbolt*, Mehveen R. Qureshi, and Amy E. Faivre. Cedar Crest College, Allentown PA 18104. *Decline of Pollen Viability in Christmas cactus (*Schlumbergera *x* buckleyi *var. Magenta) Flowers Following Anthesis*.-Many factors influence the success of fertilization in plants, such as attracting pollinators, incompatibility systems, pollen viability and pollen tube growth. Pollen viability influences pollen performance (pollen tube germination and growth) and can be affected by temperature, humidity, and the lapse of time pollen is exposed to the environment following anthesis. This study compared differences in pollen viability in one variety of Christmas cactus (*Schlumbergera* x *buckleyi* var. Magenta) in relation to flower age. Christmas cacti are the result of a hybridization of *S. truncata*, and *S. russelliana*, two species native to southeastern Brazil, and the propagation of the hybrid species has led to the production of more than 100 varieties of Christmas cacti. In this study samples of pollen grains were collected from flowers one, two and three days following anthesis and grown *in vitro* for 24 hours on nutrient agar plates. Pollen tube germination was recorded for first, second, and third day old pollen. When data for pollen viability was pooled by age and analyzed, pollen viability was significantly different for each day following anthesis ($p < 0.00001$). First day flowers had an approximate mean of 53% pollen viability, whereas second flowers had an approximate mean of 33% pollen viability and third day flowers had an approximate mean of 23% pollen viability; clearly pollen viability declined following flower anthesis. These results will be added to the growing data set on *Schlumbergera*, a genus of great interest in the horticultural trade. (167)

Chelius, Ben*, Amandeep Kaur, Timothy Hoffman, Kimberly Challenger, Sara Duryea, Michael A. Steele, and William J. Biggers. Wilkes University, Wilkes-Barre, PA 18766. *Investigations into the Endocrine Regulation of Larval Diapause in Acorn Weevils*--Acorn weevils (*Curculio sp.*) undergo a mandatory larval diapause in the ground lasting for one year, but however can also undergo a prolonged diapause lasting for an additional one or two years. In efforts to understand environmental and biological factors regulating the length of this diapause in acorn weevils, we have investigated the possible roles of juvenile hormone (JH) and ecdysone which are known to regulate pupal and larval diapause in other insects. Treatment of the acorn weevils with 20-hydroxyecdysone did not stimulate metamorphosis to the pupal stage, however injection of precocene I, which causes the destruction of the corpus allatum in insects, stimulated metamorphosis into pupae after one month compared with controls which did not metamorphose. Exposure of the larvae to cold temperatures or warm temperatures also did not advance metamorphosis. These results may indicate the involvement of juvenile hormone in the maintenance of larval diapause in acorn weevils. In future studies we will assay the levels of JH that occur in the developing larvae and in the diapause state. (189)

Cheng, Sze*, Natalie Cardenas*, Robert Kurt. Lafayette College, Easton, PA 18042. *Evaluating the presence of inflammasomes in 4T1 cancer cells by comparing gene expression between 4T1 cells and dendritic cells*. Inflammasomes, protein complexes, form part of the inflammatory signaling cascade in white blood cells. Inflammasomes are triggered when pathogens bind to toll-like receptors on the surface of the cell. The signaling cascade triggered by inflammasomes leads to an inflammatory response which helps to fight infection. Three major inhibitors of the inflammasome cascade, NLR C3, NLR P6, and NLR P12, have also been shown to be present in white-blood cells (dendritic cells) and could play a role in stopping inflammation. This project tested the levels of specific genes known to inhibit inflammation as well as genes in the three major types of inflammasomes, NLR P3, NLR P1, NLR C4, in 4T1 breast cancer cells and dendritic cells. 4TI cells found in mice were used because of their similarities to human breast cancer cells, and inflammasomes have been previously shown to hurt or help cancer progression. Dendritic cells were used as a control due to their ability to detect pathogens and their ability to initiate response to infections. The purpose of this project was to see whether certain inflammasomes were present in 4T1 cells, and to better understand their possible contribution to inflammatory responses. The results showed an overexpression of the inhibitors in 4T1 cells relative to dendritic cells, indicating that inflammation may be inhibited in these tumor cells. The reduced expression of inflammasomes NLR P3 and NLR P1 suggests that these inflammasomes were absent in 4T1 cells. (24)

Chinnici, Nicole*, Jane Huffman, Thomas Rounsville Jr. East Sroudsburg University, East Stroudsburg, PA 18301. *Genetic Structure of American Black Bears (Ursus americanus) in New Jersey*-Black bears in New Jersey are a contiguous population. Over the last 30 years, NJ's black bear population has been increasing and expanding its range southward and eastward from the forested areas of northwestern NJ. The population has grown due to increased black bear habitat. We evaluated aspects of genetic diversity and gene flow for 4 management zones in NJ using genotypic data from 9 microsatellite loci. Measures of genetic diversity were estimated at the individual level, as well as within and between management areas. Average expected heterozygosity, average number of alleles, total number of alleles, number of unique alleles, average variance in number of repeats, and average range in number of repeats were determined from microsatellite data using the program Cervus 3.0. A total of 78 alleles were observed at the 9 microsatellite loci amplified in a multiplex reaction. The degree of variation ranged from 7 to 12 alleles per locus, with an average of 8.67 alleles per population at each locus. Our results indicated that genetic diversity was high in the black bears. Results from STRUCTURE 2.3.4 suggest that NJ black bears represent a panmictic population. (90)

Ciraku, Lorela* and **Steven James**. Gettysburg College, Gettysburg, PA 17325. *Epigenetic down-regulation of snxA^{Hrb1} rescues G2-M cell cycle defects* – At the G2/M transition, eukaryotic cells enter the mitotic phase of the cell cycle by condensing chromosomes and reorganizing the microtubular cytoskeleton to form a spindle apparatus. These events are driven by the activation of the *cdc2/cyclin B* kinase (CDK1) whose localization to the nucleus governs many of the structural changes that occur at G2/M. Heat-sensitive mutations in the *Aspergillus nidulans nimX*^{cdc2} and *nimE*^{cyclinB} proteins arrest the cell cycle in late G2 phase and thus prevent mitotic entry at the non-permissive temperature of 42°C. To identify genes that interact with *nimX*^{cdc2}, extragenic suppressors of the *nimX*2^{F233L} allele were generated. Two mutations in the *snxA* gene, *snxA*1 and *snxA*2 (*s*uppressor-of-*n*im*X*), suppress the heat sensitivity of the *nimX2*^{cdc2} mutant, and by themselves confer a cold-sensitive G1 phase arrest (McGuire *et al*., 2000). *snxA* is the *Saccharomyces cerevisiae* ortholog of *Hrb1*, a nucleocytoplasmic shuttling mRNA binding protein belonging to the serine-arginine Rich (SR) protein family. Surprisingly, no DNA mutations occur in *snxA1* and *snxA2* coding regions, nor were mutations found in the 5' and 3' regulatory regions. Furthermore, we discovered that *non-overlapping* DNA fragments covering different portions of the 5' regulatory region were able to complement, or partially complement *snxA*1 and *snxA*2 cold-sensitivity. Finally, deletion of the *cclA$^{Bre2/Ash2}$* H3K4 methyltransferase, an epigenetic activator of gene expression, strongly enhanced the cold-sensitive growth defects of *snxA*1 and *snxA*2. Together, these observations suggest that epigenetic chromatin modifications in the 5' regulatory region may repress *snxA* expression and account for the *snxA*1 and *snxA*2 loss-of-function phenotypes. Consistent with this idea, *snxA* protein levels were reduced dramatically in *snxA*1 and *snxA*2 mutants. In summary, we have discovered a novel G2/M inhibitory mechanism, acting through *snxA*^{Hrb1}, in which *snxA* down-regulation appears to result from stable epigenetic modifications. (37)

Clark, Nick.* Susquehanna University, Selinsgrove, PA 17870. *Contextual Dynamics and Political Knowledge: The Role of Procedural Quality in an Informed Citizenry*--While much is known about the micro-level predictors of political knowledge, there have been relatively few efforts to study the potential macro-level causes of knowledge. Seeking to improve our understanding of country-based variation in knowledge, this paper theorizes that individuals have an easier time finding and interpreting information in political environments that provide the public with greater opportunities to engage, observe, and learn about the political process. To investigate that possibility, the paper analyzes how the procedural quality of the political process affects political knowledge. Using data from the Comparative Study of Electoral Systems and the Worldwide Governance Indicators Project, survey analyses show that the transparency and responsiveness of a political system indeed influence the public's information about their political parties and, to a lesser extent, the amount of factual knowledge retained by survey respondents. In other words, the quality of democratic governance affects how much individuals know about the political process. (161)

Conant, Gabrielle*, Audrey J. Ettinger, and K. Joy Karnas. Cedar Crest College, Allentown, PA 18104. *Effects of Retinoic Acid on Development of GABAergic Neurons*.— Neuron transplantations are a potential treatment for psychological diseases that stem from neuronal disruptions or deficiencies. One such deficiency can result from a lack of in vitamin A during prenatal development causing a shift in neuron growth and therefore decreasing GABAergic neurons. GABAergic neurons are responsible for reduction of anxiety and anger, and low numbers can contribute to the presenting of anxiety, schizophrenia and other psychological disorders. All-*trans*-Retinoic acid (RA), a derivative of Vitamin A, has been demonstrated to be a morphogen for the differentiation of GABAergic neurons from stem cells. This study explores three methods of inducing and acquiring healthy neurons using RA treatments. The first experiment involved exposing embryonic chicken neurons *in ovo* to RA and comparing the number of GABAergic neurons in control and treated samples using neuronal primers in q-rtPCR. In parallel, a second approach exposed cultured primary embryonic chicken neurons to RA to be followed by cell survival and differentiation assays. As a third approach, an immortalized chicken lymphocyte cell line (DT40) was

cultured and treated with RA, and used as a model for exploring overall cell health and ion channel expression via electrophysiology. (34)

Cook*, Shannon R., Morgan M. Sperratore* and **Sheryl L. Fuller-Espie.** Cabrini College, Radnor, PA 19087. *The Development of a Flow Cytometric Method to Measure Nitric Oxide Production in Coelomocytes of the Earthworm Eisenia hortensis in Response to Microbe-Associated Molecular Patterns and Soil-Dwelling Bacteria* - This *in vitro* study was aimed to develop a flow cytometric method to measure the highly-reactive, free radical gas nitric oxide (NO) in the immune cells (coelomocytes) of the invertebrate annelid *Eisenia hortensis* in response to microbial challenge. Subsequent to a pre-loading period of coelomocytes with the fluorescent indicator 4-amino-5-methylamino-2', 7'-difluorofluorescein diacetate (DAF-FM DA), nitric oxide detection assays were conducted to measure response to microbial components. DAF-FM DA-treated coelomocytes were incubated overnight (13-16 hours) with either highly-purified microbe-associated molecular patterns (MAMPs) of peptidoglycan (PTG), lipopolysaccharide (LPS), lipoteichoic acid (LTA), or zymosan in 5-fold serial concentrations, or chemically-fixed, intact *Bacillus megaterium, Arthrobacter globiformis, Escherichia coli, Pseudomonas stutzeri,* and *Azotobacter chroococcum* in serial dilutions of 5 or 10-fold multiplicities of infection (MOI). Flow cytometric analysis measuring increases in relative fluorescence intensity (RFI), which is directly proportional to the amount of intracellular NO produced, permitted determination of statistical significance ($p < 0.05$) of exposed coelomocytes compared to baseline controls. Significant increases in NO were detected reproducibly in coelomocytes treated with purified PTG, LPS, and LTA in three independent assays, but a more notable production of NO was observed when coelomocytes were incubated with intact bacteria. The most prominent results with 100% response in all assays performed were observed in assays using *B. megaterium* and *A. globiformis,* at MOIs of 100:1 and 500:1, respectively. *P. stutzeri* and *A. chroococcum* also produced statistically significant results at a range of different MOIs but not with 100% response levels in all assays performed. This research demonstrates that induction of NO production in response to microbial challenge can be quantitatively measured through the use of the fluorescent indicator DAF-FM DA and flow cytometry. These results provide supporting evidence of the deployment of NO as an antimicrobial defense mechanism used by the immune cells of earthworms. (79)

Corpus, Larry* and **Barbara McCraith**. Misericordia University, Dallas, PA 18612. *Identification of larval chironomids (Diptera: Chironomidae) from Trout Brook, Luzerne County, Pennsylvania*--To establish a baseline reference collection for future use in studying natural and anthropocentric effects upon Trout Brook's water quality, aquatic macroinvertebrates were sampled monthly from August 2012 through July 2013. This resulted in large numbers of macroinvertebrates from the stream that needed to be sorted, counted, and identified. Initial sorting efforts suggested that larval chironomids (Diptera: Chironomidae) were the most abundant benthic macroinvertebrates occurring in Trout Brook, with one group of riffles at one site yielding 347 chironomid larvae on one sampling date. Because of the large numbers of chironomids collected during the study and their difficult taxonomy, a faster method of separating and identifying them had to be developed. A modified process involved sorting larvae in 70% ethanol under a dissecting microscope, then grouping them based upon head capsule and general body habitus. From these sorted individuals, four to six 4th instar larvae were selected, transferred to water, their body walls punctured with a minuten insect pin, and then placed into separate porcelain dropping plate depressions with 10% KOH for 24 hours to clear soft tissue from the head capsules, thoraces, and abdomens. When adequately cleared, each larva was placed onto a glass slide in two drops of eye drop solution (glycerin, hypromellose, and polyethylene glycol), covered with a round cover slip, and viewed under a compound microscope. While there are important taxonomic features of the larval thorax and abdomen, the most important identifying characters are those found associated with the head capsule. Thus far, three subfamilies (Chironominae, Orthocladiinae, and Tanypodinae) and six genera *(Ablabesmyia*, *Chironomus, Cricotopus, Dicrotendipes*, *Procladius* and *Tanytarsus)* have been identified using this method. (104)

Coxe, Robert*. Delaware Species Conservation and Research Program, Smyrna, DE 19977. *Mapping vegetation change over 58 years (1954-2012) at the James Farm Ecological Preserve, Sussex County, Delaware* –Vegetation communities are the plant expressions of habitats on the ground with each species preferring specific conditions. As a result the movement of vegetation communities reflects changes in habitat and can be used to map changes in hydrology and/or salinity over time. The James Farm Ecological Preserve is located in the Inland Bays region of Delaware and contains a relatively undisturbed coastline. To document the current and historical changes, vegetation communities and land covers were interpreted, and mapped using historic and current aerial imagery from 1954, 2002, 2007, and 2012, and field observations. Vegetation community maps from each year of imagery were then compared for acreage, location, and change of each vegetation community/land cover. Using the above comparisons it was found that the James Farm Ecological Preserve, which totals 155 acres (63 ha), has lost approximately 10 acres (4 ha) of land to water inundation from 1954 to 2012. Between 1954 and 2012, North Atlantic High Salt Marsh lost 11 acres (4 ha), North Atlantic Low Salt Marsh gained 19 acres (8 ha), Irregularly Flooded Eastern Tidal Salt Shrub lost 17 acres (7 ha), Smooth Cordgrass-

Inland Saltgrass Tidal Herbaceous Vegetation gained 3 acres (1 ha), and Reed Tidal Marsh gained 11 acres (4 ha). Most of the observed changes are believed to be due to increased water, salinity, and erosion. Further inland, Successional Maritime Forest lost 8 acres (3 ha) and Southern Red Maple-Blackgum Swamp lost 5 acres (2 ha). (146)

Coxe, Robert*. Delaware Species Conservation and Research Program, Smyrna, DE 19977. *Mapping vegetation change over 75 years (1937-2012) at Prime Hook National Wildlife Refuge, Sussex County, Delaware, a preview of sea level rise in the future?* –Vegetation communities are the plant expressions of habitats on the ground with each species preferring specific conditions. As a result the movement of vegetation communities reflects changes in habitat and can be used to map changes in hydrology and/or salinity over time. Prime Hook National Wildlife Refuge, on the shore of Delaware Bay, has been the scene of multiple disturbance both man-made; ditching and impoundments, and natural; storm overwash and inlets. These combined alterations have produced a microcosm of what the eastern United States coast may experience in the next 100 years. To document the current and historical changes, vegetation communities and land covers in Units 1-3 of Prime Hook National Wildlife Refuge were interpreted, and mapped using historic and current aerial imagery from 1937, 2002, 2007, and 2012, and field observations. Vegetation community maps from each year of imagery were then compared for acreage, location, and change of each vegetation community/land cover. Using the above comparisons it was found that Units 1-3, which total 8,094 acres (3,276 ha), have lost approximately 2,166 acres (877 ha) of land to water inundation from 1937 to 2012. Between 1937 and 2012, North Atlantic High Salt Marsh lost 226 acres (91 ha), North Atlantic Low Salt Marsh lost 663 acres (268 ha), Irregularly Flooded Eastern Tidal Salt Shrub lost 91 acres (37 ha) and Reed Tidal Marsh gained 623 acres (252 ha). Most of the observed changes are believed to be due to increased water, salinity, and erosion. Further inland, Chesapeake Bay Non-riverine Wet Hardwood Forest gained 120 acres (49 ha), Red Maple-Gum Successional Swamp Forest gained 228 acres (92 ha), and Northern Coastal Plain Mixed Oak/Heath Forest 132 acres (53 ha), mainly due to reforestation of former fields. (145)

Crawford, Marla*, Edwards, Shawnna*, Walter, Cynthia. Saint Vincent College, Latrobe, PA 15650. *The Effects of Contact Lens Solutions on Bacterial Growth and Human Cell Metabolism in Culture* - The increased use of contact lenses raises questions on proper lens care and the impact of lens solutions on eye tissues. This study was designed to test the effectiveness of contact lens solutions to control growth of *Staphlococus aureus* and cytotoxicity for human epidermal cells in culture. We measured optical density values at 600nm before and after bacterial incubation for 24 hours at room temperature. Results indicate that only CLS1 and CLS3 had statistically significant linear relationships of decreasing bacterial growth with increasing log of dose (Regression $P<0.02$). If we use the criteria that inhibiting 90 % of bacterial growth is considered a desirable outcome, CLS3 provided this at a concentration of 12.5-25% and CLS1 required a 50% solution in media. For CLS2, however, the maximum dose (50%) was ineffective in inhibiting bacterial growth. After exposure to different contact lens solutions, human cells were analyzed with fluorescence to detect cellular activity using a Cell Titer Blue assay. The brand of lens solution had a highly statistically significant effect on human cell metabolism in a 24 hours exposure to a 50% solution of CLS ($p<0.00005$ Two factor ANOVA). CLS2 severely decreased metabolism to only 6% (sd 0.02) of controls; the other two brands resulted in metabolism at 32% (sd 0.09) and 32% (sd 0.1) of control cells. These results indicate contact lens solutions differ and some may fail to suppress bacteria during contact lens storage. Also, if a certain contact lens solution decreases proper human cell function, it can decrease the patient's ability to defend against potential pathogens that may be found on the contact lens itself. Future experiments could analyze the effects of lens solutions on human corneal or conjunctival cells for a more realistic view of the eye, making the research more relevant to eye care professionals. (46)

Cross, Trevor*, David Shade, and Caroline Nielsen. Cabrini College, 610 King of Prussia Road, Radnor, PA 19087. *A New Method to Measure the Effect of Phages on Bacterial Carbon Mineralization in Soil* - As viral impacts on ecosystem nutrient cycling has been explored in mostly aquatic environments, questions remain regarding how bacteriophages affect terrestrial microbial ecology. It is known that in the relatively homogenous, aqueous environment of marine and freshwater systems, viral abundance can significantly impact nutrient turnover, genetic exchange and the mineralization and mobilization of key elements. Terrestrial systems also contain abundant bacteriophages that are proposed to have similar influence on bacterial nutrient cycling, however it is unknown how the presence of a spatially defined matrix (e.g. soils) might alter these relationships. Bacteriophage are difficult to extract from soils, and thus quantifying their effects in natural soil ecosystems has been challenging. This investigation uses microcosm experimental set-ups to elucidate the effect of *Arthrobacter sp.* phages on respiration using GC/MS to measure headspace CO_2. Using bacterial cultures amended with varying virus to bacteria ratios (VBR) in completely aqueous conditions as a standard, analogous microcosms containing sand as a complex soil-like matrix were incubated to determine the effects of a spatially defined environment on the net respiration of each microcosm. Net CO_2 respiration for each microcosm was measured via mass spectrometry, with Agilent's Gas-Pro® column designed to detect small molecule gases. This method will allow researchers to

examine bacterial carbon mineralization with and without the presence of bacteriophage under a wide variety of conditions, including differing temperature, moisture, soil texture, and carbon substrate types. (80)

Custer, Gordon*, Tammy Tintjer, and **Julie Belanger**. King's College, Wilkes-Barre, PA 18711. *Assessment of Protection of Host Tissues by Vertically Transmitted Fungal Endophytes*− This research was undertaken in order to determine if different tissues of host plants are protected to varying degrees. The experimental plants, *Festuca arundinacea, Agrostis hyemalis and Ipomea asarioli,* are all infected by vertically transmitted endophytic fungi, such that the survival and reproduction of the endophyte is reliant on the survival and reproduction of the host. Optimal Defense Theory (ODT) states that an organism only has access to a limited supply of resources and that the organism will allocate those resources to protection as well as any other process needed to sustain life. Via ODT the organs and tissues that will be most protected are the ones most important for survival and reproduction. By applying ODT to the endophyte we hypothesize that the seeds will be the most protected. The protection provided by the endophyte comes in the form of alkaloids. An example of which, cattle grazing on endophyte infected *Festuca arundinacea* are known to exhibit symptoms of fescue toxicosis. These alkaloids are secondary metabolites of the plant's associated endophyte. These alkaloids are known to have a toxic effect on herbaceous insects and mammals. After acidic extraction of the alkaloids from several different plant tissues, alkaloid levels will be quantified using the Van-urk reagent, thin layer chromatography, and a tryptophan standard for the presence of alkaloids, which will be confirmed by spectrophotometry and quantified relative to the tryptophan standard. The results that will support the ODT are the highest levels of alkaloids in the seeds of all three plant species. Additional support for the ODT will come from high levels in the above-ground tissues, as they directly produce the seeds, when compared to the below ground tissues. (169)

Damore, Nicole[1]*, Graham D. Fairhurst[2] and **Michael W. Butler[1]**. 1-Lafayette College, Easton, PA 18045, 2-University of Saskatchewan, Saskatoon, SK, Canada S7N 5E2. *Corticosterone levels correlate with white plumage coloration in mallard ducks*- Many studies have focused on the effects on melanin-based coloration from immune challenges during development and found that birds exposed to stronger immune challenges generally have more melanin deposited in their feathers than those exposed to weaker immune challenges. Immune challenges may also affect white coloration, or lack of pigmentation, in avian plumage. An organism's natural variation in corticosterone levels (CORT; a hormone up-regulated in response to stressors) may reflect immune challenges, which could affect white coloration. In this experiment, we measured three metrics on the feathers of mallard ducks, *Anas platyrhynchos*, and examined whether immune challenges, a type of stressor, had an impact on plumage pigmentation or CORT levels in the feathers. Sheep red blood cells were injected at different stages of duckling development: before, during, and after feather growth. At adulthood, the feathers were collected and we measured the width of the white region along the rachis on the exposed part of the feather (side visible to other ducks and not hidden under other feathers) and the unexposed part of the white region along the rachis. Immune challenges did not have an effect on the unexposed or exposed white band width or total area of the white region. However, we found that CORT levels were lower in feathers with wider white bands, but only on the exposed side of the feather. Our results suggest that the negative relationship between CORT and the width of the exposed white region may act as an honest signal to other birds of previous stressors, allowing for honest signaling. (191)

Darwish, Shawqui *, Jane E. Huffman, Abdalla A. Aldras, Thomas F. Rounsville Jr., East Stroudsburg University, East Stroudsburg, PA 18301. *Case-Control Study of NJ Black Bears (Ursus Americanus) Infected with Babesia spp.* – *Babesia* spp. are intraerythrocytic protozoan parasites of animals and humans that cause babesiosis, a zoonotic disease transmitted primarily by tick vectors. Although a variety of species or types of *Babesia* have been described in the literature as causing infection in humans, the rodent parasite *Babesia microti* has emerged as the focal point of human disease. In this study, black bears in NJ were live-trapped and blood samples were taken from 2006 to 2013 during multiple seasons. Throughout this follow-up period some animals were first time captures and others were recaptures. DNA was extracted from all samples and amplified using the polymerase chain reaction using genus specific primers. A total of 63 black bears were enrolled in the study. Of the 25 bears that tested positive for *Babesia* at baseline, 52% of them cleared the infection and 48% persisted with infection at follow-up. Of the remaining 38 bears that tested negative for *Babesia* at baseline, 71% of them remained free of infection and 29% acquired infections at follow-up. All positive samples were sequenced to determine the species of *Babesia* infecting the black bears. Correlation analysis of these findings revealed predisposing factors that may have influenced the prevalence of *Babesia* in American black bears. (92)

De Young, Sheila* and Justin Ward* Suquehanna University, 514 University Avenue, Selinsgrove, PA 17870, *An Immunocytochemical Analysis of the Signaling Pathway blimp-1 in Sea Urchins Embryos Treated with Thalidomide* - Human embryos exposed to thalidomide exhibit many different teratogenic outcomes. First used in the late 1950's to relieve morning sickness, the drug was quickly removed from the market when it became apparent that embryo

exposure, especially during the first trimester, resulted in teratogenicity. In 1998, the USFDA approved thalidomide for limited clinical use. Today, clinicians prescribe thalidomide to treat numerous diseases due to its anti-inflammatory and anti-angiogenic properties. Despite intensive research and many proposed theories, there is no consensus on the teratogenic mechanism of action. Previous work in this laboratory demonstrated that sea urchin embryos cultured with thalidomide exhibit a range of malformations, including abnormal gastrulation and spicule development, both of which are products of endomesoderm specification. The blimp-1, or B lymphocyte-induced maturation protein-1, gene has a critical role in eliciting transcription factors for both early and late endomesoderm specification. Using immunocytochemistry, the effect of thalidomide on the blimp-1 signaling pathway was observed. Sea urchin embryos obtained using standard spawning and fertilization techniques were cultured in three separate solutions; seawater, dimethyl sulfoxide (DMSO), and 400 μM thalidomide. The cultures containing seawater and DMSO served as controls, since thalidomide solubility in aqueous solutions is limited. In preparation for immunocytochemistry, we fixed embryos at four different times post-fertilization (1h, 6h, 12h, and 18h). The fixed embryos were incubated for one hour with the primary antibody, goat polyclonal anti-blimp-1, then washed and incubated for one hour with secondary antibody, donkey anti-goat labeled with Alexa fluor. Stained embryos were examined using fluorescence microscopy. An altered fluorescence pattern in controls compared to embryos exposed to thalidomide could indicate alterations in the blimp-1 signaling pathway. (35)

Dhakal, Jyotsna*, Brad E. Engle and **M. Dana Harriger.** Wilson College, Chambersburg, PA 17201. *Determining the Effect of Vitamin D Supplementation on Bacillus Calmette-Guérin Vaccine-Induced Immune Response in Guinea Pigs* – The reduced efficacy of the Bacillus Calmette-Guérin (BCG) vaccine at close proximity to the equator is not fully understood. Ultraviolet radiation exposure a few days before or after BCG vaccination impairs BCG-induced resistance against tuberculosis in guinea pigs. A possible explanation for this could be the greater production of vitamin D due to enhanced sunlight exposure near the equator. Clinical studies suggest that vitamin D enhances immunity against mycobacteria, and that vitamin D deficiency is associated with susceptibility to active tuberculosis. Furthermore, vitamin D suppresses BCG proliferation *in vitro*. Paradoxically, *in vitro* studies indicate that vitamin D inhibits Th1 mediated immunity, a crucial component of the immune response against mycobacteria. These properties suggest that vitamin D could impair the efficacy of BCG either through antimicrobial activity against BCG or by restricting the immune response produced following vaccination. The aim of this study was to investigate whether vitamin D impairs the protective efficacy of BCG. Guinea pigs were given weekly doses of 1000 IU or 2000 IU vitamin D supplementation orally for 12 weeks. On the fifth week of vitamin D administration, animals were vaccinated with BCG. Seven weeks after BCG vaccination, a whole blood assay using *Mycobacterium tuberculosis* purified protein derivative was employed to generate IFN-γ responses. IFN-γ levels in the culture supernatants were quantified by ELISA. Preliminary analysis indicated that the samples from BCG-vaccinated groups that were given vitamin D had lower levels of IFN-γ than the BCG-vaccinated group that was not given any vitamin D, suggesting that vitamin D impaired the efficacy of BCG. Results of this study may provide evidence that vitamin D is a factor contributing to the variability of BCG efficacy with global latitude. (81)

DiCasoli, Richard*, Samantha Moyer. King's College, Wilkes-Barre, PA 18711. *The Effects of Retinoic Acid on trkB.t1 Expression in SH-SY5Y cells.* – Brain Derived Neurotrophic Factor (BDNF) is a neurotrophin that enhances neuroplasticity, regulates cell survival, and can reverse injury. BDNF activates two trkB receptors: TrkB.tk^+ (full-length) and trkB.t1 (truncated). Upon binding of BDNF, trkB.tk^+ is autophosphorylated, which then activates intracellular pathways through its cytoplasmic domain. TrkB.t1 is thought to be responsible for neurite outgrowth and influences intracellular signaling cascades, which are important in the study of neurodegeneration. We use SH-SY5Y neuroblastoma cells for our *in vitro* model of degeneration because these cells can mature into a dopaminergic neuronal phenotype. SH-SY5Y cells express the trkB receptors and respond to treatment with BDNF. SH-SY5Y cells express trkB.tk^+ optimally after 6-7 days incubation with retinoic acid (RA). Optimal expression of trkB.t1 is unknown, but we hypothesize that its peek expression will occur following and RA incubation period of 0-7 days. The purpose of this experiment is to determine the time course of optimal trkB.t1 expression. Current studies are measuring trkB.t1 expression, post RA treatment, via western blot analysis. Future experiments will confirm the western blot results with immunofluorescence microscopy. Once we know when trkB.t1 is optimally expressed in SH-SY5Y cells, we can use the cells to study trkB.t1 function. Ultimately, we are interested in understanding the role of trkB.t1 in the neuronal response to BDNF. (28)

Diegelman-Parente, Amy* and Sherri A. Mason. Mercyhurst University, Mercyhurst, PA 16546 and SUNY Fredonia, Fredonia, NY 14063 *Microplastics in Lake Erie and Presque Isle Bay* – Since their introduction in the 1940s and 1950s, plastics have become a central component of our consumer-driven society. Their beneficial uses, which include weight reduction and durability, generally arise from physical and chemical properties that also render them persistent pollutants in our aquatic and terrestrial environments. Plastic pollution on a macroscopic scale

(defined as particles larger than 5 mm) poses a direct threat to animals by accumulation, entrapment, entanglement, choking and suffocation. The discovery of microplastics in 2004 shed new light on the impact these post-consumer waste products can have on our aquatic ecosystems. Plastics can serve as a source of organic contaminants, either directly from the use of these materials in plastics manufacture, or through the adsorption and thus transport and uptake of hydrophobic organic pollutants and trace metal contaminants found in the watershed. While significant research has been done on the presence and persistence of microplastics in marine ecosystems, very little has been done in freshwater environments, and even less has been done to examine the effects these contaminants may have on the health of its inhabitants and the ecological integrity of their habitat. Previous hypotheses suggested that if plastic pollution were present in freshwater bodies at all, it would contain particles larger than those found in marine environments. However, the waters of Lake Erie do contain significant levels of microplastics, which have the potential to have wide reaching implications across varying trophic levels. In the proposed research, the presence and potential effects of microplastics on various fish species from the Lake Erie and Presque Isle Bay regions will be examined using a variety of chemical and biochemical methods. Of particular interest is the desire to examine water samples from both the sediment as well as the water column, considering fish species that inhabit both environments. (84)

Diegelman-Parente, Amy and **Gregg A. Robbins-Welty.*** Mercyhurst University, Mercyhurst, PA 16546. *Effects of personal care, prescription, and other emerging contaminants on sentinel species in Lake Erie beach waters at Presque Isle State Park* – Chemicals used extensively and intensively in our technological society are currently predicted to have surpassed the 100,000 mark in numbers and depending on their properties, modes, and quantity of use, a large number of these chemicals can reach the environment and have unpredictable but potentially harmful environmental and health impacts. Accurate methods of monitoring the levels of these chemicals, an understanding of their potential to damage the natural inhabitants of aquatic environments, and the ability to properly develop a risk assessment strategy are all critical pieces to the maintenance of a healthy aquatic ecosystem that does not pose a threat to human safety. Current research in our laboratory has identified several emerging contaminants in Lake Erie beach waters of Presque Isle State Park, including fluoxetine, triclosan, estradiol, and diuron, as well as the artificial sweetener sucralose. All of these chemicals have been shown to have negative health consequences in organisms from bacteria to humans. For most of these, the levels in the Park approach or exceed levels known to cause harm to aquatic species. We have examined the levels of these five emerging contaminants and are investigating the extent to which these chemicals can act dependently or in concert with one another to kill *E. coli* and other standard sentinel species through a DNA damage assay. From these data, we hope to provide a clearer picture as to levels, potential hazards of, and need for risk assessment management of these chemicals of concern in the Lake Erie beach waters of Presque Isle State Park. (86)

Diegelman-Parente, Amy and **Kristen M. Vidmar.*** Mercyhurst University, Mercyhurst, PA 16546. *Overexpression and FPLC-purification of the DNA polymerase from T. aquaticus* – The polymerase chain reaction (PCR) is a commonly used technique to amplify DNA sequences. Four main reagents required for any PCR reaction include: 1 – DNA template, 2 – DNA primers, 3 – dNTPs, and 4 – DNA polymerase. PCR optimization is frequently performed to identify experimental conditions that are optimal for the chosen template and primers. This can be a costly step of the experimental procedures, as commercially available DNA polymerases can range from a few hundred to thousands of dollars. We have undertaken the process of overexpressing and purifying the heat-stable DNA polymerase from *Thermus aquaticus*. A plasmid containing the gene for *Taq* DNA polymerase was transformed to BL21(DE3) *E. coli* cells. Cultures of these transformed cells were grown to saturation at 37°C and overexpression initiated with the addition of IPTG. The desired *Taq* polymerase was purified from a portion of the cleared lysate using FPLC and affinity chromatography. PCR activity using a standard template and primers was evaluated using samples of purified and unpurified *Taq* polymerase with comparison to commercial samples. Two inherent problems with this standard protocol for protein overexpression and purification are 1 – an inability to evaluate the extent of the protein overexpression, and 2 – the labor-intensive assaying of fractions for enzyme activity. To circumvent this problem, a GFP-fusion protein is being generated which will more easily confirm the success of protein overexpression and clearly identify fractions containing the desired enzyme. (17)

Ditty, Danielle* and Hillary Martin.* Susquehanna University, Selinsgrove, PA 17870. *Role of JNK in Sea Urchin Cleavage Stage Cell Division* - The cleavage stage of development involves rapid mitotic divisions with no dependence on growth factor signaling, paralleling the division of cancer cells. We are interested in the c-jun N-terminal kinase (JNK) pathway which phosphorylates downstream target proteins that regulate the cytoskeleton. To study the role of JNK in early development, we used Lytechinus pictus sea urchin embryos. We began by using the ATP competitive inhibitor SP600125 to inhibit JNK following fertilization. This inhibition prevented entry of the embryos into the two-cell stage, demonstrating that JNK activity is necessary to undergo first cleavage. When

JNK was inhibited after the two-cell stage, the embryos were unable to progress to the four-cell stage, suggesting an ongoing role for JNK activity in early cleavage. We chose to test the effect of JNK inhibition on three events of cell division dependent on cytoskeleton: pronuclear fusion, chromosome separation, and cytokinesis. To test JNK's role in microtubule dependent pronuclear fusion, we added the JNK inhibitor to the eggs prior to fertilization and stained the nuclei using NucBlue. The nuclei of the sperm and egg fused normally. In order to test JNK's role in spindle formation and chromosome separation, we inhibited JNK in fertilized embryos and fixed them at various time points and stained for microtubules using a fluorescent anti-tubulin antibody. We found that in JNK-inhibited embryos, spindle formation was delayed, and that the abnormal spindles that formed failed to separate the chromosomes. We plan to further characterize the defects in spindle formation by confocal microscopy. We also plan to stain actin filaments in inhibited embryos in order to determine if JNK assists with the organization of the contractile ring during cytokinesis. In conclusion, JNK activity is required for cleavage stage cell division in the sea urchin and plays a role in spindle assembly and chromosome separation. (69)

Dooley, Lynette* and Dr. Mel Zimmerman, Lycoming College, Williamsport, PA 17701. *Water Quality Assessment of the Lower West Branch-Susquehanna River*--The object of this study was to describe and determine water quality at 12 sites on the lower West Branch of the Susquehanna River between Lock Haven and Milton. Summer water chemistry (pH, alkalinity, nitrate nitrogen, nitrite nitrogen, dissolved oxygen, temperature, conductivity, orthophosphate, total phosphorus, TDS, and turbidity) are presented from 2005 to 2013. Macroinvertebrate kick samples were collected from sample sites in summer 2013 and compared to data collected in 2005. These data were subjected to the EPA Rapid Bioassessment Protocol II (RBA-Family Level), Hillsenhoff Biotic Index and Shannon-Wiener Diversity Index to determine water quality. Data suggests that the overall quality of the water appears to have improved. Implementation of new standards for sewage treatment plants that have been or are currently being upgraded will allow for future advancement and improve Pennsylvania's commitment to improve the Chesapeake Bay. (97)

Drummond, Monica*, Deborah S. Austin, and Rebecca M. Smith. Wilson College, Chambersburg, PA 17201. *Effects of Holy Basil, St. John's Wort, and German Chamomile on Fecal Corticosterone Levels in a Rat Model*- Experiencing high levels of the stress hormones cortisol or corticosterone, particularly for extended periods of time, can cause numerous health issues in an organism. Many herbs are thought to have the ability to reduce the levels of stress hormones. This study focuses on three herbs *Ocimum sanctum* (holy basil), *Hypericum perforatum* (St. John's wort), and *Matricaria chamomilla* (German chamomile). Two different types of herbal extracts, commercial supplements and freshly prepared ethanolic extracts, were used to study the effects of the three herbs on rat corticosterone levels. Each herbal extract was given orally, via a micropipette, to female Sprague Dawley rats (n=20), who subsequently received subcutaneous corticosterone injections. The fecal matter from each rat was collected, corticosterone extraction was performed, and competitive enzyme-linked immunosorbent assay (ELISA) was used to quantify the corticosterone levels. The ELISA analysis showed that corticosterone was present in all of the fecal samples; however, preliminary analysis does not reveal any trends which demonstrated that the herbs have a reductive effect on corticosterone levels. Future research, such as studying the effects of long term administration of the herbs, could help support the hypothesis that holy basil, St. John's wort, and German chamomile can reduce the levels of stress hormones. (82)

Dwyer, Matthew* and **Rebecca A. Urban**. Lebanon Valley College, Annville, PA 17003. *Asexual reproductive strategies of an invasive macrophyte compared to native species*-- The introduction of invasive aquatic plants may lead to the decline of native species and changes to ecosystem processes. *Utricularia inflata* is a rootless, carnivorous, invasive macrophyte that has spread to lakes in the northeastern United States, as well as Washington State. *Utricularia vulgaris* and *U. purpurea* are two closely related species that are native to the same Adirondack mountain lakes where *U. inflata* has invaded. Two greenhouse experiments were conducted comparing the asexual reproduction of all three species after fragmentation. Specimens were cut into 1 cm and 9 cm fragments—where the 1 cm fragments contained an original apical meristem, while the 9 cm fragments did not contain a visual apical meristem. Upon harvest, *U. inflata* had the greatest final biomass, as well as chlorophyll a, chlorophyll b, and carotenoid concentrations compared to *U. purpurea* and *U. vulgaris*, for both experiments. At the end of the 9 cm fragmentation experiment, *U. vulgaris* had significantly greater total length ($P<0.01$); however, *U. inflata* had the greatest number of new branches ($P<0.001$). These results suggest that the two species have a different asexual reproductive strategy. Considering that each new branch has the ability to develop into a new clone as the original fragment degrades, this may partially explain why *U. inflata* is a successful invader. (165)

Echanis, Emma*, M. Dana Harriger and **Brad E. Engle.** Wilson College, Chambersburg, PA 17201. *The Effects of Sonic Hedgehog and Overexpression of the DCDC2 Dyslexia Associated Gene on Growth of Primary Cilia in Developmental Cortical Neurons* – Abnormal primary cilia (Pc) growth in cortical neurons during development has been linked to many neurologic disorders, such as Dyslexia

and Attention Deficit Hyperactivity Disorder. Increased expression of *DCDC2*, Dyslexia associated gene, has been shown to stimulate elongation of Pc in developmental cortical neurons and increase extracellular concentrations of Sonic Hedgehog (Shh). To determine whether increased extracellular concentration of Shh and/or the overexpression of the *DCDC2* gene causes abnormal neural outgrowth, an *in vitro* study using E17 rat cortical neurons and cell culture techniques was performed. Half of the cell cultures were transfected with cDNA containing a *DCDC2*-GFP construct, and half were transfected with a control GFP plasmid. Then, half of each transfection group was placed in unaltered cell culture media, and the remaining groups were placed in media supplemented with Shh. After 3 days, the cells were fixed and stored at 4°C. Immunofluorescence targeting of MAP2 and gamma-tubulin was used for visualization and z-axis imaging of the neuronal processes. Data from the images will be evaluated for Pc growth and general cellular outgrowth. If extracellular Shh is linked to abnormal neural outgrowth, then cell cultures containing Shh, overexpressed *DCDC2* or both should exhibit abnormal neural outgrowth. However, if Shh is not linked to abnormal neural outgrowth, then only cultures with overexpressed *DCDC2* will exhibit abnormal neural outgrowth. Results from this study may help to elucidate the mechanisms related to abnormal neural migration, and assist in future efforts to identify and treat the disorders that may be linked to these abnormalities. (16)

Ellis, Katherine*, Christina Lackey, Kimberly Kovath, Margaret Liguori, and **Darl Swartz**. Delaware Valley College, Doylestown, PA 18901. *Detecting Chytrid Fungus in the Local Amphibian Populations in Southeast Pennsylvania-- Batrachochytrium dendrobatidis (Bd)* is a fungus of the Order Chytridiales that has been found to cause a fatal skin disease, Chytridiomycosis, in amphibians. It has caused mass die-offs and extinctions in amphibian populations world-wide. The goal of this project was to use real time Polymerase Chain Reaction (PCR) for detection of *Bd* in the amphibian populations. Sampling was done in Bucks County, Pennsylvania, an area in which no testing has been conducted according to Bd-maps.net (Olson et. al, PloS One 8(2): e56802). Using sterile swabs, 90 samples were taken from amphibians in the field from May to October 2013. DNA was extracted using the High Pure PCR Template Preparation Kit from Roche Diagnostics. Using the high-resolution melt temperature assay with Eva-Green dye (double-stranded DNA binding dye) the *Bd*-specific ribosomal DNA sequence was detected in 21 of the 89 samples taken. Of the positive animals, 20 were in the family Ranidae (frogs) and 1 in the family Plethodontidae (salamanders). Animals carrying the *Bd* fungus were found at 3 of the 5 sampling sites near Neshaminy Creek and Honey Hollow Pond of the Delaware River Watershed. Current analysis of other data taken during sampling (species, body length and life stage, and environmental conditions) may reveal trends of *Bd* presence and effects on animals and the environment. Confirmation of the presence of the fungus throughout these sites emphasizes the need for education and a more responsible approach to recreation and ecological studies in the local watershed. (74)

Esbenshade, Jannah*, and **Benjamin van Ee**. Geneva College, Beaver Falls, PA 15010, Black Hills State University, Spearfish, SD 57799. *Comparison of genetic and morphological identification of Phragmites australis subspecies in Northern Michigan* - Correct identification of native *Phragmites australis* subsp. *americanus* and nonnative *P. australis* subsp. *australis* is crucial for management and eradication of the invasive reed, but the morphological similarity of the subspecies can make identification difficult. Genetic identification is much more definitive. In this study, we compared subjects' morphological identification of sterile *Phragmites australis* specimens to the plants' genetic identification. We used chloroplast markers *rbcL-psaI* and *trnT-trnL* and nuclear gene *GBSSI* to identify each plant. All surveyed subjects assessed their own experience with plants on a scale of 1 to 5 and identified eleven reed samples using a provided key. The mean percent correct identification was 40% ± 20% standard deviation and was no different from the correct identification expected from random chance, with no significant relationship between experience and correct identification. These results show the necessity for genetic identification and the need for extreme care when attempting to morphologically differentiate the two subspecies. (163)

Eyer, Amanda*, Susquehanna University, Selinsgrove, PA 17870. *Application of water and soil analysis in relation to Habitat Suitability Index for Bald Eagles* - Determining locations of endangered species has been important since the late 20th century due to destruction of habitat and introduction of harmful chemicals into the environment that impact animal species. The Habitat Suitability Index (HSI) has been used to determine if an area can be successfully populated by a specific type of organism. A Bald Eagle HSI was applied to the Susquehanna River Corridor in Union, Snyder, and Perry counties. Nutrient analysis and elemental chemistry were completed to supplement the forging index which was based solely on water conductivity in the existing HSI. Water samples were collected to determine phosphate, nitrate, ammonia, organic carbon, and inorganic carbon Concentrations to gage the productivity of the river water. X-ray defractometry and x-ray fluorescence of soil samples collected near nesting sites to evaluate terrestrial productivity. The water analyses suggest a trend of increasing nitrate and decreasing phosphate levels in the water over time since the beginning of the trial. Elemental soil composition from the x-ray defractometry and the x-ray fluorescence suggest that the soil is silica rich which is beneficial for aquatic life. Soil and water analysis can accurately be applied to the HSI of Bald Eagles. The HSI for Bald Eagles could be applied to other areas within the United States near river basins such as

the Mississippi River, the Delaware River, and the Columbia River because the HSI correlates to Bald Eagle density within the Susquehanna River Corridor. (126)

Fetherolf, Sarah* and **Peter J. Petokas**. Lycoming College, Williamsport, PA 17701. *A Comparison of Population Structure, Density, and Stability in Two Populations of the Eastern Hellbender Salamander in North-Central Pennsylvania* – We assessed population structure, density, and stability in two metapopulations of the eastern hellbender (*Cryptobranchus alleganiensis*) in a tributary of the Susquehanna River West Branch in north-central Pennsylvania. In each of two stream sections, located ca. 8 km apart, all movable rocks >0.5m length and width were lifted to capture resident hellbenders during June-August 2013. Captured adults and juveniles were sexed, measured, weighed, and tagged with passive integrated transponders as part of an 8-year-long study of population dynamics. We then compared our results with data collected from the two populations during the summer of 2011. Population density (number per linear meter of stream length) did not change between sample years and was nearly identical for the two populations. Sex ratios changed from favoring males to an increased proportion of females at both locations. The number of juveniles captured also increased between years at both sites, possibly reflecting increased recruitment. Population size structure is similar between populations, and did not change in the downstream population between sample years. However, mean total body length was significantly smaller in the upstream population in 2013 compared to 2011. Two upstream movements between the populations were observed –a young adult female and a young adult male. Such movements are important for gene flow, but also confound attempts to estimate population size. Continued population monitoring should permit us to detect any distinct trends leading to population declines, as have occurred in other nearby watersheds. (118)

Force, Rebecca,* Shui Chen,* Emily Fortier, Emily Rowlands, Jean Heneks, and **Geneive E. Henry,** Susquehanna University, Selinsgrove, PA, 17870. *New spirocyclic acylphloroglucincols from hexane extract of Hypericum pyramidatum* - The *Hypericum* plant genus consists of over 450 species scattered in warm-temperate areas throughout the world. The genus is widely known as a source of biologically active natural products, including xanthones, flavonoids, naphthodianthrones and acylphloroglucinol derivatives. *Hypericum ascyron ssp. pyramidatum (H. pyramidatum)*, is one of nineteen *Hypericum* species growing in Pennsylvania. A subspecies of *H. ascyron* growing in China is used for the treatment of wounds, swelling, headache, nausea and abscesses. Prior phytochemical study of the Chinese species yielded a series of cytotoxic acylphloroglucinol derivatives. *H. pyramidatum* was investigated to compare its chemical constituents to those of the Chinese *ascyron* plant species. Interestingly, the chemical profiles of the two plants are similar, but not identical. Four new acylphloroglucinol derivatives, named pyramidatones A-D, have been isolated from the hexane extract of *H. pyramidatum*. The compounds were purified using a variety of chromatographic techniques, including HPLC, and their structures were determined based on 1D and 2D-NMR spectroscopic data. (172)

Fortier, Emily*, Dalyna Ngo, Jean Heneks*, Rebecca Force, Shui Chen, and **Geneive Henry.** Susquehanna University, Selinsgrove, PA, 17870. *Polyene and polyphenolic compounds from acetone extract of Hypericum pyramidatum* - For centuries, St. John's wort (*Hypericum perforatum)* has been used externally to treat wounds, burns, skin conditions, and inflammation, and internally to treat insomnia, hysteria, and depression. In recent years, a growing number of studies of several species of the *Hypericum* genus, including *H. perforatum*, have identified a wide range of biologically active natural products from the napthodianthrone, acylphloroglucinol, flavonoid and xanthone classes. Several members of these classes of natural products show anti-HIV, anticancer, antioxidant, antibacterial, anti-inflammatory, and antidepressant activities. As part of an ongoing study to isolate new biologically active compounds from *Hypericum* species growing in Pennsylvania, the acetone extract of *H. ascyron ssp. pyramidatum* was purified to afford polyphenolic xanthones and flavonoids, in addition to a polyene. The compounds were obtained by a combination of normal phase silica gel column chromatography and reverse-phase HPLC using a C-18 column. The structures of the compounds were elucidated on the basis of ultraviolet (UV) and 1D/2D nuclear magnetic resonance (NMR) spectroscopic data. (173)

Frampton, Alycia*, William G Dougherty, Susquehanna University, Selinsgrove, PA 17870. *The Synthesis, Characterization, and Electrochemical Properties of Tris(3-tert-butlypyrazolyl)borate Nickel Complexes* - A *tert*-butyl substituted trispyrazolylborate ligand (Tp^{tBu}) was synthesized from sodium borohydride and 3-*tert*-butylpyrazole using a melt method in a 63% yield. This Tp^{tBu} ligand was reacted with nickel nitrate hexahydrate in methanol to synthesize $Tp^{tBu}NiNO_3$ in a 75% yield. From this complex, nitrate was substituted with different anionic ligands yielding a series of complexes with varying metal environments. These complexes were characterized using ^{1}H-NMR spectroscopy, infrared spectroscopy and small molecule X-ray crystallography. Results of NMR spectroscopy indicate paramagnetic behavior with peaks ranging from -20 to 100 ppm. The infrared spectra exhibit a characteristic B-H stretch near 2500 cm^{-1}, which is a higher energy than the B-H stretch of the free ligand. X-ray crystallography revealed the structures of these complexes were pseudo-tetrahedral with the Tp ligand capping one triangular face. The redox properties of each complex were analyzed using

cyclic voltammetry and the trends are consistent with the donor properties of the ligands. (181)

Fryer, Henderson W.* and **Jessica Nolan.** York College of Pennsylvania, York, Pa 17403. *Determining Basking Habits of Native and Invasive Freshwater Turtles in Lake Marburg (Hanover, PA)*-- Basking is a common behavior for aquatic turtles to regulate body temperature, which is necessary for metabolic activation. Many factors influence this complex behavior and have yet to be fully understood. The objective of this study was to determine the effects of environmental and physiological factors on basking length of the three species: red-bellied turtles (*Pseudemys rubriventris*), painted turtles (*Chrysemys picta*), and red-eared sliders (*Trachemys scripta elegans*). The potential for competition between native and invasive turtle species was also assessed. At Lake Marburg in Hanover, PA, basking habits of native and invasive turtle species were observed while recording air and water temperature, light intensity, and disturbance. Surface-to-volume ratios of each species were also calculated to compare thermal inertia. Results indicated that there was no relationship between basking length and turtle size ($P > 0.05$). Air temperature and disturbance were two factors contributing to basking length ($P < 0.0001$). No relationship between turtle size and basking length may be a result of variation between optimum body temperatures of each species. The observed aggressive behavior of red-eared sliders toward red-bellied turtles shows the potential for interspecific competition. (116)

Gagne, Jeaneva*[a], M. Dana Harriger[a], Laura F. Altfeld[a], Kurt D. Hankenson[b], and **Julie Engiles[b].** [a]Wilson College, Chambersburg, PA 17201 and [b]New Bolton Center, School of Veterinary Medicine University of Pennsylvania, Kennett Square, PA 19348. *Effectiveness of Fecal Bacterial Population Enumeration and Analysis as a Preventative Method for Equine Endocrinopathic and Inflammatory Laminitis*- Laminitis is a condition of the equine digit that is characterized by inflammation of the laminar tissue and rotation of the third phalanx; resulting in lameness and permanent hoof alteration. Diets high in non-structural carbohydrates have been identified as an initiating factor in the development of laminitis and are also associated with an alteration in the microbiome of the equine hindgut, from a largely cellulolytic population to one that is predominately lactic-acid producing. The objective of this study was to utilize bacterial culture techniques both *in vitro* and *in vivo* to determine if alterations of carbohydrate sources in the equine hindgut result in a change in population of *Fibrobacter intestanillis*, *Ruminococcus flavefaciens*, *Lactobacillus mucosae*, and *Streptococcus bovis* and if this trend could be observed using fecal samples from both healthy and laminitic horses. The findings from this study have the potential to contribute to the development of a laminitis preventative tool. Such a tool would essentially monitor the microbiome of an animal by regularly culturing fecal samples, the results of which could detect the early onset of laminitis before resulting in permanent damage. (48)

Galperin, Michael*, Jasmeen Saini, Mary J.S. Roth and Laurie F. Caslake. Lafayette College, Easton PA 18042. *Quorum Sensing is Necessary for Biofilm Formation by Pseudomonas fluorescens MIC102L in Sandy Soil* – Pseudomonads are known to produce strong biofilms, which can reduce the permeability of soil environments. By engaging in a process known as quorum sensing, Pseudomonads "talk to each other" to build these biofilms. We were interested in investigating the effects of a known quorum sensing inhibitor, (Z-)-4-Bromo-5-(bromomethylene)-2(5H)-furanone [e.g., furanone 56], on the development of soil biofilms. The effects of this inhibitor were tested using civil and geotechnical engineering tools. *Pseudomonas fluorescens* strain MIC102L was grown in acrylic rigid columns filled with Ottawa 50-70 sand, a fine-grained silica sand, with and without furanone 56 for 15 days. A constant head permeameter was used to run permeability tests at five-day intervals followed by sand sample examination using confocal microscopy and scanning electron microscopy. We observed a decrease in permeability in the columns of *P. fluorescens* MIC102L with no quorum sensing inhibitor. The results indicate that furanone 56 is effective in reducing biofilm formation in a soil environment. (51)

Gegaris, Carissa* and Frank Varriale. King's College, Wilkes-Barre, PA 18711. *Investigating Functional Differences Between Premaxillary and Maxillary Teeth in the Ceratopsian Dinosaurs Archaeoceratops and Liaoceratops* – Microscopic wear patterns (microwear) on premaxillary, maxillary, and dentary teeth from the ceratopsian (horned) dinosaurs *Archaeoceratops* and *Liaoceratops* were analyzed to explore functional differences in the use of these teeth that may have occurred during life. The premaxillary dentition is morphologically distinct from that of the maxillary/dentary set in both taxa, suggesting a functional difference in their use. Dental microwear was examined by molding and casting teeth in epoxy resin. Micrographs of casts were taken using an AMRAY 1810 scanning electron microscope and wear features were quantified and analyzed using various statistical software packages (Microwear 4.02, MiniTab 16, Oriana 2.0). In both taxa, significant differences were not found among premaxillary and dentary/maxillary teeth for lengths and widths of scratches. There is also no significant difference between the pit ratios (width/length) on each tooth in *Archaeoceratops*. Rao's spacing tests revealed a preferred direction for orientation of microwear striations on each tooth. In *Archaeoceratops* striation orientation of premaxillary teeth is significantly different from those on dentary/maxillary teeth. Within a taxon, striation orientation among premaxillary teeth is not significantly different. In *Liaoceratops* orientation on premaxillary teeth showed the

greatest difference from dentary/maxillary teeth. There is also a pattern of increasing difference in orientation on teeth that are located further apart. Comparison of mean length, width, and pit ratio does not support a functional difference between premaxillary and maxillary/dentary teeth. This may be due to the dependency of these features on diet and that all teeth encounter the same food when it was chewed. However, differences in striation orientation between tooth sets do support our hypothesis, suggesting that the head was held at a different angle when food contacted premaxillary teeth or the lower jaw impressed food into the tooth sets differently. (188)

Getz, Amy*, Kaitlyn Bailey, Fred J. Brenner, Heather Barton, Arleigh McRae, Luke Latario, and **Stacey Senter.** Grove City College, Grove City, PA 16127. *DNA fingerprinting of the White-Tailed Deer* – DNA fingerprinting of short tandem repeats (STRs) in nuclear DNA from white-tailed deer (*Odocoileus virginianus*) was investigated as a means of determining breeding patterns within deer herds in Presque Isle State Park in Pennsylvania as well as in two metroparks in Dayton, Ohio. Previously obtained liver tissue samples from a total of 38 deer were selected for study beginning in June, 2013. Isolated nuclear DNA from liver tissue and nine fluorescently labeled primers for DNA were used in polymerase chain reactions to amplify the STRs of nuclear deer DNA. Products of PCR reactions were then confirmed using gel electrophoresis in 2% agarose gel and photographed under UV light using a Bio-Rad imaging unit. Successful PCR products were then analyzed using an Applied Bio Systems 310 single capillary automatic DNA sequencer with GeneScan software to accurately measure STR length. This process was used to begin to create a unique DNA "fingerprint" of each deer based on the STR size and frequency, a procedure analogous to forensic identification of human DNA. Three analysis programs known as GenePop, FSTAT, and Arlequin were used to determine potential gene flow within the sample population, which yielded results consistent with Hardy-Weinberg equilibrium. It is suspected that a more exhaustive study will produce results displaying increased heterozygosity, which would suggest a lack of inbreeding and that bucks move in and out of the different herds. This information will contribute to determining more clearly paternal genetic history and infer the breeding behavior among white-tailed deer herds in Presque Isle and Dayton, OH. (134)

Giblin, Shelby*, Evelyn Neunteufel. Misericordia University, Dallas, PA 18612. *Does heterospecific size affect the feeding behaviors of Black-capped Chickadees* (*Poecile atricapillus*)*?* – The purpose of this study is to determine whether the body size of heterospecific birds present at a feeder affects the behaviors of black-capped chickadees. It is believed that a heterospecific larger than a chickadee will be a threat, but a smaller heterospecific will not be a threat to the chickadees while they are trying to feed. In a residential neighborhood in Dallas, PA and in Honesdale, PA chickadees with one or more other bird species present and chickadees alone at the feeder were video-recorded. Sessions with chickadees and only one heterospecific bird present, as well as chickadees alone, were analyzed. Behaviors such as number of seeds taken while at the feeder alone, number of seeds taken when a heterospecific was present, whether the chickadee stayed at the feeder or left the feeder when a heterospecific arrived, etc. were recorded on an ethogram. Preliminary analyses showed no differences in the number of seeds per second taken by either the chickadee at the feeder alone or by the chickadee with a heterospecific. Further analyses are in process. (131)

Gomes, Jenelle*, Chad Freed, and Stephen Madigosky. Widener University, Chester, PA 19013. *The Spatial Distribution of Environmental Attributes for DeShong Park in Chester, PA to support a Sustainable Development Plan* -- Alfred O. DeShong, a wealthy Chester industrialist bestowed his 27-acre estate, mansion, and art museum to the people of Chester, PA in 1913 to be used as a park. Currently, the park is abandoned and has not been maintained by local government for over 25 years. In general, the park suffers urban decay and both the museum and mansion on the property exist in a dilapidated condition with structural damage and graffiti. Although the park is accessible to the public it is not used for public events. This project provided a baseline spatial assessment of the current environmental attributes of DeShong Park. These environmental attributes include the geology, hydrology, biological habitats, and biology of the existing trees, some of which were planted over 100 years ago. Using methods developed by the United States Forest Service and selected attributes of the trees, ecosystem services and tree replacement values were calculated. All of the attribute information was georeferenced and imported to a geographic information system (GIS). This information was combined with remote sensing data for spatial modeling and visualization. The spatial modeling results are used to support future restoration and conservation of the park and sustainable development plans that are being created as part of the Obama Administrations Strong Cities Strong Communities Program (SC2). These sustainable development plans integrate business development and land development site layouts that result in taxable revenue to the community while maintaining the original intent of Alfred DeShong to maintain the property as a biodiverse urban park. (113)

Good, Clayton*, Cory Trego and Dr. Mel Zimmerman. Lycoming College, Williamsport, PA 17701. *Contribution of Lycoming College CWI to the PFBC Unassessed Waters Project (2010-2013)***--** The primary threat to unassessed waters is inadequate water quality protection. Without knowledge of the aquatic communities inhabiting these

unassessed waters it is difficult to properly protect these waters during the permitting process. Ever increasing urbanization into PA's rural regions and the recent expansion of Marcellus Shale Extration throughout the North Central regionhas highlighted the importance of proper stream classificationand its role in the permitting process. Much of the information provided in this project focuses on coldwater aquatic communities as these tend to be the most fragile. This is the fourth year that Lycoming College CWI has participated in the Unassessed waters project. To date a total of 311 streams have been completed in the Loyalsock, Lycoming, and Pine Creek watersheds by CWI. This past summer four additional watersheds in North Central Pa where sampled and of the 83 assessed streams, a total of 12 supported no fish because they were dry, 7 support fish but no trout, 13 were class A trout streams, 13 were class B, 11 were class C, 27 were class D, and 19 were class E. Data for this project has been logged into the PFBC Unassessed Waters Data set for consideration of trout stream protection. The number of class A, B, C, D and E streams in each watershed will be presented. Over 200 additional streams need to be assessed in these watersheds in the future. (109)

Gordon, Brian*, Quentin Reinford, Dr. Mel Zimmerman, Lycoming College, Williamsport, PA 17701. *Farm BMP Project 3rd Year Update, Summary of Nutrient and Sediment Load*-- The goal of the joint project between the Lycoming College Clean Water Institute, Lycoming County Planning Commission and the Lycoming County Conservation District to monitor the implementation of agricultural best management practices (BMPs) on four farms in North-central, PA. The collection of water chemistry for nutrient and sediment load is taken on a monthly basis and supplemented with storm events to create a baseline comparison for the progress of the BMP's affects. In June of 2012, on an unnamed tributary of White Deer Hole Creek, Elimsport, PA, three collection sites were picked: Rt44, Ulr, & Orgf; as named from downstream to upstream. Nutrient load data for Nitrogen and Phosphorus continues to show an increase from the upstream to downstream sites due to agricultural runoff. This is found by pairing a stream volume calibration and Solinst Levelogger data with the aforementioned regularly collected water samples. A preliminary discussion of the effectiveness of the best management practices on nutrient and sediment load reductions will be presented as well macroinvertebrate and fish population results. Plans for future study. (107)

Gordon-Sandweiss, Alexander *, Rebecca LaRosa, James R. Dearworth Jr., and Megan Rothenberger. Lafayette College, Easton, PA 18042. *Seasonal Frequency of the Red-eared Slider Turtle in the Lehigh Valley* — The red-eared slider turtle (*Trachemys scripta elegans*) is an invasive species present in the Lehigh Valley. This study investigated the seasonal frequencies of different species of turtles and correlated their presence with environmental parameters to better understand the reasons for the red-eared slider's invasiveness. Water sampling and trapping were conducted at the Bushkill Creek both below and above the Bushkill Dam (40.695251˚, -75.211126˚), as well as the Hope Road Canal (40.643596˚, -75.277629˚). Environmental measures included oxygen levels, pH, air and water temperature, salinity, total dissolved solutes, nitrate, phosphorous, turbidity, and conductivity. The numbers of turtles at each site and different species were noted. Data were analyzed using non-metric multidimensional scaling ordination using PC ORD v. 5.0. In general, turtles (especially red-eared sliders) were more abundant when oxygen concentrations and pH were lower. Turtles were also most visible during high temperature measures for both air and water. Consequently, few turtles were seen or caught at the Bushkill Creek as high levels of oxygen with high pH and both low air and water temperature were observed here. Significantly fewer total turtles were seen and caught in the winter months than in the summer. Snapping turtles (*Chelydra serpentine*) were present mostly in the early summer months; the eastern painted turtles (*Chrysemys picta picta*) were more prevalent during the fall. Red-eared slider turtles were most visible during the late summer into the fall period. Interestingly, red-eared sliders were easily observed, however, in comparison to the others were not caught in traps. Further study is necessary to determine the significances of the difficulty in catching red-eared sliders, the varying activity periods among different species, and the correlation of red-eared slider turtles in waters having low levels of oxygen, low pH, and both high air and water temperatures. (114)

Gowton, Chelsea M.* and **David P. Matlaga**. Susquehanna University, Selinsgrove, PA 17870. *Examining the influence of disturbance on the relative success of sexual and clonal recruitment of Japanese Knotweed* – Japanese knotweed (*Fallopia japonica*) is an herbaceous invasive plant in North America and Europe. *F. japonica* alters riparian habitats by forming monodominant stands that deeply shade the forest floor. Increased shading may decrease seedling recruitment and increase clonal recruitment. *F. japonica* can recruit new individuals via both sexual reproduction (seed production) and clonally (rhizome and stem fragmentation). Riparian forest invaded by *F. japonica* may experience regular disturbance due to flooding or mowing. It is important to understand how disturbance impacts sexual and asexual recruitment of this riparian invader as it will provide valuable information for land managers wanting to limit its establishment. We addressed this topic using an experimental approach to observe recruitment via three reproductive modes in disturbed and un-disturbed plots. To mimic natural disturbance, above ground biomass was removed within a 3.5 m diameter area plot. Within undisturbed plots, vegetation was left intact. Reproductive propagules (rhizome fragments, stem fragments, and seeds)

were planted in both disturbed and undisturbed plots at three sites along the Susquehanna River in Snyder County, PA. Both canopy openness and propagule status (presence of sprouting and height) were censused every four weeks for five months. Preliminary results indicate the disturbance treatment increased canopy openness by 15.7%. The disturbance treatment had little effect on rhizome and stem establishment. Regardless of treatment, rhizome fragments have a higher probability of establishing than seeds or stem fragments. Thus, new recruits of *F. japonica* may be more likely to occur via rhizome fragmentation than seed production or stem fragmentation. (138)

Grady, Rebecca B.*, Jessica Kline, and Dr. André P. Walther Cedar Crest College, Allentown, PA 18104. *The Development of a novel qPCR assay to measure Homologous Recombination in the budding yeast Saccharomyces cerevisiae.* – One of the major underlying causes of cancer is the accumulation of mutations that result from unrepaired or misrepaired DNA damage. All human cells experience DNA damage due to normal cellular processes and when exposed to DNA mutagens from the environment. In normal, healthy cells, different types of DNA damage are usually recognized and repaired efficiently by specific cellular repair mechanisms. One such DNA repair mechanism is homologous recombination (HR), which involves multiple proteins that recognize and repair of double stranded breaks in the DNA. Defects in a large number human homologous recombination repair proteins have been linked to an increase in the incidence of cancer. The high level of similarity in homologous recombination mechanisms between humans and fungi make the budding yeast *Saccharomyces cerevisiae* a strong model organism to understand this repair process. To better understand homologous recombination, we have been developing a novel real time PCR (qPCR) assay to measure the formation and repair of a single double-strand break that is generated at the Mating Type Locus located on Chromosome III during the process of Mating type switching in *S. cerevisiae*. Haploid yeast cells can exist as either MATa or MATα mating types, and the haploids can switch from MATa to MATα through a site directed homologous recombination event to repair a single double strand break caused by the enzyme HO endonuclease that is under the control of an inducible promoter. We have been validating this assay by examining homologous recombination in yeast strains containing mutations in known homologous recombination proteins such as the single-stranded DNA binding protein Replication Protein A (RPA). We hope to use this novel assay to gain further insights into the mechanism of homologous recombination in yeast and humans that may lead to novel therapies for cancers linked to defects in homologous recombination. (39)

Graves, Elizabeth* and **Kelly Orlando.** Immaculata University, Immaculata, PA 19345. *Morphological Changes in Candida glabrata Inhibited by Anti-Fungal Agents*- Nosocomial, or hospital-acquired, yeast infections are caused by several different strains of yeast, including *Candida glabrata.* Morphogenesis from a non-pathogenic form lacking hyphae to a pathogenic form with hyphae and the excretion of biofilm are thought to allow yeast to cause disease. These experiments seek to find a way to eliminate or inhibit the growth of biofilm and hyphae and ultimately decrease the number of nosocomial yeast infections. Hyphal growth and biofilm formation was induced through nitrogen starvation; using both nitrogen rich and nitrogen deficient medium and the anti-fungals garlic, aspirin, and terbinafine, morphology was microscopically observed and calculated using ImageJ. The samples were grown on plates and in broth. The flasks provided a surface for adhesion of biofilms, which was stained with crystal violet and provided a side-by-side visual comparison. The biofilm formation was also indirectly measured through clumping of the *C. glabrata*. Samples from the broth were taken and the absorbance was measured in a spectrophotometer over time to track the speed at which clumps fell from suspension. The larger clumps fall faster, showing a greater change in absorbance and indicating a greater amount of biofilm. The anti-fungals were diluted in ethanol and applied to discs that were placed atop a lawn of *C. glabrata* on the plates. Samples were taken from the outer edges of the zone of inhibition for microscopic analysis of the effects of the drugs on biofilm formation. Data from the control, garlic, aspirin, and terbinafine plates and flasks are still being analyzed. (47)

Griffiths, Heather * and **David Singleton.** York College of Pennsylvania, York, PA 17404. *Effects of a thermal effluent on the bacterial community of the Susquehanna River* –A thermal effluent created by the steam conversion of a coal-fired power plant creates a unique microbial community in the Susquehanna River in York Haven, PA. This thermal effluent provides a unique opportunity to study the effects of unseasonably warm water on presence and patterns of bacteria, particularly coliforms. Coliforms enter the river upstream from wastewater treatment facilities as well as agricultural run-off. Water was collected and temperature was measured at approximately 30-day intervals over the course of nine months at the thermal effluent site, as well as sites upstream and downstream for comparison. Selective and differential media was used to enumerate coliforms collected from each site in triplicate. Bacterial rDNA was amplified via polymerase chain reaction using highly conserved 16S rRNA primers for gel analysis and DNA sequencing. Temperature and coliform counts showed distinct trends. Temperature of the thermal effluent appeared to negatively affect coliform count. The greatest coliform counts were found in summer months at the control site, upstream from the effluent, with consistently lower monthly water temperatures. The lowest

overall colony counts were obtained from all test sites during autumn months. Seasonally, coliform counts at the control site varied greatly but decreased downstream from the effluent. Overall, the lowest coliforms counts were found at the site of the thermal effluent and downstream. (55)

Gustin, Jessica* and Bradley Rehnberg. York College of Pennsylvania, York, PA 17403. *The Behavioral Effects of Diphenhydramine on CD-1 Female Mice (Mus musculus) Consuming Caffeine*--The depressant, diphenhydramine, is a popular sleeping aid that is often counteracted by the stimulant caffeine. The objective of this study was to assess possible synergistic activities when mice are exposed to caffeine and diphenhydramine at the same time. This study used an animal activity tracker to record the ambulatory time, stereotypic time, resting time, and distance traveled of female CD-1 mice in six experimental groups. Each mouse was placed in a solitary cage overnight with the option to consume water (control) or caffeinated water at 0.30 mg/mL (low) or 0.50 mg/mL (high). The next day, test mice were given an intraperitoneal injection of either physiological saline or 25 mg/kg of diphenhydramine and immediately transferred into the tracking device. Results from this study showed that the high dose of caffeine increased the effects of diphenhydramine more than the low dose of caffeine, which suggested that diphenhydramine slowed the metabolism of caffeine. Resting times differed significantly (one way ANOVA, p-value = 0.0037) among the six experimental groups. Our data showed a limited synergism between diphenhydramine and caffeine. The greater effectiveness that diphenhydramine had at increasing the resting behavior and decreasing the ambulatory behavior on the mice that consumed caffeine revealed the synergistic effects between the two drugs. (194)

Halsor, Kyla*, Katrina Toporcer*, and Kenneth Klemow. Biology Department, Wilkes University, Wilkes-Barre, PA 18766. *Investigating the Ethanol Biofuel Potential of Cattail* (Typha latifolia) *Biomass* - Biomass energy is viewed as a potential alternative to fossil fuels. The U.S. currently derives approximately 4% of its energy from biomass, particularly as ethanol from corn, sweet sorghum, or sugar cane, or as cellulose from switchgrass or fast-growing woody plants. Critics of biomass point to an unfavorable energy yield, as well as the diversion of plants from food production to energy. One potentially overlooked source of biomass energy is cattail (*Typha latifolia*), an emergent wetland herb commonly found throughout the U.S. Studies conducted in the 1960s - 1990s showed cattail rhizomes contain up to 60% starch and leaves up to 20% sugar. Despite those promising yields, cattail is not used as a source of biomass, and little research into its potential has been conducted in the past decade. To that end, we are examining the biomass-producing ability of cattail on a per plant and per area basis. Approximately thirty representative plants are being harvested from each of two non-jurisdictional wetland sites in northeastern PA, taking care to keep the rhizome intact. After being transported to the lab, plants are processed by separating above and belowground parts. Half of the rhizomes are being placed in pots with potting soil in the Wilkes greenhouse, promoting the growth of new shoots. The other rhizomes are dried and weighed. Each rhizome is then ground in a Wiley mill, producing a powder that is subject to enzymatic degradation to convert starch to sugar. The sugar content is then determined using a Brix meter. Leaves are also juiced and Brix sugar content determined. Those values will be converted to calculate starch content - and ethanol potential - both per plant and per area - and compared to those for other biomass plants. (170)

Hanson, Kelly*, and **Bridgette E. Hagerty**. York College of Pennsylvania. York, PA 17403. *Color vision phenotype as a driving factor in the evolution of Lake Malawi African cichlids.* Colorblindness is very often perceived as a disadvantageous trait because affected individuals are able to distinguish fewer colors in their surroundings. However, the frequency of colorblindness in human populations raises the question of whether the trait is an actual drawback or whether it is an advantage in some environments or situations. In this study, we explored the idea that colorblindness aids in the detection of color-camouflaged objects with respect to the visual systems of Lake Malawi African cichlids. Red-blind *Cynotilapia afra* and color-normal *Cyrtocara moorii* were shown an artificial predatory stimulus hidden against a red camouflage background. Their activity levels were quantified to assess their reactions to this hidden stimulus and compared to the proper controls. Based on a two-way ANOVA analysis of mean activity level across species and camouflage treatments, the red-blind species was better able to detect the camouflaged predator than was the color-normal species. Both species had comparable activity levels during all control trials, but when shown the camouflaged stimulus, *C. afra* exhibited significantly reduced activity while *C. moorii* activity levels remained high, as in trials with no predatory stimulus present. Therefore, this particular aspect of visual systems is likely at work in cichlids, which corroborates previous studies exploring this idea in humans and other primates. Further, factors that drive the evolution of Lake Malawi cichlids, such as diversified mate selection and a differential ability to capture prey or escape predation, may result from the variation in individuals' color sensitivities. (75)

Hardy, Jeffrey*. East Stroudsburg University, East Stroudsburg, PA 18301. *An analysis of extratropical storms that produce damage along the coast of New Jersey* - Although not as powerful as hurricanes, extratropical storms occur at a higher frequency and are also capable of producing significant damage along the coastal areas of New Jersey. The Great Nor'easter of 1992, for example, caused hundreds

of millions of dollars in damage primarily due to coastal flooding and high winds in the state. This study identifies the non-hurricane synoptic weather patterns that have produced strong winds and flooding along the New Jersey coast for the last 30 "winter" seasons (October to April from 1983 to 2013). The Storm Data publication was utilized to determine the dates of property damage and beach erosion of each storm event. Surface weather maps were then analyzed to identify the pressure patterns responsible for the strong wind/coastal flooding events. Several synoptic weather patterns were found to be responsible for coastal flooding in New Jersey. Many of the events are associated with cyclones that originate over the Gulf of Mexico or off the Atlantic coast in the vicinity of Florida or Cape Hatteras, NC. These cyclones often intensify rapidly and move quickly up the U.S. east coast. However, some of the strongest coastal flooding events result from a strong pressure gradient between an intense extratropical cyclone and an anticyclone stalled over the North Atlantic or New England. The monthly and annual frequencies of the synoptic weather patterns are also examined in this study. (144)

He, Jin*, Shixiong Hu, and Jeff Hardy. East Stroudsburg University, East Stroudsburg, PA,18301. *Monitoring stream water temperature in Brodhead Watershed, NE, PA*—The Brodhead watershed is located in Northeastern Pennsylvania, and includes the Brodhead Creek and its major tributaries: Marshalls, McMichael, Paradise, and Pocono Creeks, extending from Barrett Township and Mount Pocono in the north to Brodheadsville in the west to the Delaware River. The watershed includes all or part of 17 of Monroe County's 20 municipalities and part of Greene Township, Pike County. The goal of this project is to investigate the stream temperature change and its controlling factors. Stream temperature was collected from 15 sites within the Brodhead Watershed. HOBO Pro temperature loggers were used to measure stream temperature every 15 minutes at each site with approximately two years data (from Jun.2011- Feb.2013). The temperature readings were compared with PA DEP cold-water fishery standard to calculate the number of violations that occurred at each site. The preliminary results from two tributaries (Pocono & Kettle Creek) show that the violation rate of the monitoring station for Kettle creek below the waste water discharge sites (Kettle01) increase when compared with that of monitoring station above the waste water discharge site (Kettle02) in the majority months (16 out of 18) of the fixed period, though the increase percentages are not significant. However, the violation rates increase significantly for Pocono Creek from upper stream to downstream (poC04,poc05,poc01),of which poc05 has the higher violation rate in Winter (November to February),while poc01 has higher violation rate in Summer (May to September).The spatial pattern of the stream temperature changes also indicate that a significant increase trend of the violation rates from upper stream to downstream for both tributaries due to human activities such as sewage treatment plants discharges. (148)

Healy, Rebecca L.*, and **John M. Campbell.** Mercyhurst University, Erie, PA 16546. *Baseline Emerald Ash Borer Surveillance Network for Erie County, Pennsylvania* – Emerald ash borer (EAB), *Agrilus planipennis Fairmaire* (Coleoptera: Buprestidae), is a destructive invasive species that is currently infesting populations of ash (*Fraxinus* spp.) trees throughout the United States and Canada. Many ecosystems are dependant on these trees throughout North America and the major loss of their population can be detrimental to multiple populations. We set up a surveillance network of 8 ash tree stands, each with differing abundances of ash species, in a range of about 46.67 kilometers, which begins at the most western location of infestation. This allows us to formulate a baseline idea of the species abundance and conditions of the ash trees in order to study and track EAB infection progression in Erie County. As of this survey, trees that we observed to have the distinct markings of being infested by EAB were contained at the 2 previously confirmed infestation sites before our arrival. Possible sentinel trees were observed at all sites to use as markers for increased EAB infestation progression. ArcGIS will be utilized to estimate progression of the spread towards more rare ash species stands in the eastern part of the county to best predict the measures that need to be taken to keep the stand from being infected without the use of potentially harmful pesticides. Since many other invertebrate organisms use these trees for food and shelter without being posing a significant risk, it's important to understand the spreading rate potential of EAB before taking drastic measures. (141)

Hendry, Nicholas R*, Timothy Kennedy, Michael Pheasant, and **Barbara McCraith**. Misericordia University, Dallas PA 18612. *Comparison of two species leaf litter breakdown in Trout Brook, Luzerne County, Pennsylvania*--The degradation of plant material falling into streams plays a significant role in the overall ecosystem function. Decomposition is a complex process involving not only physico-chemical processes, but also macroinvertebrates, fungi, and bacteria. The purpose of this study was to compare the decomposition of the leaves from the two dominant species of trees in Trout Brook's riparian zone, *Quercus bicolor* (swamp oak) and *Acer rubrum* (red maple). To assess the physico-chemical nature of the stream we measured the flow, depth, width, dissolved oxygen, pH, conductivity, and temperature. We placed coarse artificial leaf packs (mesh 10 mm) and fine leaf packs (mesh 500 μm) in three riffles in Trout Brook to determine decomposition by benthic macroinvertebrates and microbes. We collected the leaf packs at intervals of two, four, eight, and twelve weeks. Our preliminary results indicated that red maple leaves in the coarse leaf packs decomposed at a faster rate than both the oak leaves and the mixed species. The oak leaves

remained the most intact. Our results also indicated that the decomposition of the leaves is mainly due to microbial activity. It is likely that the cold temperatures, causing the creek to freeze, slowed decomposition rates, which affected benthic macroinvertebrate colonization of the leaf packs and thus decomposition of coarse organic particulate matter to fine organic particulate matter. (98)

Herting, Jennifer* and Wendy L. Ryan. Kutztown University of Pennsylvania, Kutztown PA 19530. *Analysis of Submersion Patterns in Steller Sea Lions (Eumetopias jubatus) and Beluga whales (Delphinapterus leucas) in an Artificial Habitat*--Beluga whales (*Delphinapterus leucas*) and Steller sea lions (*Eumetopias jubatus*) were studied at Mystic Aquarium (Mystic, CT) as an inexpensive and reliable opportunity to expand our understanding of how several environmental cues may influence the dive duration of animals who are protected by the Marine Mammal Protection Act and are therefore important, but somewhat difficult to access. This study focused specifically on the submergence patterns of these marine mammals as a behavior reflective of the animals' unique physiology that can be relatively easily monitored and quantified. The animals are kept in outdoor exhibits where external environmental cues such as time of day and seasonal variations have the potential to influence their diving behavior, while additional confounding variables such as foraging, predation, and migration are absent. It was hypothesized that the submergence behaviors of both the beluga whales and the Steller sea lions would reflect both seasonal changes and time of day. The dive durations for each animal were recorded in groups of five dives repeated three times a day starting upon arrival (9-11am), then at mid-day (12-2pm), and before closing (3-5pm) approximately once a month over a three-year period. Analysis of the data suggests that neither time of day nor time of year had a significant influence on the submergence durations of the beluga whales, while both seemed to influence the submergence times for the Steller sea lions. As a result our hypothesis was partially refuted, since only the submergence durations for the Steller sea lions appeared to respond to seasonal and daily external environmental cues. This may reflect differences in the lifestyles of these two animals, with the whales being fully aquatic mammals in contrast to the semi-aquatic lifestyle of the sea lions. Examination of additional representative species could further clarify if these are actually intrinsic differences. (127)

Hile, Jessica* and Amy Reese, PhD. Cedar Crest College, Allentown PA 18104. *Domesticated Canines as Fungal Reservoirs for Rhodotorula species* – As the number of individuals living in an immune-deficient state increases worldwide, the more important it is to understand the potential risks for secondary diseases and how they can be prevented. Opportunistic fungi such as *Cryptococcous neoformans* and *Rhodotorula* species have been emerging as clinical pathogens in HIV/AIDS patients and other immunocompromised individuals. *Cryptococcous neoformans* has a special characteristic that separates it from other fungal yeasts; it has a polysaccharide capsule which makes it virulent. *Rhodotorula* species share this same special characteristic and these strains are emerging more and more as pathogenic fungi. Where these patients are coming in contact with these fungi is sometimes a mystery. We know these fungi are found in the environment, but where else are they found? Could a family pet be a carrier of fungal spores much like how rats were carriers of the bubonic plague? A dog is often referred to as man's best friend, but what hidden dangers could they be carrying with them? In this survey, we will determine the prevalence of yeast-like fungi, specifically *Rhodotorula* species, in domesticated dogs. A medical history and general survey will be obtained for each dog. They will then be swabbed along the head and back multiple in a clinical setting to determine what potential organisms they may be carrying in their coat. Preliminary data suggests sample growth on Sabouraud agar cultured at 34°C may permit optimal yeast growth but reduce mold growth. *Rhodotorula* species colonies can preliminarily identified by their pink color and further genotypic methods will be used to identify which species are prevalent. In future directions, the survey could be opened up to other domesticated and household animals such as cats, rodents, and birds. (136)

Himmel, Anneliese C.* and **Carlos A. Iudica**, Susquehanna University, Selinsgrove, PA 17870. *Temporal changes in diversity and activity patterns of terrestrial vertebrates in central PA: Phase 1*--We are interested in gathering data that will help us to accurately portray the diversity and activity patterns of local terrestrial vertebrate species. We would like to explore the methodologies that may allow for the quantifying of individuals within populations of different species using noninvasive research protocols. Eight wildlife cameras, three brands, were set up on the Yoder Farm (CEER - part of SU campus in Selinsgrove, Pennsylvania) starting in summer 2013 and continuing during fall 2013-spring 2014. We are building a list of species that actively use the area based on recorded images on the cameras. Distinctive markings observed in the images are used to identify individuals so that we can eventually use "capture-recapture" methodologies to calculate relative abundances within species. Metadata (time, lunar phase, and temperature) is recorded for each individual captured. Nine species have been identified in the area with increased activity in the evenings over all. White-tailed deer represented the majority of the captures. Individuals of this species exhibit distinctive markings that may allow for future studies to identify individuals and family groups. Other species observed were gray squirrels, opossums, raccoons, domestic cats, grey foxes, groundhogs, eastern cottontails, and chipmunks. These species were observed with less frequency than the white-tailed deer

with the gray squirrel being the next most common species. During late fall 2013; we introduced scent stations in all camera trap stations hoping to provoke territorial behaviors in the resident carnivores. We plan to continue collecting and analyzing images/videos during the spring and summer 2014 and look for seasonal activity and patterns of spatial use by the observed species in the area of the farm. (121)

Hinkel, Lauren* and **Manuel Ospina-Giraldo.** Lafayette College, Easton, PA 18042. *Expression of the chitin synthase gene in Phytophthora spp.: Analysis of expression in sporangial structures and during host infection*. *Phytophthora* spp. are fungal-like organisms, notorious for causing widespread and highly destructive diseases within certain agricultural staple crops. *Phytophthora infestans* is the plant pathogen that causes late blight of potato, a plant disease infamous for its association with the Irish Potato Famine. *Phytophthora sojae* is a closely related pathogen that attacks soybean crops worldwide causing a disease known as stem and root rot, which results in devastating economic losses. In these oomycetes, the majority of the cell wall is composed of cellulose instead of chitin, as is the case in true fungi. However, genomic analyses have revealed that *P. infestans* and *P. sojae* possess a chitin synthase (CS) gene homolog in their genomes. We have studied the expression of the CS gene in *Phytophthora* spp. during infection of the plant host. In addition, we also analyzed its transcriptional levels in sporangia, which are very durable reproductive structures, key in the dissemination of the pathogen. Our results revealed differences in expression during infection as compared to expression in *in vitro* grown mycelial tissue, indicating a potential involvement of the CS gene in pathogenicity. The CS gene also appears to be expressed during sporangial development. (76)

Hippeli, Steven* and **Tammy Tintjer**. King's College, Wilkes Barre, PA 18711. *The role of the endophyte Neotyphodium coenophialum in the invasive properties of Festuca arundinacea through soil community feedback* – The goal of this study was to determine the role of soil community feedback as a mechanism by which the fungal endophyte *Neotyphodium coenophialum* may enhance the invasiveness of the grass *Festuca arundinacea*. The endophyte is known to alter the grass root morphology and secondary chemistry, which may alter the soil microbial community in such as way that subsequent plant growth may be negatively affected. To test this effect, a mixture of grassland and woodland soil was conditioned for twelve weeks with *F. arundinacea* that was either positive or negative for infection with the endophyte. The plants were then removed from the soil, and *Trifolium repens* was planted into the same soil and grown for eight weeks. Soil conditioned with endophyte-infected *F. arundinacea* increased the number of nitrogen-fixing rhizobia nodules on the roots of the subsequent *T. repens* samples when compared to those grown in endophyte-free conditioned soil, and there was a significant effect on the nodule counts between the two soils ($p<0.05$). Soil conditioned with endophyte-infected *F. arundinacea* increased the both the above and below-ground growth of the subsequent *T. repens*, with a significant difference in above-ground growth when soil positive and negative for endophytic infection were compared ($p<0.05$). The biggest factors contributing to the growth of *T. repens* was conditioning with *F. arundinacea* regardless of endophyte infection having a microbial community present in the soil prior to conditioning. Changes in the soil community due to soil conditioning were also measured using Biolog Ecoplates to test for microbial diversity in the soil. (168)

Hoffman, Hunter R.*, and Courtney L. Thomas. Susquehanna University, Selinsgrove, PA 17870. *Identification of multisubunit complexes containing the S. cerevisiae bud neck ring protein Elm1p* - Cell morphology and nuclear division in *Saccharomyces cerevisiae* are coordinated in part by proteins located at the bud neck ring structure. Research into the bud neck ring complex has identified interactions between Nap1p, Clb2p, and Gin4p with overexpressed Elm1p. A model for the association of these proteins has been proposed, however the endogenous protein interactions have yet to be verified. This study was conducted to elucidate the specific interactions of these proteins *in vivo* using fluorescence resonance energy transfer (FRET). Plasmids which coded for a cyan fluorescent protein (CFP) and yellow fluorescent protein (YFP) were amplified through *E. coli* and used to generate cassettes to integrate the fluorescent tags onto the C-terminus of the proteins of interest by polymerase chain reaction (PCR). These cassettes were then used to transform strains of *S. cerevisiae*, with verification by genomic isolation and PCR. Yeast strains were made containing one YFP tagged protein and one CFP tagged protein as well as a control YFP-CFP protein. FRET was then utilized to verify the interactions of these proteins *in vivo*. (61)

Hoppe, Tim*. Pennsylvania Game Commission, Harrisburg, PA 17110. *Relative abundance of snowshoe hare (Lepus americanus) in relation to forest size class and silvicultural history* – The results of this study are part of a larger monitoring effort designed to track changes in hare relative abundance following even-aged management on State Game Land 29 in Warren County Pennsylvania. A snowshoe hare track survey was conducted during the winters of 2012 and 2013. The purpose of this survey was to determine which forest size class supported the highest relative abundance of snowshoe hare pre-treatment. Twenty-one forested stands were examined in which 18 transects were sampled seven times across five strata; transects totaled 31,024 m^2. The highest relative abundance for snowshoe hare in this study occurred in size class 4 (0.18 snowshoe hare/unit), while size class 3 had the lowest (0.02). The dominant overstory cover

type of size class 4 was black birch *(betula lenta)* having a dbh less than six inches and being >50% stocked. Stand conditions originated following a clearcut 18 years earlier and represented the youngest stands sampled. Tracks of five species other than snowshoe hare were observed during the survey. White-tail deer (*Odocoileus virginianus*) tracks were most abundant in size class 5, and the most abundant species found during the survey. Our data reflects that relative abundance of snowshoe hare will increase in stands regenerated under even-aged management. (88)

Horowitz, Brent* and **Manuel Ospina-Giraldo.** Lafayette College, Easton, PA 18042. *The Role of Pectin Methylesterase-encoding Genes of Phytophthora sojae during Infection of Susceptible Soybean Plants.* The fungal-like organism *Phytophthora sojae* is among the most destructive soybean pathogens worldwide. Although it was first identified in 1958, the infection process *P. sojae* utilizes to infect the soybean host is not fully understood. *Phytophthora sojae* possesses a specialized hyphal structure called appressorium, which many true Fungi use to breach the host cell wall and begin infection. However, previous research has shown that the pressure applied by the appressorium is insufficient to breach the structural strength of the cell wall. In order to penetrate the cell wall and facilitate infection, it has been indicated that *P. sojae* uses secreted cell-wall degrading enzymes. One such enzyme family is the pectin methylesterase (PME; EC 3.1.1.11), which is involved in breaking down pectin, one of the main components of the cell wall. Genomic analyses have revealed that there are eighteen putative PME-encoding genes in *P. sojae. In planta* expression analysis of this gene family across the first 72 hours elapsed after inoculation of the host has been performed. Our findings indicate that PME gene expression varies significantly throughout the course of penetration and infection. (77)

Hummel, Kody* and Carlos A. Iudica. Susquehanna University, Selinsgrove, PA 17870. Activity and Diversity of PA Bat Species During Hibernation and Emergence at Woodward Cave — Of the eleven species of bats living in Pennsylvania, six are found to hibernate in caves and mines. These six species can arouse a few times from hibernation during the winter, and then emerge in early spring. It is not well understood if and what environmental factors trigger their emergence from hibernation. Barometric pressure is known to fluctuate dramatically throughout a cave or mine. The purpose of this project is to understand what causes bats to exit hibernation in the spring, determine the frequency of bat activity during the hibernation period, identify the bat species utilizing the cave throughout the year, and to propose methods for passive ultrasonic acoustic recording inside a cave structure. (128)

Husek, Jakub* and William G Dougherty. Susquehanna University, Selinsgrove, PA 17870. *The Coordination Chemistry of the Janus-Head Ligand Phenylbis(2-pyridyl) phosphine with First Row Transition Metals* - One-to-one molar reactions of metal nitrate salts, M= Zn^{2+}, Ni^{2+}, Fe^{3+}, Cu^{2+}, and Co^{2+}, with the ligand in methanol produced coordination compounds in an average yield of 77% across the series. Small molecule X-ray crystallography was used to determine the solid-state structure of the complexes that were successfully crystallized. The Zn^{2+} and Cu^{2+} complexes exhibit octahedral geometry with one bidentate phosphine ligand and bound nitrate counter ions. The isolated Ni^{2+} complex is octahedral but two bidentate phosphine ligands and a bound nitrate anion fill the coordination sphere. The average M-N bond length of all crystallized complexes is 2.023(2) Å, which is consistent with similar complexes of this type. ^{31}P-NMR spectroscopy for the Zn^{2+} complex exhibits a resonance at -4.3 ppm, which is consistent with a N-bound, unoxidized ligand. IR spectroscopy was used to identify complexation of the ligands and all coordination compounds exhibit unique resonances at 1590 cm^{-1} and 1383 cm^{-1}. Investigation toward formation of bimetallic complexes was explored using an oxidized version of the phosphine ligand. (182)

Johnson, T. Wade, Samantha Coons*, Patrick Erickson*. Susquehanna University, Selinsgrove, PA 17870. *Characterization of high reduction potential anthraquinones in the A_1 site of Photosystem I* – The project's objective is to understand the structure function relationship of the electron transfer system in Photosystem I (PSI) and characterize changes in electron transfer rates. We will replace the native phylloquinone (PQ) with a set of anthraquinones (AQ) at the A_1 site of PSI to determine the effect of high reduction potential compounds on the system. This involves specifically engineered *in vivo* modifications, including an *in vivo* insertion of the AQ into PSI, protein purification, and confirmation of AQ content by HPLC. The resulting samples will be characterized by extensive spectroscopic characterization. The PSI activity will be determined by terminal electron recombination lifetimes of $P_{700}^{+}/F_{A/B}$ by 850 nm pulse probe laser system. Predicted effects include slowed A_1 reduction as the AQ potentials approach that of the A_0 donor, and a corresponding rate increase for the AQ reoxidation as the electron is transferred forward. (62)

Jones, Carli*, Samantha Evans, Robert Kurt. Lafayette College, Easton, PA 18042. *Comparing Expression of Genes in the TLR4 Pathway Between 4T1 and Dendritic Cells.* In our research we were trying to determine if there were any differences in the expression of genes in the Toll-Like Receptor 4 (TLR4) signaling pathway in murine breast cancer (4T1) cells and white blood cells (dendritic cells). Previous data demonstrated that 4T1 cells and dendritic cells responded differently when exposed to bacterial products

such as lipopolysaccharide (LPS), so in order to better understand this difference in cell behavior we investigated the relative amounts of RNA coding for proteins in the TLR4 pathway in each cell. In order to do this, we used quantitative reverse transcriptase PCR (qRTPCR), which quantifies the amount of RNA present compared to a reference gene. After isolating RNA from 4T1 and dendritic cells, we created cDNA using the RNA as a template. The qRTPCR revealed that, compared to dendritic cells, 4T1 cells overexpressed *Fos* and underexpressed *Myd88*, *cRel*, *TLR4*, and *p65*. *Jun*, *p52*, and *p50* were expressed in comparable amounts in both cell types. These data helped to identify which genes should be investigated further in order to more fully understand the differences in the TLR4 pathway between the murine breast cancer model and white blood cells. Eventually, a better understanding of this pathway could allow us to manipulate the cells' responses. (25)

Kashnicki, Marisa* and Angela Latona*. King's College, Wilkes Barre PA 18711. *Accumulation of Oxidative Stress in the Mitochondria of SH-SY5Y cells*—Oxidative stress is a major mechanism of neuronal injury in many neurodegenerative diseases. Oxidative stress in the mitochondria is caused by an imbalance of oxidants and antioxidants, leading to an accumulation of reactive oxygen species (ROS) in the cell. While glutamate is the major excitatory neurotransmitter in the brain, it induces excitotoxicity at high concentrations. For our experiments, we developed a novel protocol to study glutamate-induced oxidative stress in the mitochondria of SH-SY5Y cells. After inducing oxidative stress, the mitochondria of the cells are isolated and ROS accumulation is determined using a fluorescent compound, H2DCFA. Hydrogen peroxide was used as the ROS control that reacts with H2DCFA. Preliminary studies show that cells treated with 25mM to 150mM of glutamate for 6-18 hours induces cell death. To study oxidative stress, we use concentrations of glutamate that are below 150mM. Currently, we have not seen detectable levels of ROS in isolated mitochondria. We believe this is most likely due to insufficient quantities of mitochrondrial starting material. Therefore, current studies are increasing the original density of cells to maximize the amount of mitochondria for our experiments. We propose that once we have enough mitochondria, we will be able to detect ROS levels using the H2DCFA assay. (26)

Kennedy, Timothy A*, Nicholas Hendry, Michael Pheasant, Barbara McCraith. Misericordia University, Dallas PA 18612. *Benthic Macroinvertebrate Diversity in Different Detrital Environments*--Benthic macroinvertebrates act as an energy converter in stream ecosystems, breaking down allochthonous organic matter to allow microbes and other aquatic macroinvertebrates to feed on detritus. We used leaves of the two most dominant tree species, *Quercus bicolor* (swamp oak) and *Acer rubrum* (red maple), in the Trout Brook, Luzerne County riparian zone. We placed 25 single species artificial leaf packs containing either maple or oak, along with 25 leaf packs with both species, in three riffles of Trout Brook. We retrieved leaf packs after 2, 4, 8, and 12 week periods. We measured pH, dissolved oxygen, flow, depth, width, conductivity, and temperature each time leaf packs were collected. Preliminary observations indicated that the mixture of both maple and oak leaves had greater benthic macroinvertebrate diversity than either the single species of maple or oak. (99)

Keppel, Brandi, Dustin Lowry, Nicole Nicholson, Bridget Pettit, Alyssa Arnold and Gregory Paulson*. Shippensburg University, Shippensburg, PA 17257. *Testing the Efficacy of Three Fly Repellents for Controlling Biting Flies in Horse Paddocks* - Bite Free Stable Fly Traps™ were used to monitor biting fly populations, especially Horse Flies (*Tabanus* sp.), Stable Flies (*Stomyx calcitrans*), House Flies (*Musca domesticus*) and mosquitoes. The traps, designed to attract biting flies through color and light refraction, were treated with one of three repellent products; Bronco Equine Fly Spray™, Ultra Shield Green™, or Oak Hill Farm Naturals™. Bronco is an inorganic synthetic permethrin based product. Ultra Shield and Oak Hill Farm are natural, plant oil based products. Control traps were treated with water since all of the products are aqueous solutions. Treatments were applied using label recommendations. The traps were distributed near a large paddock and indoor arena in arrays of 4 traps, one for each treatment and the control. The traps were checked at regular intervals for 3 weeks. During each inspection, trapped insects were classified, counted, and removed from the traps. ANOVA was used to analyze our results. (184)

Kerns, Peter M.*, Joseph W. Lafferty and Dr. Swarna Basu Susquehanna University, Selinsgrove PA 17870. *A LabVIEW-based fluorescence detection system.* A fluorescence detection system has been developed using a National Instruments PCI-6251 data acquisition (DAQ) board that is driven by LabVIEW Signal Express. The signal is collected using a collimator and transported to the DAQ board using a fiber-coupled detector. The same detection system can be incorporated into an inverted microscope that has been fitted with internal dichroic mirrors to allow for fluorescence detection from the slide. The detection system has been calibrated using various fluorescence standards and has been used to measure fluorescence intensity, laser power (pulsed Nd^{3+}:YAG and continuous-wave Ar^{+}-ion) and fluorescence lifetimes of various systems. Standard deviation, and signal-to-noise ratios have been determined for different applications. (60)

Khan, Asra* and Meda Higa. York College of Pennsylvania, York, PA 17403. *Determining how glycosylation of hantavirus glycoproteins affects infection of Vero E6 cells.* - Hantaviruses (family *Bunyaviridae*) are carried by rodents

and can infect humans through aerosolized feces. Hantavirus infection results in Hemorrhagic Fever with Renal Syndrome and Pulmonary Syndrome, which can in turn lead to death in the host. Glycoproteins G_n and G_c are two surface proteins encoded by the hantavirus genome. Both G_n and G_c are involved in the virus-host interactions and contain putative N-linked or O-linked glycosylation sites. Some of these sites aid in the process of protein folding as well as virus-host interactions, however the function of the glycosylation sites within these proteins remain unclear. To study this role, we used pseudovirions by expressing the glycoproteins on the surface of a Vesicular Stomatitis Virus (VSV) core modified with the reporter gene, luciferase, but lacking the ability to replicate in its entirety. These pseudovirions were then enzymatically deglycosylated and infection rates were determined by fluorescence. In addition, the pseudovirions were introduced to a mannose competition. Concentrated mannose media was incubated on the Vero E6 cells prior to viral infection. Our studies suggest that there were no changes in infection rates with deglycosylated glycoproteins, however viral competition with mannose resulted in lower infection rates. This suggests that the virus needs to bind to the mannose sites on the host cell in order to gain entry into and cause infection. (30)

Khan, Rizwan* and Matthew H. Persons. Susquehanna University, Selinsgrove, Pennsylvania 17870. *Female Pardosa milvina wolf spiders increase silk advertisements when in the presence of silk from courting males*--Female wolf spiders deposit silk to attract male conspecifics. Males of the wolf spider *Pardosa milvina* also deposit silk while performing courtship displays. We examined if female silk deposition behavior changes when encountering silk produced from a courting rather than a non-courting male. Male *P. milvina* were placed in one of two environments for a 30-minute period: 1) a container with an unmated adult female behind a transparent barrier (courting male treatment), or 2) an empty container without a female present (non-courting male treatment). Females were then exposed to one of the two substrates or a third control substrate that never had a male present. We measured the quantity of three different types of silk deposited by females across these substrates (dragline silk, cord silk, and attachment disks). Females significantly increased attachment disk deposition in the presence of silk from a courting male compared to a non-courting male. Females also showed elevated dragline deposition in the presence of male silk but whether or not the male was courting had no effect on dragline deposition. Female cord silk deposition did not vary across treatments. Courting males produced significantly fewer attachment disks than non-courting males while dragline and cord silk deposition did not vary. We conclude that females can discriminate between silk from courting or non-courting males and increase attachment disk deposition in the presence of courting males. The number of male attachment disks deposited may be one mechanism by which females can discriminate between silk produced by courting rather than non-courting males. (185)

Khan, Rizwan*, Nicholas Van Nest*, Matthew Persons, and **Lou Ann Tom.** Susquehanna University, Selinsgrove, PA 17870. *Preliminary Identification of a Volatile Silk-based Sex Pheromone of the Wolf Spider Tigrosa helluo*--Spiders communicate chemically through a combination of volatile cues and silk draglines. These semiochemicals are known to reduce herbivory in crop pests and are also used as sex pheromones during mating. Given the dual role of these compounds, they could be used in the development of novel arrestants, repellents, deterrents, and antifeedents to manipulate insect pest behavior while also attracting predators to the area. Despite their potential for chemically-mediated biocontrol, of the 44,540 spider species, only six spider pheromones have ever been identified. Silk and volatile odorants from females of the wolf spider *Tigrosa helluo* have been shown to act as a repellent and reduce feeding in a variety of crop pests. We screened volatiles produced from the silk of adult male and female *T. helluo* (n=20) . Mature females were individually placed in glass vials for twelve hours during which they were exposed to visual courtship displays of conspecific male spiders (n=20) and allowed to deposit silk. A serial wash using methylene chloride was performed on vacated vials (n=20) followed by characterization using gas chromatography/mass spectroscopy (GC/MS). A long-chain alkene appears to be unique to the female silk when compared with rinses of male silk, control vials, and peat moss in which the spiders are reared. In a separate method of sample collection, solid-phase microextraction (SPME) is being used to collect headspace samples of female spiders allowed to inhabit vials for twelve hours. These samples will be analyzed using GC/MS and compared with the previous results. (186)

Klitsch, Erika C.* and Dr. Jodi L. Yorty. Elizabethtown College, Elizabethtown, PA 17022. *Effects of the Stress Hormone Corticosterone on the Production of Pro-Inflammatory Cytokines and Expression of IL-17R on U937 Cells* - Rheumatoid arthritis (RA) is a chronic inflammatory autoimmune disorder affecting nearly 1.5 million people in the United States. This disability is partly mediated by the influx of monocytes to the synovial tissue. In the joints of RA patients, CD4+ T cells begin to stimulate monocytes to secrete pro-inflammatory cytokines. Thus, RA treatments often block TNF-α and IL-1β production in an effort to reduce the high concentration of these cytokines in synovial tissue. More recent studies, however, focus on IL-17A, a T cell cytokine that promotes inflammation. In this investigation the human monocytic cell line, U937, was exposed to molar dilutions of corticosterone (CORT), an anti- inflammatory glucocorticoid in order to determine whether CORT affects

aspects of cell growth and the IL-17A signaling cascade. Flow cytometry data confirmed the presence of the IL-17 receptor on the U937 cell surface. Although CORT did not decrease the growth of the U937 cells, initial studies indicate that CORT may decrease expression of the IL-17 receptor. Western Blot assays also suggest that CORT may reduce the expression of the glucocorticoid receptor in U937 cells. Since IL-17A promotes inflammation, studies are currently underway to determine whether exposure of U937 cells to IL-17A induces TNF-a production, and whether CORT decreases the production of TNF-α in the presence and absence of IL-17A. The potential for inhibition of the inflammatory mediator IL-17A through the IL-17R may provide another viable option for RA treatment. Thus, these studies seek to elucidate additional mechanisms of action for future RA drugs. (83)

Kolba, Nikolai*, Dr. Jane Huffman. East Stroudsburg University: Northeast Wildlife DNA Laboratory, East Stroudsburg, PA 18301. *Investigating the molecular characterization of Babesia spp. in North American river otters (Lontra canadensis), North American beavers (Castor canadensis), muskrats (Ondatra zibethicus), and the American minks (Neovison vison) within Pennsylvania and New Jersey.* -Babesia is a genus of protozoan piroplasms that infect the blood and cause a parasitic hemolytic disease known as babesiosis. Over 100 species of Babesia have been identified, but only a few have been documented to be pathogenic in humans. Human babesiosis is an increasing health concern in the northeastern United States, where Babesia microti and other Babesia species, are spread through the bite of infected Ixodes scapulari ticks. We sampled river otters, muskrats, beavers and mink in Pennsylvania and New Jersey to determine if Babesia spp. was present using the polymerase chain reaction (PCR). The prevalence of Babesia spp. in otters was ~75%, in muskrats 65%, in beaver 29%, and in mink less than 10%. The species of Babesia was determined by sequencing the 18s ribosomal fragment. The pathogenic potential of this organism for otters or other species remains unknown. (93)

Korpics, Samantha *, Julia Kelly*, and Amy Reese, PhD. Cedar Crest College, Allentown PA 18104. *Overexpression of alpha-1,3-glucanase in Cryptococcus neoformans using two different cloning approaches – Cryptococcus neoformans* is a pathogenic fungus that affects immuncompromised individuals worldwide, especially those with HIV/AIDS. The exceptional virulence of *C. neoformans* comes from its polysaccharide capsule, which allows the cells to evade phagocytosis by the immune system in the human body. The capsule is anchored to the cell by cell wall alpha-1,3-glucan and the enzyme which regulates cell wall alpha-1,3-glucan is hypothesized to be alpha-1,3-glucanase (*AGN).* There are four *AGN* genes in *C. neoformans,* but the role of each is not known. Two molecular cloning approaches have been implemented to investigate the role that *AGN* gene and gene products play in capsule attachment in *C. neoformans*. The first approach involves the overexpression of *AGN* genes in a yeast system to generate a protein reagent for subsequent treatment of cryptococcal cells to degrade cell wall alpha-1,3-glucan and remove capsule. For this approach, the genes will be overexpressed in *Kluyveromyces lactis* using the pKlac2 vector. Currently one of the four *AGN* genes (*AGN3)* has been successfully cloned into the pKlac2 vector and protein expression experiments are being evaluated. The second cloning approach involves overexpression in the *C. neoformans* cells themselves, to be able to monitor the impact that too much alpha-1,3-glucanase has on the cells. In this approach, the *AGN* genes will be overexpressed using the inducible plasmid pCTR4-2, in which transcription can be regulated by the amount of copper in the surrounding media. By increasing the amount of *AGN* produced in *C. neoformans*, the roles of *AGN* genes and their products may become clear, and a new potential target for anti-fungal drugs may be identified. (41)

Kosak, Zachary J.* and **Jeramia J. Ory**. Department of Biology, King's College, Wilkes-Barre, PA 18711. *Exploring Microarray Data from Cryptococcus neoformans to Identify Novel Cryptococcal Meningitis Virulence Indicators* - *Cryptococcus neoformans* is an opportunistic human pathogen, causing cryptococcal meningitis in patents with compromised immune systems. Left untreated, cryptococcal meningitis is 100% lethal; up to 25% of treated cases are still fatal. Many studies have suggested virulence indicators, including signaling networks that influence melanin production, fungal capsule development, and tolerance of the 37ºC environment within potential human hosts. Observations such as these have provided promising avenues for examining how *C. neoformans* infects immunocompromised humans. Our objective is to perform microarray analysis on *C. neoformans* strains isolated from patients and compare our findings with their associated clinical data. We hope to correlate more severe clinical characteristics with particular gene expression profiles. cDNA was generated utilizing a 3DNA Array 350 Kit (Genisphere, Hatfield, PA). cDNA was hybridized to the microarray slides with the Genisphere kit, and 3DNA hybridization was performed per protocol. Microarray slides were scanned, and image normalization was performed utilizing the print-tip lowess methodology in the Goulphar program. Significance analysis of normalized microarray data was performed to identify genes with significant results that correlated with clinical data. Preliminary findings indicate that host gender and age may correlate with clinical symptom severity, but further study is currently underway to determine whether these results are statistically significant. Identifying these pathways may provide novel treatment targets for healthcare providers and pharmaceutical companies attempting to treat those infected with cryptococcal meningitis. (44)

Kraker, Laura and Kinley Hardy. Susquehanna University, Selinsgrove, PA 17870. *Microbial Ecology of the Centralia, Pennsylvania Mine Fire: The Study of Thermophilic Actinomycetes* – The Centralia, Pennsylvania mine fire that started in 1962 has had a major impact on the overlying soil environment. The underground fire vents gases upward through gaps in the soil, causing significant changes to the chemical and physical composition of the soil and to the microbial communities surrounding the vents. Previous research has demonstrated the presence of thermophilic actinomycetes around these vents, some of which may be capable of producing antibiotics. In order to extend this research soil samples were collected from around the vents at temperatures of 32˚C, 48˚C and 65˚C, diluted in sterile water, and used to inoculate glycerol yeast agar plates at 55°C. Six unique colonies were isolated and visualized microscopically using a Gram stain where potential actinomycetes (Gram positive, filamentous growth) were observed. Genomic DNA was extracted from these isolates using a MoBio UltraClean DNA Isolation Kit. The 16S rRNA genes were then amplified using PCR and sequenced. Preliminary results identified these isolates as *Brevivacillus sp.*, *Bacillus fumariolo*, *Streptomyces sp.*, and *Bacillus gelatini*. Further research is being performed to identify additional isolates, and to perform antimicrobial testing on the previously identified isolates. (57)

Krall, Joshua W. * and Angela L. Asirvatham. Misericordia University, Dallas, PA 18612. *Circadian Rhythms in College Students* - To determine the importance of biological rhythms in college students, data on heart rate, body temperature, time estimation, arithmetic speed and fine movement was collected from 32 healthy individuals aged between 18 and 22 years over 16 consecutive days at five different times (8:00 AM, 12 PM, 4:00 PM, 8:00 PM and 12 AM) of a 24 –hour day. Students were also required to keep a record of the time spent awake and sleeping on a sleep/wake chart. Fast heart rate, high body temperature, accurate time estimation, and fast arithmetic and fine movement speeds were observed throughout the middle of the day and early evening hours (noon, 4:00 P.M., 8:00 P.M.), with slightly slower heart rate, lower body temperature, less accurate time estimation, and slower arithmetic and fine movement speeds occurring at midnight. The slowest heart rate, lowest body temperature, least accurate time estimation, and slowest arithmetic and fine movement speeds were recorded at 8:00 A.M. Although the average values for each measured parameter seemed to follow a circadian rhythm throughout the day, it was determined by statistical analysis that the means were not significantly different from each other ($p < 0.05$). Mean values of the measured parameters display that, on average, the 32 colleges students that participated in the study were "evening-type" people. Additional studies must be conducted in the future to better understand the effects of having an evening-type circadian preference on academic and athletic performance. (63)

Kreider, Erin V.*, **Paul T. Stathis***, and **Daniel Klem, Jr.**, Muhlenberg College, Allentown, PA 18104. *Gross anatomy and histology of Cooper's (*Accipiter cooperii) *and Red-tailed* (Buteo jamaicensis) *hawks alimentary tracts* – The basic constituents of the avian alimentary tract are: esophagus, proventriculus, ventriculus, small intestine, caeca, and large intestine; in general these organs are similarly structured in most species of birds. The anatomy and histology of alimentary organs are known to be influenced by the diet of the organism. This study compares the gross anatomy and histology of the alimentary tracts of two avian predators that primarily feed on other birds and mammals. Comparison of the gross anatomy revealed the Cooper's Hawk had proportionally longer proventriculus and small intestine while the Red-tailed Hawk had a larger esophagus and ventriculus. Comparison of the histology revealed Red-tailed hawk had a greater proportional representation of epithelium in each of the alimentary organs while the Copper's Hawk had a greater proportional representation of muscular tissue layers throughout. (193) [Moved to Poster Session II, will be displayed on board 96]

Kretovics, Sean* and Cynthia Walter. Saint Vincent College, Latrobe, PA 15650. *The Effect of Phytochemical Extracts from Solanum lycopersicum on Larvae of the Mosquito, Aedes aegypti*- Mosquitoes are one of the most important groups of insects with regard to public health. This experiment focused on the mosquito, *Aedes aegypti*, one of the most prolific mosquitoes in North America, and killed it with the most commonly homegrown plant, the tomato, *Solanum lycopersicum*. A larvicide was made from tomato leaves after they were dried, ground and mixed with methanol at a ratio of 1g dry weight : 9 ml, incubated at room temperature overnight and centrifuged. The mosquito culture was raised until the 3rd or 4th in-star stage before the larvicide was added. Mosquitoes were raised in groups of three or four in three separate 250 Erlenmeyer flasks per treatment group. The larvae were exposed to the larvicide and methanol alone at concentrations up to 1% of culture water and observed for nine days until larvae hatched or died. After 24 hrs., the LD-50 for methanol was 1% and 0.37% for larvicide. After 72 hrs., the LD-50 decreased to 0.34% for methanol and 0.21% for larvicide. Concentrations from 0.12 -1% were tested on *Daphnia*, organisms often found with mosquitoes. They are a good indicator of whether or not the phytochemical extract will negatively affect invertebrates other than mosquitoes. Preliminary results indicate these crustaceans survive and successfully release young during four days of observation after a single dose of tomato extract and/or methanol at concentrations up to 1% of culture water. Natural phytochemical extracts are the future of pesticides. They provide a less toxic way of managing pests, and will hopefully be more environmentally friendly

to non-target organisms. (106)

Lachhab, Ahmed, Matt Beren*, and Brian Zuidervliet. Susquehanna University, Selinsgrove, PA 17870. *Middle Creek Water Assessment using Water Quality Index (WQI)* - Water quality Index (WQI) provides a single value that is used to express the overall quality of water based on a number of measurable parameters. WQI was calculated based on 10 data sets collected during the period between June and July of 2012 and July of 2013 in an effort to assess the water quality of Middle Creek (MC) (Snyder, CO. PA). MC is a 2nd order tributary stream flowing into Penn's Creek, before joining the Susquehanna River. In this study, eleven sites were selected along MC between the head waters and its confluence with Penn's Creek. Physical properties were measured in the field and grab-samples were tested for P, NO_2^-, NO_3^- and NH_3 in addition to BOD_5, COD and TSS. WQI was measured based on the above mentioned elements and was found to be 89.71, indicating that MC is in good condition regarding water quality and is capable of buffering nutrient and chemical runoff. Results have shown that certain parameters such as T°, COD or BOD, can be used for forecasting. Due to their correlation with WQI values, T°, COD and BOD were found to be parameters which could be used in order to evaluate water quality within a short period of time. In this study T° and COD were found to be the best forecasting parameters, followed by BOD. (110)

Lafferty, Joseph, Peter Kerns, and Dr. Swarna Basu. Susquehanna University, Selinsgrove, PA 17870. *Cross-linking of proteins using laser excitation of various photoactivators* - Three-dimensional free-form fabrication, also known as cross-linking or photo-polymerization, of proteins (bovine and human serum albumins, fibrinogen and lysozyme) has been carried out using a pulsed Nd^{3+}-YAG laser as the excitation source. Cross-linking is carried out by the direct excitation of various photoactivators (ex. Rose Bengal, Methylene Blue and 9-fluorenone-2-carboxyic acid). These cross-linked structures can serve as models for various applications including drug delivery and tissue engineering. Optimal laser exposure dose for cross-linking has been determined. Cross-linking was observed on proteins that had been heated to 60 °C but not higher due to denaturation. Cross-linking of proteins that had been involved in other processes (binding to transition metal complexes) was carried out and the cross-linking efficiency was drastically reduced as the tryptophans that are typically involved in cross-linking had limited accessibility. Finally, fluorescence experiments were carried out to monitor cross-linking, determine bioactivity and measure fluorescence recovery within these structures following photobleaching. (176)

Laird, Amber* and **Garrett Barr.** King's College, Wilkes-Barre, PA 18711. *Tracking Digestion in Larval Two-Lined Salamanders with Fluorescently Marked Prey* – Recent research on day and nighttime feeding of stream salamanders relied on an assumption that prey items pass through the foregut of larval salamanders within 8 hrs. To test this assumption, we measured the time it took fluorescently marked water fleas (*Daphnia magna*) to pass through the foregut of larval two-lined salamanders (*Eurycea bislineata).* To track the digestive rate of the salamanders, water fleas were marked by placing them in a suspension of GloGerm; water fleas readily consumed the GloGerm. When water fleas were fed to salamanders, the GloGerm was visible under Epi Blue light with a Sybr Gold filter using a gel documentation system. We captured digital images every hr for 9 hrs after each salamander consumed 1 water flea. We measured the location of the brightest spot using ImageJ. We also dissected a subset of salamanders to test the reliability of our measurements. Results suggest that most prey items exit the foregut of larval salamanders within 8 hrs. However, dissections identified more than expected variation in the shape of salamander digestive tracts, suggesting patterns may differ between size classes of salamanders. Our non-lethal technique for tracking digestion rates in salamanders seems promising, and we are continuing to analyze results to more effectively measure the time it takes prey to exit the foregut of salamanders. (119)

Landis, Sarah *, Brittany Smith, and Edward P. Levri. Penn State Altoona, Altoona, PA 16601. *The geotactic behavior of different clones of the invasive the New Zealand mud snail in response to fish odor*--The New Zealand Mud Snail, *Potamopyrgus antipodarum,* is known to exhibit geotaxis, which is the vertical response to light and gravity, and this behavior has been demonstrated to vary between different genotypes of the snail. The snail is also known to alter its behavior when it detects the presence of fish predators. The purpose of this experiment was to determine if there is also clonal variation in the geotactic response to the presence of predator-scented water. Both US invasive and native New Zealand clones of the snail were assessed for their geotactic behavior in the presence and absence of fish odor under both light and dark conditions. The snails were placed in a glass tube, oriented vertically, and timed for 2 minutes. After the allotted time period, the distance traveled was measured and the direction of snail movement was recorded (up or down). The data demonstrate that the highly invasive US1 clone displayed positive geotactic behavior when exposed to predator-scented water, but displayed negative geotactic behavior when exposed to plain water. The other non-native (and less invasive) clones (US3 and Ontario) exhibited negative geotaxis in both plain and predator-scented water. Native New Zealand clones also behaved differently than the US1 clone. These results suggest that differences in behavior may influence the

invasion success of different genotypes of this species. (133)

Laubach, Larry* and **Jane E. Huffman.** Northeast Wildlife DNA Laboratory, East Stroudsburg University, East Stroudsburg, PA 18301. *Seasonal prevalence of haemogregarine parasites, in the turtles Chrysemys picta, Chelydra serpentina, Sternotherus odoratus, and Trachemys scripta, from Pennsylvania and New Jersey* - Haemogregarine parasites, vectored by leeches, are commonly found in freshwater turtles. Differences have been noted in infection prevalence and parasitemia between turtle species. In this study, turtles were trapped in hoop traps or fish and crab traps baited with sardines, from eight locations in eastern Pennsylvania and western New Jersey. Trapping was conducted in the fall of 2012, spring of 2013, and the fall of 2013. Blood samples were taken from the subcarapacial venous site from four species of turtles; *Chrysemys picta, Chelydra serpentina, Sternotherus odoratus*, and *Trachemys scripta*. The prevalence and severity of haemogregarine infection was recorded from the blood smears. The mean number of cells per field of view was determined for that smear and a parasitemia estimate was made. Multiple stages of intraerythrocytic haemogregarine were observed in this study. Parasitemia was characterized as being low, moderate, or heavy. Comparisons on the seasonal prevalence were made as well as changes in parasitemia. Recaptures did occur, allowing the comparison of these values from some individuals. (73)

Lazzeri, Amanda*, Evelyn Neunteufel. Misericordia University, Dallas, PA 18612. *Caching Behavior of the Eastern Gray Squirrel (Sciurus carolinensis) in Northeastern Pennsylvania*-- Do foraging eastern gray squirrels use perishability as a factor in deciding which nuts to cache and which nuts to eat immediately? Our hypothesis is that squirrels will cache intact, whole hazelnuts more often than hazelnuts with no shell or a cracked shell, because whole, intact hazelnuts will be less perishable in caches. Our prediction is that squirrels will cache whole, intact hazelnuts the most, followed by nuts in cracked shells (more perishable), with the least amount of caching instances occurring for nuts with no shell (the most perishable). Individual squirrels in the Kirby Park region in Edwardsville, PA were each provided with a single hazelnut either with an intact shell, or with a cracked shell or with no shell. We expected caching decisions in eastern gray squirrels (*Sciurus carolinensis*) to be determined by whether the nut is perishable (cracked shell or no shell) or not perishable (intact shell). Results showed that generally more hazelnuts were eaten than cached; 35% of the whole nuts offered were cached, but only 12% of the cracked nuts were cached and 18% of the nuts without a shell were cached. These preliminary findings indicate the importance of perishability in caching decisions since the least perishable nuts were cached the most often. Additional data will be collected in order to determine whether results are significant and to analyze how different seasons may affect caching behavior in eastern gray squirrels. (129)

Maake*, Connor, Erika Hernandez*, Megan Rothenberger. Lafayette College, Easton, PA 18042. *Using data from a multiyear monitoring effort as a tool for assessing dam removal* –Increasing concerns about the environmental and economic impacts and public safety hazard of aging small dams have led to growing interest in dam removal as a means of river restoration. While the physical removal of the dam structure itself can be a relatively straightforward process, careful planning is necessary to limit the risk of impact on aquatic species. Although over 500 dams have been removed in the United States over the past two decades, there is relatively little information available to guide resource managers through a small dam removal project. In July 2010, shortly after the City of Easton submitted a proposal to the federal "2010 Open Rivers Initiative" for the permitting of several small dam removals along the lower Bushkill Creek, Lafayette students began collecting monthly data on water quality and macroinvertebrate assemblages above and below the three dams proposed for removal as well as three upstream control sites. The objectives of this study are to 1) continue pre-removal monitoring at these six sites and 2) analyze spatial and seasonal differences in water quality and macroinvertebrate abundance and diversity. Analysis of these preliminary data has indicated that dissolved oxygen, macroinvertebrate species richness and biodiversity, and disturbance-sensitive taxa are significantly more abundant in the shallow, high velocity waters of the sites below the dams. Analysis of seasonal changes in macroinvertebrate composition indicates that overall abundance is significantly higher in summer, but there is no significant difference in biodiversity among the seasons. The data collected as part of this multiyear monitoring study will be used to explore opportunities and make recommendations to reduce the impact of dam removal on aquatic life. (101)

Mackey, Matthew* and Cynthia Walter. Saint Vincent College, Latrobe, PA 15650. *Assessment of Physical, Biological, and Chemical Niche Features of Rosa multiflora in a Temperate Deciduous Forest in Southwestern Pennsylvania* - *Rosa multiflora*, or multiflora rose (RM), is an invasive plant of Japanese descent that is of particular interest in the eastern United States because of its ability to dominate forest understories. In order to study some parameters of its ecological niche, thirteen 314m^2plots of mature second growth forest were selected in Powdermill Nature Reserve (PNR) based on preexisting RM abundance data from a 2006-2008 vegetation survey conducted at PNR. Plots were studied in late summer and early autumn of 2013. Canopy cover densities were collected using a convex densiometer. Soil samples were analyzed at Penn State University's Agricultural Analytical Services Laboratory for soil chemistry, including pH and nutrient content. To

judge whether RM is indeed excluding native plants, a vegetation survey of plant abundance was conducted in each study plot. Plant abundance was measured by counting individuals, and health was quantified by scoring herbivory and visible necrosis in terms of percent leaves affected. Using current canopy cover data, we obtained nearly a statistically significant relationship (P=0.06) using a linear regression model and determined that canopy cover density ranging from 64%-94% can explain 31% of the variation in RM abundance. *R. multiflora* displayed no sensitivity to pH across a tight range of 4.1 to 5.6. Regressions involving soil nutrient content showed that RM abundance did not respond to varied levels of nitrogen, potassium, and calcium. Specifically, the shrub showed no trend when it experienced a twenty-fold spread of soil calcium content (147 lb/A to 2744 lb/A). Likewise, RM showed no response to total basal area or total abundance of canopy species within each site. These results may have implications for management of RM in forested areas affected by the shrub's invasion. (125)

Madden, Shelby* and **Garrett Barr.** King's College, Wilkes-Barre PA 18711. *Effects of Marking Larval Salamanders on Their Survival in the Presence of Trout and Crayfish* – Mark-recapture is among the few techniques for effectively measuring the density of wildlife. However, the assumptions of mark-recapture techniques frequently remain untested. To test the assumption that marking salamanders does not affect survival in the presence of common stream predators, we measured the survival of unmarked two-lined salamander (*Eurycea bislineata*) larvae to those marked with a Visible Implant Elastomer (VIE). Our experiment included 5 replicates of 2 predator treatments: 1 brook trout (*Salvelinus fontinalis*) or 1 crayfish). Each 38 L tank contained 19 L of stream water, a natural mix of stream substrate collected with a 1 ft^2 Surber sampler, three marked salamanders, three unmarked salamanders, and one predator. After 1 week, we removed predators and carefully searched tanks for surviving salamanders. Marked salamander survival was higher in the presence of trout, and survival of marked salamanders was higher than unmarked salamanders in the presence of crayfish. Our results suggest that studies using VIE to mark salamanders may under estimate salamander density in streams with crayfish. Further research should address whether marks affect predation because of changes in salamander or predator behavior. (120)

Madigosky, Stephen R.* Widener University, Chester, PA 19013. *A Unique Service Learning Initiative from "Cultivation-to-Cup"* -- Service learning is an educational experience where students, faculty, and designated community partners work together in a well-orchestrated nner to address the specific needs of a business, the community, or an organization. A carefully designed service project addresses the needs of the client while honing a student's academic skills and instilling in them a sense of civic responsibility and commitment to the partnership. At Widener University, much of our mission is based upon engaging students in service projects as part of an integrative undergraduate learning experience. Within the sciences, we are especially receptive to having students work on international service projects that are linked to conservation and/or sustainable development initiatives. This project outlines a unique relationship between Widener University, Golden Valley Farms Coffee Roasters (GVF), Las Lajas, a coffee farm in Costa Rica, and a food service provider. Collectively, we are assisting farmers in Costa Rica, converting their conventional coffee farms to a more environmentally sustainable operation that employs the use of organic, shade-grown cultivation practices. We are attempting to change one of the most environmentally exploitative agricultural industries on the planet to one that favors a more biologically diverse pesticide/herbicide free environment. Students from all academic disciplines are now assisting farmers in this venture and have helped to develop a unique brand of coffee for the university. This venture encourages fair-trade practices while helping students learn about the impact of their purchasing decisions on a global scale. This could very well help change how coffee is perceived and produced from "cultivation-to-cup." This session will outline the development of this unique venture and describe how other institutions can become involved. We are looking for partners to help augment this service-oriented sustainable development initiative. (143)

Manchanayakage, Renuka, and **Janelle Geist*.** Susquehanna University, Selinsgrove, PA 17870. *Application of olefin metathesis in the synthesis of polyconjugated compounds* - Organic compounds with polyolefinic structure are frequently found in living systems. In the course of making some of these natural products, we were interested to develop a practical synthesis for the preparation of polyenes which possess 1,3,3-trimethylcyclohexene as part of the molecule. The olefin metathesis using Grubbs ruthenium-based catalysts is widely and successfully applied in the synthesis of biologically active complex molecules. A series of starting compounds for olefin metathesis was prepared using Barbier-type allylation reaction. The beta-cyclocitral was reacted with different allyl halides using tin or zinc as the metal in various solvent systems. The tin-mediated allylation of beta-cyclocitral afforded the hydroxyl-elimination compound as the major product in good yields. These products were purified by flash column chromatography and characterized by NMR spectroscopy. The elimination products from Barbier reactions were then subjected to olefin cross metathesis using Grubbs first and second generation catalysts. (179)

Manchanayakage, Renuka, Hannah Kronenwetter*, and **Brian Etz*.** Susquehanna University, Selinsgrove, PA 17870. *Synthesis and applications of chiral pyrrolidinium-based ionic liquids* - Asymmetric synthesis is one of the most important areas of organic chemistry. The use of chiral solvents as the sole inducer of enantiomeric excess in organic reactions is a strategy that has been investigated previously. The difficult syntheses of chiral solvents and modest enantioselectivities often precluded their use. An attractive alternative to such solvents is chiral ionic liquids. Ionic liquids are nonvolatile, nonflammable materials with low or nonexistent melting points. Also, a significant transfer of chirality when used as a solvent in chemical synthesis can be expected due to their high degree of organization. This project focuses on developing efficient, economic and simple ways to prepare chiral ionic liquids. A series of pyrrolidinium-based chiral ionic liquids was prepared. The chirality was introduced by the lactate anion and the compounds were characterized by spectroscopic methods. The prepared chiral ionic liquids were then used in asymmetric Diels Alder reactions. (178)

Manchanayakage, Renuka, Dalyna Ngo*, and **Mbelu Kalala*.** Susquehanna University, Selinsgrove, PA 17870. *One-pot synthesis of chalcone epoxides: An environmentally benign protocol* - Chalcone derivatives are known for their antimicrobial activities. Epoxides of chalcones are important precursors for many organic transformations. The multi-step synthesis of chalcone epoxides have been reported previously. However, in recent years there has been an increased effort to introduce green chemistry principles into organic synthesis. Waste minimization is a very important aspect of an environmentally benign protocol. One-pot multicomponent processes and one-pot consecutive processes have been discovered that allow compounds to be prepared without having to isolate and purify the intermediates. A one-pot synthesis for chalcone epoxides has been developed. In this project, various chalcone epoxides were synthesized from benzaldehyde and acetophenone derivatives by one-pot consecutive reactions of aldol condensation and epoxidation. A low concentration of hydrogen peroxide was used as the epoxidizing agent. The final products were recovered in good yields. The epoxides were characterized by melting point analysis and IR and NMR spectroscopic methods. (180)

Manmiller, Sarah M. * and David R. Singleton. York College of Pennsylvania, York PA 17403. *Isolation of Sulfate Reducing Bacteria from Estuarine Water for the Bioremediation of Cadmium* - The purpose of this study was to isolate sulfate-reducing bacteria (SRB) for the potential bioremediation of cadmium. Humans are exposed to cadmium through heavy metal leaching from incinerator ash concrete and by ingesting crustaceans harvested from polluted ocean waters. Cadmium is particularly harmful to the kidneys and has been implicated to increase the risk of cancers and other diseases. In this study, we isolated five potentially novel SRB that most closely relate to *Clostridium* spp. These bacteria would be preferential for the bioremediation of cadmium since they have been shown to resist heavy metal toxicity at high concentrations and are able to render cadmium insoluble. In addition, these bacteria are anaerobic and therefor would be able to remediate contaminated mud. DNA sequences from these species can also be further analyzed for known and new cadmium resistance and remediation genes. (56)

Mathur, Dilip and **Elisabeth Bleistine***. Mercyhurst University, Erie PA 16546. *Examination of American shad Restoration Efforts: Susquehanna River Example* -Efforts to restore American shad to multiple river systems on the Atlantic coast have been ongoing in various forms since the mid-1800s. The Susquehanna River has been the site of multiple forms of restoration and this makes it the ideal system to study the various efforts and their success. In the early 1900's the construction of four major dams permanently changed the structure of the Susquehanna River and had an impact on migratory fish populations. Modern restoration efforts began in the 1950's and is ongoing. These efforts have included trap and transport, fish lifts and ladder, and hatchery operations. Using published data, this examination looks at the restoration goals, the various restoration efforts, and the success of these efforts. (160)

Matthews, Stephen* and **Ronald Kaltreider,** York College of Pennsylvania, York, PA 17403. *Heat induced expression of a protein similar to HSP70 in size, found in* Hyphantria cunea *(Lepidoptera:Arctiidae)* – Heat Shock Protein 70 (HSP70) is a ubiquitous member of the HSP family noted to be involved in the thermotolerance of a host of organisms. *Hyphantria cunea* has been observed to successfully withstand temperatures exceeding that of their optimal range. The goal of this study was to determine the method behind the thermotolerance of *H. cunea*. We hypothesized that there would be a presence of HSP70 in *H. cunea* directly related to changes in temperature. This study was conducted by subjecting groups of live *H. cunea* to controlled environments experiencing different temperatures, ranging from 25ºC to 48˚C, to possibly induce HSP70 expression. Electrophoresis gels containing standardized samples of homogenized *H. cunea* were ran and subsequently stained with Coomassie Blue. The gels indicate a heat-induced expression of a protein that matches in size to HSP70. This observed protein gradient appears to be related to temperature in a direct fashion, increasing in concentration as the temperature increases. The gene expression of HSP70 was also examined through RT PCR, with forward and reverse primers made from HSP70 sequences conserved between two closely related species, *Manduca sexta* and *Lymantria dispar.* The results of this study provide links indicating HSP70 could be responsible for the thermotolerance of *H. cunea*. (32)

Mecca, Joshua D.*, and **Robin P. Ertl.** Marywood University, Scranton, PA 18509. *Biochemical adaptation of algae to ocean acidification* - Ocean acidification is one of the complications resulting from 33.5 billion tons of carbon dioxide produced each year from the burning of carbon based fuels. A dramatic consequence of decreasing pH is the decline of coral in large portions of the Great Barrier Reef because of its inability to defend against this change. An unknown consequence is how Ocean Acidification will impact the bottom of the food chain upon which marine organisms depend. Similar to coral, algae cannot defend against pH calling into question whether this population will collapse or adapt. The catalytic activity of the algae is governed in part by the protonation state of enzymes and thus dependent on pH. The goal of this study is to determine whether enzymes in algae have already adapted to the change in ocean pH that has occurred over the last 5 decades. To examine this point, growth rates in algae collected and preserved over the decades were compared under the more acidic conditions. It was found that under the more acidic conditions the algae, *Nannochloropsis gaditana* isolated in 1998 had an advantage in growth rate compared to algae isolated in 1952. This is consistent with the hypothesis that ocean acidification has altered the evolution of algae and that at least certain strains will still flourish in the future, although the types and diversity of algae remaining may dramatically alter the diversity of organisms depending on algae as a food source. Future studies will next examine the underlying biochemical adaptations that allow these algae to grow at these pHs. (87)

Melnyk, Alysha*. Susquehanna University, Selinsgrove, PA 17870. *Microbial Ecology of the Centralia, Pennsylvania Mine Fire: The Study of Sulfur-Reducing Bacteria* - In 1962, a mine fire began in Centralia, Pennsylvania that is still burning to this day and has the capacity to burn for decades more. The fire covers approximately three hundred acres, and has drastically modified both the local landscape and ecosystem. Soils overlying the fire have been shown to have elevated temperatures and sulfur levels due to the venting of hot, sulfur-rich gases from the fire below. Since the fire expands slowly, newly impacted microbial communities have the opportunity to adapt and evolve as the environment changes. Evolutionary studies of the microorganisms that reside in hot soils indicate that they are highly representative of the overall ecological impacts of the fire. This study is especially interested in the roles that local bacteria play in the biogeochemical cycling of the sulfur released by the mine fire, and the metabolic strategies these sulfur bacteria possess while surviving in this extreme environment. Preliminary studies show that the surviving microbial communities include sulfur-reducing bacteria, and thus it is hypothesized that Centralia could serve as an important source for industrially important sulfur-reducing bacterial isolates. Surface soil samples were collected adjacent to active vents and were used to inoculate both a Sulfate API Broth and a Sulfate-Reducing Medium with Lactate. Single colonies were isolated and are currently being identified using microscopy and 16S rRNA gene sequencing, while their capacity to metabolize sulfur will be analyzed via PCR with primers specific for genes involved in sulfur cycling. Metagenomic DNA isolated directly from the soil samples is also being analyzed using these primers. It is hoped that these culture-independent studies will lead to greater insight regarding the various species of sulfur-reducing bacteria dwelling in Centralia. (58)

Meyer, Alexandra* and David Singleton. York College of Pennsylvania, York, PA 17403. *Diversity of Bacterial Species Present in a Mouse Model throughout the Decomposition Process within Different Environments* - Valuable information can be obtained from a carcass during the decomposition process. This becomes especially true in the examination of a forensic investigation, as the main component in solving the crime is to first use this information to determine the time of death of the victim. Bacteria grow and thrive off of decomposing organisms, allowing microbial diversity and complexity to become a plausible method in estimating the time since death. The objective of this research was to investigate the diversity of the bacterial species present within tissue samples collected from decaying mice placed within two diverse environments. Bacterial DNA within the tissue samples was purified and analyzed using a specific DNA isolation protocol, polymerase chain reactions (PCR), agarose gel electrophoresis, and temperature gradient gel electrophoresis (TGGE). TGGE demonstrated a notable trend in that the bacterial species diversity progressed with the succession of each decay stage. Currently we are determining the species of bacteria via DNA sequencing. This study established a preliminary understanding of the progression of the bacterial diversity throughout decomposition, however much more comprehensive research needs to be completed in order to allow bacteria to become a forensic tool that can assist pathologists in accurately pinpointing the time of death. (54)

Minier, Sarah * and Dr. Garret Barr. Kings College, Wilkes-Barre PA 18711. *Chronic and Episodic Acidification of Fishing Creek: Effects on Two-lined Salamanders--* Episodic and chronic acidification are persistent problems in many streams throughout the northeastern US due to acid deposition and poor buffering capacity in some watersheds. Acidification often results in reduced diversity and density of aquatic organisms. The Fishing Creek watershed located in Columbia and Sullivan counties is affected by episodic and chronic acidification, and our study focused on the degree to which acidification affects the presence and abundance of larval salamanders. We sampled five headwater tributaries of the East Branch of Fishing Creek and seven headwater tributaries of the West Branch of Fishing Creek in PA State

Game Lands 13. We measured the pH of each tributary and captured larval two-lined salamanders (*Eurycea bislineata*) for 0.5 person hrs. Regression analysis showed an inverse relationship between pH and salamander abundance ($p = 0.025$, $R^2 = 0.41$). No salamanders were found at sites with a pH lower than 5.5. We find it interesting that the relationship between salamander presence and elevation is different in the 2 tributaries of Fishing Creek. Salamanders are present of the lower tributaries in the East Branch and the higher tributaries of the West Branch. Our initial impressions are that these patterns are related to differences in buffering capacity that are caused by the geology of the Fishing Creek watershed. We are continuing our investigation of the water chemistry and geology of Fishing Creek to develop a better understanding of their relationships to salamander abundance. (117)

Moyer, Brian*, Julia Eckenrode, Maureen A. Levri, and Edward P. Levri. Penn State-Altoona, Altoona, PA 16601. *Current versus future reproductive effort in Mountain Laurel (Kalmia latifolia)* – Trade-offs are predicted between traits that may compete for resources within an individual. Mountain laurel (*Kalmia latifolia*) produces variable numbers of inflorescences per plant and variable numbers of flowers per inflorescence. The purpose of this study was to determine the relationship between the size and number of inflorescences produced in a given year to the size or number produced subsequent years. One hundred twenty-five plants were utilized in the Seminar Forest on the Penn State Altoona campus. The number of inflorescences and the average number of flowers per inflorescence were determined for each plant over the course of three consecutive years. The data from each year was correlated with each other year. The data comparing 2011 to 2012 and 2012 to 2013 suggests that increased floral output by a plant the previous year results in a decreased floral production the following year, and smaller floral output the previous year yields a greater floral production the following year. In addition, there was a significant positive correlation between reproductive efforts between 2011 and 2013. (166)

Mrozek, Christine* and **Dr. Jodi L.Yorty.** Elizabethtown College, Elizabethtown, PA 17022. *Recovery of Splenic Dendritic Cell Populations of C57BL/6 Mice after Treatment with Corticosterone*- The ability of the immune system to protect organisms from infection and the formation of tumors, can be adversely affected by the presence of stress hormones such as glucocorticoids. Dendritic cells, otherwise known as DCs, are a small population of immune cells that play an integral role in the immune response by activating T cells, and have been shown in previous experiments to be reduced in number by the glucocorticoids. These studies investigated the effects of the glucocorticoid, corticosterone (CORT), on the DC populations in the spleen of C57BL/6 mice. Mice were exposed to 150 µg/ml CORT for 24 hours. Spleens were either harvested immediately or on varying days post-CORT removal. Spleens were processed, analyzed via cell count, and DC populations were quantified by flow-cytometry. Results suggest that DCs are sensitive to CORT since exposure to this hormone decreased all splenic DC populations in comparison to control mice. All DCs demonstrated gradual recovery over a five-day period post-CORT removal, and recovery kinetics varied between subsets. Notably, the cross-priming subset of DCs appeared to recover the fastest, and the percent of this DC subset exceeded baseline levels present in control mice by day five. The percentage of all DCs recovered to baseline levels by 10 days post-CORT removal. At this time the percentage of T cells and other splenocytes had not achieved a full recovery. Some studies have suggested that elevated levels of DCs correlate to increased survival rates in certain transplant surgeries, and there has been use of DCs for immunotherapy trials. Knowledge of recovery rates could in theory help to determine when treatment times would be most successful. (29)

Napoli, Megan*, and **Dr. Terry Master.** East Stroudsburg University, East Stroudsburg, PA 18301. *A Comparison of Hemlock Woolly Adelgid Infestation Levels and Acadian Flycatcher Nesting Success in the Delaware Water Gap National Recreation Area and Delaware State Forest.* The Eastern Hemlock (*Tsuga canadensis*) is an ecologically important component of Northeastern Pennsylvania forests that have become threatened by the Hemlock Woolly Adelgid (*Adelges tsugae*), an invasive aphid-like insect from Japan. The Acadian Flycatcher (*Empidonax virescens*), is a strongly hemlock-dependent species whose nesting success is being compared across infestation levels found in two hemlock-dominated habitats, ravines with steep sides and fast flowing streams and benches characterized by flat flood plains with meandering streams. Reproductive metrics, including nesting success, pair density, hemlock preference as a nesting substrate and HWA infestation level were measured. A comparison with a previous study in 2001/02 for two of our study sites showed no significant difference in nesting success for either stream ($c^2=1.235$, $p<0.267$), ($c^2=2.935$, $p<0.087$). In the current study, benches had 32 (59%) of all nests located, with 22 (69%) successfully fledging young. Ravine sites had 22 (41%) of all nests, with 19 (83%) of nests successfully fledging young. Nesting success between benches and ravines was not significantly different ($c^2=2.213$, $p<0.14$). An analysis of Acadian Flycatcher reproductive success across adelgid infestation levels showed that 61% of nests in heavily to moderately infested trees were successful. In low to non-infested trees, 11% of nests were successful and 9% failed. Nesting success across infestation levels were not significantly different ($c^2=0.245$, $p<0.452$). These are preliminary results with an additional field season scheduled for 2014. If cost effective control methods useful at the landscape scale are developed to combat Hemlock Woolly

Adelgid infestations, it would be logical to start with the most productive hemlock habitat type. The Acadian Flycatcher may prove to be a useful bioindicator for comparing habitat productivity. (72)

Nguyen*, Jacquelyn D. and **Eric P. Ingersoll.** Penn State Abington, 1600 Woodland Road, Abington, PA 19001. *Expression of Matrix Metalloproteinases by Invasive Breast Cancer Cells* – According to the American Cancer Society, breast cancer is the most common cancer in women. As with any cancer, breast cancer becomes most dangerous when the cancerous cells acquire the ability to invade into surrounding tissues. This invasion later leads to metastasis and an increase in the severity of the disease. One of the main tools that cancer cells use to mediate their invasive behavior is matrix metalloproteinases (MMPs). MMPs are a group of metal-containing enzymes that degrade many extracellular matrix proteins allowing cancer cells to invade, enter the circulation, and eventually spread and form tumors at other locations in the body. We have investigated the expression of MMPs in two breast cancer cell lines using RT-PCR. One is a non-invasive breast epithelial cancer cell line, the other is an invasive cell line derived by derived from the first by mutagenesis and selection. We have found that both cell lines express several MMPs and some differences in MMP expression are evident between these two cell lines. In addition, we examined the effects of exposing cells to specific MMP inhibitors on their invasive activity. We will present our data on MMP expression and the role of MMPs in the invasive behavior of these breast cancer cell lines. (23)

O'Donnell, Scott*, Nikki January* and Jane E. Huffman. East Stroudsburg University of Pennsylvania, East Stroudsburg, PA 18301. *Population Genetics of Wood Turtles (Glyptemys insculpta) in The Delaware Water Gap National Recreation Area, U.S.*A-- Wood turtles are listed under the International Union for Conservation of Nature (IUCN) as an endangered species. They are particularly sensitive to habitat destruction as they have a wide home range, which includes both aquatic, riverine habitat as well as terrestrial habitat depending on the time of year and their migratory patterns, while having limited mobility. A population of wood turtles in the Delaware Water Gap National Recreation Area (DWGNRA) has been monitored for several years and a current construction project required an updated study of this population. Blood samples were collected from nine turtles from the subcarapacial sinus. Ten microsatellite markers were employed to investigate the genetic variation and population structure of wood turtles in the DWGNRA. The results from our study were compared to a genetic study of wood turtles conducted in the park in 2004. Of the three new loci that were analyzed, two showed allelic diversity. The primer B21 showed five unique alleles while primer D114 showed four unique alleles in a sample size of 9 individuals. This may indicate that there is high allelic diversity at these loci across populations. Further study of other populations using these loci could be beneficial in the further comparison of populations of wood turtles in Pennsylvania and New Jersey. (115)

Chibueze Onwunaka* Dr. Dan Ressler Susquehanna University, Selinsgrove, Pennsylvania 17870 *The New Carbon Cycle*-- Rapid changes in atmospheric carbon dioxide concentrations, particularly since the Industrial Revolution, suggest humans have disrupted the global carbon cycle. Biofuels represent a means of an energy source that could use atmospheric carbon rather than fossil carbon. A closed combustion system might feature exhaust collected directly to be used to grow a biofuel like algae. Two different engines were run: a 4-cycle gasoline engine (a lawn mower) and a diesel engine (John DeereTM Gator) and their exhaust gas was run through piping and water to create bubbles to allow the exhaust carbon dioxide contact time with water to dissolve and create H_2CO_3 and other dissolved carbon substances. Preliminary results demonstrated that with the device attached to the mower we collected nearly 5% of the carbon inputted into the mower. Carbon collected in the water is used to grow algae along with a solution that provides additional nutrients used with liquid collected from the mower and gator. At 0, 10, 20, and 30 minute intervals of gas collection 24 bottles were used in the process of algae growth and the carbon from the exhaust gas becomes the limiting nutrient for the algae. By utilizing the carbon collected in the water, algae are grown along with a solution that provides additional nutrients. Algae grown in the exhaust enriched solutions were harvested to determine the carbon recovery rates. (171)

Ortiz, Michaela A.*, Chelsea Mahoney, and Dr. André Walther. Cedar Crest College, Allentown, PA 18104. *Identification of Proteins that Physically Interact with Replication Protein A in a Phosphorylation Dependent manner in the budding yeast Saccharomyces cerevisiae.* – Cancer is a serious disease that can arise from unrepaired DNA damage or by the incorrect repair of the DNA damage. Replication Protein A (RPA) is a single stranded DNA binding protein involved in processes such as DNA replication and DNA repair. To effectively function in a process such as DNA repair, RPA physically interacts with other proteins involved in these processes. Defects in these physical interactions with RPA are likely to lead to defects in the function of RPA in DNA repair and replication, and may lead to an increased likelihood of cancer. RPA can also become phosphorylated in a cell cycle dependent manner and in response to DNA damaging agents, and biochemical evidence indicates that phosphorylation of RPA can affect which proteins are capable of interacting with RPA. Therefore, this project specifically focused on identifying the proteins are interacting with RPA in a phosphorylation dependent manner. A yeast two-hybrid assay was used

to screen for phosphorylation dependent protein-protein interactions in yeast RPA (RFA, Replication Factor A). So far there have been seven of ninety screened yeast proteins that have shown a phosphorylation dependent interaction. We are in the process of identifying these proteins, and have discovered one potential candidate (SIM1) that both interacts in a phosphorylation dependent interaction with RPA and may be involved in DNA replication. In the future these proteins, such as SIM1, will be investigated in more detail in order to potentially lead to a better understanding of the underlying causes of cancer. (38)

Allison Osborne*, Alicia Zook, Audrey J. Ettinger, and K. Joy Karnas. Cedar Crest College, Allentown, PA 18104. *Using a* Gallus gallus *cell line to Investigate the Effectiveness of Herbal Remedies in Preventing Cell Death*.— It has been suggested that the herbal supplement *Ginkgo biloba* may act as a neuroprotective agent to prevent neuronal apoptosis following ischemic stroke. Previous studies used glutamate to induce apoptosis in primary *Gallus gallus* neurons, and subsequently examined the ability of *Ginkgo biloba* to block this response. A drawback of these studies, however, is that differentiated neurons do not divide in culture, limiting the quantity of cells for experiments. For that reason, this study focuses on an established *G. gallus* cell line, DT40 cells, which were derived from immortalized lymphoblasts. DT40 cells were cultured and exposed to glutamate to induce apoptosis. After RNA isolation from treated and untreated cells, q-rtPCR was used to identify specific genes with altered expression. The second part of this study involved treatment with *Ginkgo biloba* in an attempt to rescue the cells from apoptosis, followed by assessment of differences in gene expression. Our long term goal is to apply information learned in DT40 cells to chicken neurons to better understand the efficacy of using *Ginkgo biloba* as an anti-apoptotic treatment following ischemic stroke. (31)

Panas, John*, Jonathan Niles, Samuel Silknetter, and **Michael Bilger.** Susquehanna University, Selinsgrove, PA 17870. *Long-Term Responses of Brook Trout Populations to Flooding from Tropical Storm Lee* - Extreme flooding events act as cleansing mechanisms for stream organisms. During early September 2011, Tropical Storm Lee deposited over twelve inches of rain in the Loyalsock Creek watershed with a catastrophic flood and debris flow resulting on September 7 and 8, 2011. Peak flows (69,100 cfs) exceeded the previous record (55,800 cfs), and devastated the area. Streambed was scoured, trees were uprooted, and stream biota was decimated. As part of the Pennsylvania Fish and Boat Commission's Unassessed Waters Initiative, we collected pre-flood brook trout population estimates in summer 2011 at 30 tributary streams in the Loyalsock Creek watershed. Post flood population estimates were collected at each of these sites in summer 2012 and 2013. Flooding drastically reduced brook trout populations across all 30 sites. During 2012 sampling, we found very few brook trout in the 100-150mm size classes (1-2 year old fish) present. Flooding essentially eliminated these age classes from streams. We found across all study streams, some adult brook trout greater than 150mm (ages 3-4) were able to survive the flooding (2011) and spawned in fall 2011 accounting for the large number of age-0 (40-90mm) fish in 2012. Results from summer 2012 indicate an extremely large age-0 year class, which may be evidence of compensatory recruitment and density dependent mechanisms. We found high survival of 2012 age-0 brook trout into the 2013 age-1 year class as evidenced by the strong numbers of age-1 brook trout across study streams. It remains to be seen whether this age distribution and recruitment continues, as age-1 fish in 2013 will not be capable of spawning until 2014, thus reproduction is still reliant on the few remaining age 3+ fish in these streams. Full recovery of these streams to previous population levels may take 5 or more years. (155)

Pattison, Amanda*, Molly McQuilken, and **Dr. Andre P. Walther.** Cedar Crest College, Allentown PA 18104. *Analysis of the Role of Replication Protein A Phosphorylation on Telomere Length in the model organism Saccharomyces cerevisiae*.- Telomeres are nucleoprotein structures that cap the ends of linear chromosomes to help prevent the loss of genetic information during DNA replication. These conserved molecular structures are regulated by the enzyme telomerase and various telomere structural proteins. The budding yeast, *Saccharomyces cerevisiae* has telomeres that are functionally and structurally similar to human telomeres making it a powerful model organism to understand telomere regulation in eukaryotes. Our research focuses on the role of the highly conserved single stranded DNA binding protein Replication Protein A (RPA), known for its role in telomere synthesis. RPA consists of subunits Rfa1p, Rfa2p, and Rfa3p, and Rfa2p is phosphorylated in a cell cycle-dependent manner and in response to cellular DNA damage. We generated yeast strains containing mutations in RPA that mimic constitutive phosphorylation (*rfa2-Asp*) or prevent RPA phosphorylation (*rfa2-Ala*) and determined that *rfa2-Asp* strains have short telomeres and *rfa2-Ala* strains have long telomeres. To better understand the role of RPA phosphorylation in regulating telomere length we generated yeast strains combining mutations in RPA phosphorylation sites with mutations in known telomere maintenance genes including telomerase subunits (*EST1, EST3*), telomerase recruitment and activating proteins (*KU70, TEL1*), and telomerase inhibitory proteins (*RIF1, RIF2*). Telomere length was examined using Telomere Restriction Fragment Southern Analysis, and PCR. We have shown that the telomere maintenance genes *EST1, EST3, RIF1* and *RIF2* genetically interact with RPA phosphorylation mutations. These results indicate that RPA phosphorylation plays an important role in telomere length regulation in yeast through the regulation of telomere regulating proteins and

telomerase. (152)

Paul, David*, Dr. Douglas S. Glazier. Juniata College, Huntingdon, PA 16652. *Effects of Temperature and Predation Regime on the Body-size Scaling of Activity in the Freshwater Amphipod Gammarus minus* - Previous work in our laboratory has shown that the scaling of resting metabolic rate with body mass in the freshwater amphipod crustacean, *Gammarus minus*, varies with temperature and predation regime. Surprisingly, the temperature-related variation did not completely conform to predictions of two different theoretical models of metabolic scaling. A possible explanation for this unexpected variation may be thermal stress, resulting in unseen increases in activity. If so, we may have measured active rather than resting metabolic rates, thus explaining deviations from metabolic scaling theory. To test this hypothesis, we determined the effect of temperature on the activity of *G. minus* from the previously tested populations. Activity, measured as body lengths moved per minute, was recorded from four populations of *G. minus*, factorially varying in predation (present/absent) and temperature (10/17 °C). Surprisingly, the data did not suggest a relationship between dry body mass and activity ($r^2 < 0.35$). When calculated independently of body size, a Kruskall-Wallis one-way analysis of variance suggested that activity positively correlated with temperature. This observation is similar to that seen in ant species (Shapely 1920). Activity did not appear to be affected by native temperature or predation regime. These data do not support the hypothesis that temperature-related variation in metabolic scaling is due to thermal stress. (190)

Perkins, Ashley G.*, Deborah S. Austin, Rebecca M. Smith. Wilson College, Chambersburg, PA 17201. *Quantitation of Epigallocatechin (EGC) and Epigallocatechin Gallate (EGCG) in Green Tea Supplements* - Due to the lack of FDA control and consistency of catechin levels in green tea supplements, analysis of various brands of green tea supplements was done via High Performance Liquid Chromatography (HPLC) and compared to the manufacturer's claims. Five different brands of green tea supplements with different quantities of green tea catechins were analyzed. Preparation of the green tea supplement samples consisted of dissolving 1mg from a capsule/tablet in 1mL of a solvent containing 1:1 methanol: 0.5% acetic acid. Samples were sonicated for 20 minutes to ensure a homogenous sample. Samples were filtered using a 25 micron filter, and then 20 microliters was injected into a Zorbax eclipse plus C18 column. Elution was done at a rate of 1mL/mL using a solvent system of 88% deionized water/0.5% acetic acid solution and 12% acetonitrile/0.5% acetic acid. Tryptophan was used as the internal standard and peak area ratios were determined. The Epigallocatechin (EGC) and Epigallocatechin Gallate (EGCG) quantities were consistently low in this study. In addition, an unexpected peak was detected in two of the brands, which was determined to be caffeine, even though the manufacturer made no claim that the supplement contained caffeine. The results of this study support the need for the FDA to regulate supplements and require standardized manufacturing practices and quality control methods, along with requiring complete and reliable labeling information provided by manufactures, in order to ensure the safety of consumers. (42)

Pheasant, Michael S.*, Nicholas R. Hendry, Timothy A. Kennedy, Barbara J. McCraith. Misericordia University, Dallas PA 18612. *Macroinvertebrate functional feeding group distribution and diversity in leaf packs of varying species*-- Functional feeding group distribution and diversity in different species of leaf litter can help determine the impact allochthonous input has on the benthic macroinvertebrate community. The functional feeding groups that were examined were filtering-collectors (FC), scrapers (SC), shredders (SH), gathering-collectors (GC), and predators (PR), found within *Acer rubrum, Quercus bicolor*, and mixed species leaf packs. Leaf packs of *Acer rubrum*, *Quercus bicolor,* and both species mixed were placed in Trout Brook in November 2013. The leaf packs were removed at 4 intervals (2, 4, 8, and 12 weeks) from November 2013 through January 2014. After preliminary analysis, a consistent pattern was found in the distribution of benthic macroinvertebrates in all three types of leaf packs. The dominant functional feeding group was the filtering collectors. High numbers of chironomid larvae contributed to the dominance of the filtering collectors. (100)

Phuong, Tiffany*, Robert Kurt, Chun Wai Liew. Lafayette College, Easton, PA 18042. *Modeling TLR4-Myd88 signaling in 4T1 cells to predict tumor progression*. We used Netlogo, an agent based computer modeling program, to create a model in space and time of the Myd88 signaling cascade in cancer cells. Previously, we found that inhibiting Myd88 expression decreased tumor progression, while increasing Myd88 expression increased tumor progression. We used co-immunoprecipitations to identify what other proteins were part of the Myd88 protein complex and to confirm that TLR4-Myd88 signaling occurred in the 4T1 tumor cells. In the model, TLR4 proteins are set in the cell surface, Myd88 and associated signaling proteins in the cytoplasm, and the CCL2 gene in the nucleus. Parameters in the model are used to control the amount of proteins the cell begins with. The signaling cascade begins with LPS, a ligand for TLR4, binding to TLR4, which is followed by subsequent protein-to-protein interactions in the signaling cascade. The signaling leads to NF-κB entering the nucleus, where it then binds to the CCL2 promoter and induces transcription of CCL2. In the model the recruitment of the proteins are kept in track by each TLR4 on the cell surface. Depending on what ligands have been bound to TLR4 determines which proteins are next allowed to be bound. The model is built via

a set of rules where each rule is composed of a condition and an action that occurs if the condition is true. For example, in one rule, if "not bound protein A" (the condition) is true, then x (the action) will happen, while in another rule if " protein A bound" (the condition) is true then y (the action) will occur. CCL2, like Myd88, can be used as a marker for tumor progression. We expect that the model will enable us to predict the rates of CCL2 RNA expression and tumor progression that would result from the TLR4-Myd88 signaling cascade. (154)

Polekoff, Sarah E* and **Kate Goddard**. Ursinus College, Collegeville, PA 19426. *Effect of Dam Removal on Macroinvertebrate Communities in Darby Creek, Drexel Hill, PA.* – Small dam removal is an increasingly common practice across the nation, but its effects are not well understood. Dams lower water quality, impede the movements of fish, and can pose a public safety hazard if not maintained. A breached boulder dam at Kent Park, Upper Darby, PA was one of three dams removed on the Darby Creek in 2012. We assessed stream quality above and below the Kent Park dam before and after its removal by studying aquatic macroinvertebrates. Macroinvertebrates act as stream health indicators because different taxa have varying pollution tolerances. We counted individuals and taxa present to calculate an index of biotic integrity (IBI) score; higher scores indicate greater stream health. Before the dam's removal, deep silt accumulated above the dam; few species could survive there other than vermiform organisms. Downstream of the dam, a greater variety of macroinvertebrates lived under submerged rocks, which hid them from predatory fish and swift currents. However, compared to other, less urban streams, the biodiversity both above and below the dam was poor. The dam removal process caused a wave of sediment to travel downstream which may have smothered downstream organisms. Immediately after dam removal, we found a greater variety of macroinvertebrates living above the old dam site than were there previously. The rocks that had been buried under silt were exposed within a few days of the dam's removal, providing new habitat. A year after the dam's removal, there has been no further improvement in IBI scores. Studies show that it can take years for recovery to occur. (71)

Pratt, Jessica L.* and Bradley G. Rehnberg. York College of Pennsylvania, York, PA 17403. *The Behavioral Effects of Aspartame Exposure to Black Planaria (Dugesia dorotocephala) – A*spartame is a popular artificial sweetener used in a large array of products. There is an ongoing debate among researchers whether aspartame causes developmental, behavioral, or neurological effects. This study investigated whether changes in behavior of the black planaria (*Dugesia dorotocephala)* occurred after periodic exposures to low (0.001 M) and high (0.01 M) aspartame concentrations. The control, low, and high concentration groups were kept in separate glass dishes and given fresh water every 3 days after a feeding. Exposures to aspartame or control water occurred in microcentrifuge tubes for 2 hours. This protocol proceeded for 29 days where single-blind observations were recorded every other day. Based on previous research, we observed head bopping, squirming, twitching, head swinging, and inch worming. There were no significant differences in head bopping, squirming, and twitching behaviors across the 3 groups and over the 29-day observation period. For head swinging behavior, there was no difference across the 3 groups but there appeared to be an increase in activity over time. The mobility of all groups steadily decreased from days 1- 29. In conclusion, aspartame at our test concentrations did not produce overall deleterious effects on the behavior of the planaria. (195)

Rebuck, Alexandra* and Tammy Tobin. Susquehanna University 514 University Avenue Selinsgrove, Pa 17870. *Identifying Novel Actinomycetes in Centralia Mine Fire Soils.* Mesophilic actinomycetes currently play critical roles in the development of antibiotic and antifungal drugs. However, the increasing number of antibiotic-resistant microbial strains dictates that novel antibiotics and treatment options will be needed in the future. Thermophiles may be particularly important sources of these new antimicrobials. Thus, our research will focus on the identification of novel actinomycete species in coalmine fire-affected soils. Last fall, three soil samples (taken from soils of 39.44˚C, 52.78˚C, and 62.78˚C respectively,) were removed from boreholes in Centralia, Pennsylvania. A MoBio Powersoil DNA Isolation Kit was then used in order to isolate DNA directly from the soil and to remove as many humic contaminants as possible. This spring, these soil samples will be analyzed for the presence of novel actinomycetes using PCR with primers specific for both the 16S rRNA genes and the polyketide synthase genes, which are involved in the biosynthesis of secondary metabolites, including antibiotics. The resulting PCR products will be sequenced to identify resident actinomycete species. These culture-independent analyses will complement the lab's ongoing culture-based efforts to isolate thermophilic actinomycetes. (59)

Reichart, Nicholas J.*, Bridgette E. Hagerty and Carolyn F. Mathur. Department of Biological Sciences, York College of Pennsylvania, York, PA 17403. *Rate of Biofilm Formation is Influenced by the Bacterial Composition in Mixed Cultures* – Biofilm formation involves many complex interactions that are influenced by the species of microbes present. In order to study these interactions, we compared the rates of biofilm formation using *Pseudomonas aeruginosa* (Pa), *Escherichia coli* (Ec)*, Staphylococcus aureus* (Sa)*,* and *Bacillus cereus* (Bc). We measured each bacterium alone and in paired combination with each of the other three organisms. Using staining procedures and spectrophotometry, biofilm growth was quantified at 0, 6, 24 and 48 hours. Absorbance (OD) was compared across bacteria and time using a two-way ANOVA

followed by Tukey multiple comparisons. Pa was the most robust biofilm producer at 0.46abs/hr. In comparison, Ec biofilm production was 0.11abs /hr., followed by the weakest producers, Sa at 0.04abs/hr. and Bc at 0.03abs/hr. Pa significantly increased the rate of biofilm formation of individual Sa, Bc or Ec cultures when grown with each of them in combination. Sa and Bc significantly decreased the rate of biofilm formation of Ec. Pa rapidly formed biofilms, whether alone or in combination with other bacteria. The latter is probably due to the PA growing faster than the others in the mixed cultures. Explanations for the inhibition of Ec biofilm formation by either Sa or Bc is not so readily apparent and requires further studies. (53)

Rhodes, Alexander A.* and Lou Ann Tom, Ph.D. Susquehanna University, Selinsgrove, PA 17870. *Preparation of a molecularly imprinted polymer for the selective retention of the insecticide fenvalerate*. Several molecularly imprinted polymers (MIPs) were synthesized to selectively bind fenvalerate, an insecticide, for isolation and concentration in aqueous samples. The goal is to develop a polymer that can be used either in a solid phase extraction cartridge for the concentration of fenvalerate from dilute environmental samples, or for direct analysis of the compound by packing the solid into an HPLC column. One MIP was prepared using β-cyclodextrin and toluene-2,4-diisocyanate in dimethylsulfoxide with fenvalaerate as the target analyte. Using HPLC, an external standard curve was prepared and the amount of fenvalerate removed from the polymer by washing was determined to be 74%. This "test" polymer and an additional "control" polymer prepared without fenvalerate were evaluated for selectivity by adding fenvalerate in a water/ethanol mixture to each polymer placed in a small beaker. Solutions were stirred overnight, and the supernatant was removed for HPLC analysis to determine if the fenvalerate had remained in the imprinted "pockets" of the test polymer compared with the non-imprinted control polymer. No significant difference in the amount of fenvalerate in the supernatant of the two polymers was found. Similar results were found using other solvents for evaluation. A second set of MIPs was prepared using methacrylic acid as the monomer, ethylene glycol dimethacrylate as the crosslinker, and 2,2'-azobisisobutyronitrile as initiator in chloroform. This set of polymers is currently being evaluated for its ability to selectively retain the target compound when compared with the non-imprinted, control polymer. (43)

Rhodes, Bradleigh, Matthew Bruer*, and **Geneive E. Henry.** Susquehanna University, Selinsgrove, PA, 17870. *Chemistry of the hexane extract of Hypericum stragulum* - The *Hypericum* plant genus is well known as a source of biologically active natural products, with acylphloroglucinol derivatives being the most important class of compounds. *Hypericum hypericoides ssp. multicaule (H. stragulum)*, is one of nineteen *Hypericum* species growing in Pennsylvania. A subspecies of *H. hypericoides* growing in Jamaica produced a series of polycyclic polyprenylated acylphloroglucinol derivatives, which inhibit HIV infection and display cancer chemopreventive activity. The hexane extract of *H. stragulum* was investigated to compare its chemical constituents to those of the Jamaica *hypericoides* species. The isolation and structural elucidation of natural products from *H. stragulum* will be presented. (174)

Rhodes, Bradleigh*, Alexander Rhodes, and **Geneive E. Henry.** Susquehanna University, Selinsgrove, PA, 17870. *HPLC analysis of the phenolic constituents of Hypericum species from Pennsylvania* - The *Hypericum* plant genus contains over 450 species divided into 36 taxonomic sections. This study was aimed at determining the phenolic composition of methanol extracts of ten Pennsylvania *Hypericum* species, divided into five taxonomic sections: Hypericum (*H. perforatum, H. punctatum*), Brathys (*H. canadense, H. gentianoides*), Myriandra (*H. densiflorum, H. ellipticum, H. prolificum, H. stragulum*), Roscyna (*H. pyramidatum*) and Trigynobrathys *(H. mutilum*). The presence of eleven polyphenolic compounds of pharmacological importance (chlorogenic acid, caffeic acid, rutin, quercitrin, isoquercitrin, quercetin, hyperoside, luteolin, myricetin, kaempferol, apigenin) was evaluated by reversed phase high performance liquid chromatography. The data indicate that all ten species, contain quercitrin and isoquerictrin, with most species containing significant levels of both. Varying amounts of chlorogenic acid, caffeic acid, hyperoside and rutin were found in some species, but apigenin, luteolin, kaempferol, myricetin and quercetin were not present in significant amounts in any of the species investigated. (175)

Ricca, Jacob*, Robert Kurt. Lafayette College, Easton, PA 18042. *The Potential Use of Antibody-DNA Complexes as a Molecular Targeted Cancer Therapy* – Molecular targeted cancer therapies offer the potential to treat cancer with limited collateral damage to healthy tissue. One molecular targeted therapy with limited success is Herceptin, a monoclonal antibody specific for HER2/neu, a membrane protein that is upregulated in around thirty percent of breast cancer specimens. The current research proposes a novel and versatile molecular targeted cancer therapy that relies on receptor-mediated endocytosis. Anti-HER2/neu monoclonal antibodies, which selectively target MDAMB 453 human mammary carcinoma cells, and dsDNA sequences encoding either interleukin-8 (IL-8), a secreted protein, or nuclear apoptosis inducing factor (nAIF), a protein that induces apoptosis through a caspase-independent pathway, were linked through a biotin-streptavidin linkage to form an antibody-DNA (AbDNA) complex. These complexes were incubated with human MDAMB 453 (HER2/neu positive) and MDAMB 231 (HER2/neu negative) mammary

carcinoma cells. nAIF mRNA expression was determined after 24, 48 and 72 hours of incubation. In the experiments using IL-8 AbDNA complexes, MDAMB 453 cells showed greater expression of IL-8 mRNA at both the 48 and 72 hour incubations than MDAMB 231 cells, which did not show any increase in IL-8 expression over the 72 hour period. In the experiments using nAIF AbDNA complexes, MDAMB 453 cells treated with the nAIF AbDNA complexes showed greater expression of nAIF mRNA at 72 hours than MDAMB 435 and 231 cells not treated with AbDNA and MDAMB 231 cells treated with AbDNA. Further, MDAMB 231 cells treated with AbDNA did not show an increase in nAIF mRNA expression over MDAMB 231 cells not treated with AbDNA. This study demonstrates the feasibility of a molecular targeted cancer therapy utilizing AbDNA complexes. (153)

Roche, Kathryn* and **Steven A. Bloomer**. Penn State Abington, Abington PA, 19001. *Is thioredoxin-1 protein expression altered in a model of aging and hyperthermia?*-- Increased levels of oxidative stress and a reduced capacity to tolerate common stressors are two hallmarks of aging. Environmental heat stress is a stressor associated with high rates of morbidity and mortality in the elderly. The liver is particularly susceptible to hyperthermia, and oxidative damage to this organ results in liver dysfunction. The purpose of this study was to evaluate the effects of aging and heat stress on the expression of thioredoxin-1 (Trx-1) in the liver. Trx-1 is a protein that protects against oxidative stress, and little is known about its expression after heat stress in an aging model. Young (6 mo) and old (24 mo) Fischer 344 rats were exposed to a two-heat stress protocol, and livers were harvested at several times after the second heating bout. Hepatic expression of Trx-1 was evaluated by immunoblot and immunohistochemistry. By immunoblot, levels of Trx-1 were similar between age groups and were not affected by heat stress. In liver sections, Trx-1 was localized primarily to hepatic macrophages (Kupffer cells) and biliary epithelial cells (BEC), with low expression of Trx-1 in hepatocytes. Double-staining for Trx-1 and heme oxygenase-1 (HO-1; a macrophage marker) confirmed Kupffer cell expression of Trx-1. Similarly, double-staining for Trx-1 and cytokeratin-19 (CK-19) confirmed BEC expression of Trx-1. Overall, our results suggest that Trx-1 is not upregulated in this model of aging and hyperthermia. However, this study provides important information on the localization of Trx-1 in liver tissue. To our knowledge, robust expression of Trx-1 in BEC has not yet been reported. This study raises important questions as to the function of Trx-1 in BEC, and the significance of its pronounced expression in this cell type. (198)

Roper, Cortney*, Brad E. Engle and **Laura F. Altfeld.** Wilson College, Chambersburg, PA 17201. *Chemotactic Factors Involved in the Migration and Homing of Canine Adipose Tissue-Derived Mesenchymal Stem Cells* - Canine adipose–tissue derived mesenchymal stem cells (cAdMSCs) have the capability of differentiating into osteocytes to form new bone and can be transplanted into an area of injury to elicit healing. However, the signaling molecules and homing mechanisms involved with cAdMSC migration to damaged sites in bone are poorly understood. The objective of this study was to test the effectiveness of several growth factors, transforming growth factor-beta (TGF-β), bone morphogenetic protein (BMP), platelet derived growth factor (PDGF), and vascular endothelial growth factor (VEGF), on the migration of cAdMSCs. Adipose tissue was collected from canines that underwent ovariohysterectomies and harvested for mesenchymal stem cell (MSC) isolation. The MSCs were allowed to expand and maintained in cell culture (37°C; 5%CO_2). The chemotaxis of cAdMSCs toward the growth factors was observed using an *in vitro*, transwell, cell migration assay. Following a 48 hour incubation period, the migratory cells were fixed, stained and counted using a digital imaging system. Preliminary results showed that PDGF and BMP elicited the greatest migratory effect, whereas VEGF and TGF-β had a more limited effect. Furthermore, a combination of PDGF and BMP produced an even greater migratory capacity, possibly indicating a synergistic effect. Results from this study may lead to a better understanding of the signaling molecules and homing mechanisms responsible for cAdMSC migration to damaged sites in bones and/or joints, and ultimately may help in the development of more effective regenerative therapies using cAdMSCs. (20)

Rounsville Jr.*, Thomas F., Jane E. Huffman, Abdalla A. Aldras. East Stroudsburg University, East Stroudsburg, PA 18301. *Coyotes (*Canis latrans*) as a Diagnostic Tool for the Presence of Zoonotic Pathogens* — Within the past 75 years coyotes (*Canis latrans*) have drastically expanded their range into nearly all available habitats in North America, becoming one of the most successful mammalian predators on the continent. In the eastern United States, coyotes have become the keystone predators in many habitats where significant anthropogenic disturbance has occurred. While coyotes fulfill this ecological role, their longevity and habits as a generalist predator result in interactions with a diversity of prey species and exposure to the diseases that these organisms carry. Analysis of samples collected from coyotes can determine if certain infectious agents, that may be transmissible to humans, are present in a locality. Screening predators for disease is much more effective than reservoir hosts since predators consume many hosts during their lifetimes—greatly increasing the likelihood of exposure. One hundred and eighty one coyote Nobuto blood strip samples collected from 9 states and 50 counties

were screened for antibodies to *Borrelia burgdorferi*, *Yersinia pestis*, and *Francisella tularensis* using the enzyme linked immunosorbent assay (ELISA). Positive results, as determined by at least duplicate redundancy, were then verified by the Western Blot technique. The resultant seroprevalence data was then used to generate a range map of localities where the presence of each pathogen was detected. (94)

Routson, Zachary J.*, Steven Jacob, and **Ronald Kaltreider.** York College of Pennsylvania, York, PA 17404. *Social Factors, Demographic Characteristics and Disease-associated Emotions and Effects on Diabetes Self-care and Nutrition Regime Adherence*-- Over 25% of Americans suffer from or are at risk of developing diabetes mellitus at a cost of over $245 billion dollars annually. Decreasing the occurrence of this highly preventable disease should be paramount in combatting the escalating costs that hinder access to health care. The purpose of this study was to identify factors that influence compliance and adherence of diabetic care plans and nutritional regimes. Understanding and highlighting these factors allow for the patient and physicians to overcome the obstacles that lead to lower than expected health outcomes and patient satisfaction. A survey was conducted using a questionnaire designed to collect responses from people with Types 1 and 2 diabetes mellitus within a primary care practice in South Central Pennsylvania. The questionnaire was designed to elucidate common social pressures and preconceived ideas of the disease, nutrition and fitness and how they affect the day to day management of diabetes mellitus. Chi-square analysis, word association and latent factor analysis were performed on survey data. We established relationships between demographic characteristics, social factors and disease-associated emotions on compliance and adherence to care plans, diet regimes, health outcomes and overall patient satisfaction. These relationships should be considered by dieticians, primary care physicians and diabetic educators when establishing individual diabetic care plans to improve patient outcomes. Understanding the factors that influence disease progression, other than medical factors, can lead to improved health outcomes and increased patient compliance and satisfaction. While our study suggested a relationship between specific social and demographic characteristics and disease management, more data are needed to develop these relationships in greater depth. (64)

Ruck, Rachel,* and Diane Bridge. Elizabethtown College, Elizabethtown, PA 17022. *Production of chimeric Hydra to examine effects of gamete precursors on aging* -- Existing data suggest that *Hydra vulgaris* do not show increased mortality with age. In contrast, members of the related species *Hydra oligactis* have a limited lifespan following reproduction. Adults of both species have extensive regenerative ability. They possess stem cells termed interstitial stem cells, which give rise to nerve cells, gametes, and stinging cells. In other animals, signaling by germ cells affects lifespan. In *Hydra*, it is possible to eliminate interstitial cells from one individual and repopulate its tissues with interstitial stem cells from a donor individual of the same species. To investigate the role of cells which form gametes in *Hydra* aging, we are working to produce *H. vulgaris* with interstitial cells from *H. oligactis*, and *H. oligactis* with interstitial cells from *H. vulgaris*. We are using colchicine and hydroxyurea to selectively eliminate the rapidly dividing interstitial cells from recipient animals. Treated *Hydra* of one species are grafted to untreated animals of the other species to allow interstitial cells to migrate into the body of the previously interstitial-cell-free animal. To date, we have not found that *H. vulgaris* interstitial cells are able to survive in host *H. oligactis*. Should production of chimeric *Hydra* be successful, numbers can be increased through asexual reproduction, and animals will be examined to document the effect of the introduced gamete precursor cells on aging. (66)

Rummel, Shawn* and **Amy Wolfe.** Trout Unlimited, Eastern Abandoned Mine Program, Lock Haven, PA 17745. *Recovery of Native Brook Trout Populations and Benthic Macroinvertebrate Communities Following Treatment of Abandoned Mine Drainage Pollution* – Water quality degradation as a result of abandoned mine drainage (AMD) is prevalent throughout the native range of the Eastern brook trout. AMD impacts water quality primarily by decreasing pH and elevating toxic metal concentrations, creating conditions that are unsuitable for most aquatic life. In Pennsylvania and West Virginia alone, AMD pollutes over 8,000 miles of streams. The West Branch Susquehanna watershed is the largest of the six major subbasins comprising the Susquehanna River basin. The watershed is located in northcentral Pennsylvania and includes some of Pennsylvania's most pristine waters, as well as over 1,200 miles of AMD polluted streams. Over the past 20 years, numerous restoration efforts have been completed throughout the watershed to mitigate AMD and restore native brook trout populations. The goal of this study was to monitor the aquatic biological community response to AMD treatment over time in the lower portion of the Kettle Creek watershed (approximately 50 square miles in area), a tributary to the West Branch Susquehanna River. Overall, dramatic improvements in water quality have been observed. In addition, benthic macroinvertebrate diversity has increased, including a shift from pollution tolerant taxa to the presence of pollution sensitive taxa. Brook trout populations have also demonstrated a significant increase in biomass and density following restoration. These results will aid in the prioritization of AMD restoration efforts and guide management of native brook trout populations in areas once polluted by AMD. (102)

Runeric, Ronald* and Shanon Donnelly. University of Akron, Akron, OH 44325. *Relationships between four measures of water chemistry and watershed topography, geology, and land use in sixteen small streams*-- Runeric (2008) studied physical and social attributes of seventeen small streams; six were located in Susquehanna County, Pennsylvania, and eleven were in Luzerne County. Four measures of water chemistry – pH, total alkalinity, total hardness, and specific conductance -- were significantly ($p \leq 0.01$) different between the nine streams located on private land versus the other eight streams which were accessible to the public. The present research identifies correlations between levels of the water chemistry variables (the dependent variables) with watershed topography, geology, and land uses (the independent variables) at sixteen of those streams. Most data were obtained from public records of the Pennsylvania Fish and Boat Commission, Fisheries Management Division (PFBC), and from the Pennsylvania Spatial Data Access (PASDA) internet site. All chemical attributes were obtained during the period 23 June-8 September 1999. Independent variables were measured using ArcGIS 10.0. Stepwise linear multiple regression was used to model relationships between the dependent and independent variables. The quality of the models for each dependent variable was evaluated using Akaike's Information Criterion for small samples (AIC_c) and related procedures (Burnham and Anderson 2002). Bedrock was the most important influence on base flow chemistry. Except for electrical conductance, at least one geologic variable was significantly correlated with all other measures reflecting water chemistry. Watershed bedrock of the Catskill and Mauch Chunk formations were positively related to some water chemistry measures, while bedrock of the Spechty Kopf and Pocono formations was inversely related. Human activities also had substantial relationships with stream chemistry. Primarily forested watersheds were inversely correlated with pH and total alkalinity (Log_TALK) of associated streams. Electrical conductance was strongly correlated with road length within catchments. This effect was probably a residual effect of salt use for de-icing roads. (147)

Scalo, Christian* and Frank Martin. Immaculata University, Immaculata, PA 19345. *The Dynamics of Yeast Metabolism as Reflected through Changes in Hydrogen Ion Concentrations* - In the natural world, organisms typically use one of two main forms of respiration to convert the energy stored in chemical bonds into useable metabolic energy: aerobic (oxygen dependent) and anaerobic (oxygen independent) respiration. While some organisms that use anaerobic respiration can survive in the presence of oxygen, other organisms (such as humans) that utilize aerobic respiration cannot survive in the absence of oxygen. Yeast, however, is an exception found in the animal kingdom, and consequently, is capable of using both forms of respiration. Such an atypical characteristic appears to be demonstrated by the measurement of hydrogen ion concentrations (pH) in both the presence and absence of oxygen, within the confines of a carefully controlled system. In this presentation, we report on the results of a properly controlled investigation into the characteristics of yeast metabolism, with findings that demonstrate the dynamics of such respiration under aerobic and anaerobic conditions. (40)

Schilling, Megan*, Jessica Plisko, and Christopher Brey. Marywood University, Department of Science, Scranton PA, 18509. *Investigation of Fatty Acid Metabolism in Caenorhabditis elegans by Krüppel-like Transcription Factors.* Organisms have the ability to store energy as fat in adipose tissue where the regulation of fat is directly related to the organism's fitness. When fat storage is in excess, this leads to obesity which may have devastating effects to the organism, including diseases such as type 2 diabetes and heart disease. *Caenorhabditis elegans* have the ability to regulate fat metabolism dependent on their food availability, this makes them an excellent organism to study the basics of fat metabolism. The nematode's sequenced genome contains genes and mechanisms homologous to humans, including the mechanism for fatty acid synthesis and fat metabolism and three Krüppel-like Transcription Factors, *KLFs*. *KLFs* regulate lipid accumulation within the intestines of the worm and are major factors in adipogenesis. *Caenorhabditis elegans* contain *Ce-klf-1* and *Ce-klf-3*, which relate to human *klf-1*, and *Ce-klf-2,* which relates to human *klf-7.* The genes exhibit large deletions, *klf-3* of 1.6 kb and *klf-2* of 2.1 kb that have been found to cause developmental and reproductive defects. Through our study, we are examining the role of the *klf-2* gene to determine if it is critical for normal fat metabolism within the worms. Expression data of the *klf-2* gene will be obtained through qRT-PCR to determine the expression patterns of the *klf-2* versus the *klf-3* gene expression which was previously found. Double stranded RNA from fragments of the *klf-2* gene will be constructed and injected into worms to study the effects of RNA interference on the *klf-2* gene. Also a double mutant containing both the *klf-2* and *klf-3* mutant genes will be developed in order to see the effects on the double mutant's progeny. The double mutant progeny will be studied through multiple assays, including reproductive, developmental and behavioral assays, and fat O-red staining. Results will be presented at the meeting. (21)

Scholl, Logan*. Susquehanna University, Selinsgrove, PA 17870. *Measurements of ambient ammonia using an ion mobility spectrometer* - Ammonia is the predominant basic gas in the atmosphere and is emitted primarily from agricultural activities. After emission, gas phase ammonia can react with sulfuric and nitric acids to create ammonium sulfate and ammonium nitrate particles, which are harmful to human health. In addition, ammonia can be incorporated

into rain, fog, and dew where it can neutralize acidic species and raise pH values. Removal of ammonia from the atmosphere through dry or wet deposition can influence biological activity and is a major source of nitrogen to some ecosystems. To learn more about ammonia, an ion mobility spectrometry (IMS) was used to measure ambient ammonia concentrations at 10 s intervals in Selinsgrove, PA starting in May, 2013. The IMS accuracy was evaluated by making comparisons with simultaneous denuder measurements of ammonia concentrations. Phosphorous acid coated denuders were used to collect ammonia over 12 hour sample periods which were followed by extraction and analysis by ion chromatography. Good agreement was observed between the denuder method and the IMS for concentrations up to 10 ppb. Above 10 ppb the IMS reported higher concentrations than the denuders. Based on the IMS data, higher ammonia concentrations were observed during the spring than during the summer or fall. The IMS data also showed a diurnal trend during some periods with higher ammonia concentrations during the day and lower concentrations at night. This trend may be caused by the removal of ammonia to dew covered surfaces at night. Chemical analysis of multiple dew samples showed that ammonium was the dominant ionic species in dew, supporting this theory and illustrating the significant role that ammonia plays in this region. (183)

Selby, Jessica* and **Bradley Rehnberg.** York College of Pennsylvania, York, PA 17403. *The short-term effects of green tea consumption on physical fitness through voluntary exercise of male CD-1 mice* – Green tea contains catechins that have been linked to increased longevity while additionally having short-term impacts. The short-term effects of basal metabolic rate (BMR) and voluntary running time were evaluated using mice for a 12-week period. Green tea was prepared at low (0.1%) and high (0.25%) concentrations and provided to 2 test groups, *ad libitum*, along with a control group given water. Mice were individually placed in a test container with free access to a running wheel and total distance run was recorded biweekly. Oxygen consumption, using indirect calorimetry, and body weight were taken weekly. The running distance by the high concentration group was greater than low and control groups by week 8. No significant differences were seen in BMR among groups. The low concentration group did not gain as much weight as high and control groups after week 7. As hypothesized, drinking green tea had beneficial effects on willingness to exercise and weight gain. These results likely happened through various pathways, not solely due to increased metabolic rate. The results of this study may ultimately have relevance to strategies for human diet and exercise programs. (196)

Seltzer, Jedediah *, Kelly Cowher, Daniel Ackerman, Bethany Lashbrook, Erin Eperthener, and Fred J. Brenner. Grove City College, Grove City, PA 16127. *Studying urban and rural white tailed deer herds through DNA sequence analyses*- There are few species that both impact their environment as well as humans in such a large magnitude as the white tailed deer (*Odocoileus virginianus*). Being the most abundant hooved animal east of the Mississippi, white tailed deer are valuable game animals providing revenue for state resource agencies as well as filling an important biological niche in the environment. Managing deer herds is important to prevent over population which leads to unhealthy deer populations, an increase in deer automobile collisions, habitat destruction and an increase in tick borne diseases. This study involved using DNA sequences to understand the genetic diversity and dispersal pattern in urban and rural deer populations in Pennsylvania and Ohio. By analyzing the mitochondria displacement loop (D-loop), maternal lineages and the nucleotide diversity were calculated for these populations. An understanding of genetic diversity in deer populations provides and additional tool to study deer movement patterns and the overall health of the herd. Based on a 108 individual white-tailed DNA sequences, urban populations have lower genetic diversity and defined maternal linages as compared to rural deer populations. These studies are continuing to increase the sample size of both urban and rural deer populations. (89)

Shields, Tyler *, Ahmed Lachhab. Susquehanna University, Selinsgrove, PA 17870. *Application of Multiple Geophysical Method to track water table fluctuation at the CEER, Selinsgrove, PA* -- Electrical Resistivity Tomography (ERT) and Ground Penetrating Radar (GPR) were used to track water table fluctuations and compared to the ground water levels from five monitoring wells at the Center for Environmental Education and Research (CEER) at Susquehanna University. ERT and GPR are approaches that have been used separately to investigate the level of water table in near surface investigation yet rarely combined. In this study, the following methods were used collectively to assess the water table levels and to determine which method or combination of methods is/are most effective to identify the water table in shallow groundwater aquifers. In this study, ERT and GPR results showed similar results. During the summer 2013, ERT was performed and data was collected for different water levels. Water level meter was used in all five observation wells to monitor water level depth while monitoring geophysical techniques were implemented. Multiple ERT surveys were completed at different electrode spacings which upon interpretation showed as the electrical spacing decreases (from 2 to 0.25m) the water table is detected accurately. Large electrode spacing (2m) provided a better overall site understanding including the local geology. (112)

Silknetter, Sam*, Jonathan Niles, and **Mike Bilger**. Susquehanna University, Selinsgrove, PA 17870. *Short-Term Response of the Benthic Macroinvertebrate Community to Catastrophic Flooding in Central Pennsylvania*-- In high-gradient systems, extreme flooding events act as cleansing mechanisms for benthic macroinvertebrates. Populations of benthic macroinvertebrates have been shown to be severely depressed following catastrophic flooding, yet may recover quickly. We sought to quantify the responses of benthic macroinvertebrates to catastrophic flooding in headwater streams, specifically in streams where sources of recolonization were limited. Downstream drift is limited in headwaters due to the small area of the watershed, and places of refugium are restricted due to the scouring associated with high flows. In late August 2011, Hurricane Irene deposited more than five inches of rain in the Loyalsock Creek watershed (north central Pennsylvania), effectively saturating the study region. Tropical Storm Lee followed in early September 2011, depositing over twelve inches of rain in the same area. A catastrophic flood and debris flow resulted throughout the watershed on September 7 and 8, 2011 with peak flows (69,100 cfs) exceeding previous record flow (55,800 cfs). Throughout the watershed, the stream bed was scoured and new substrate materials were deposited, trees were uprooted from riparian areas, and the stream biota was decimated. Monthly post-flood benthic macroinvertebrate samples were collected using Pennsylvania DEP protocols at five headwater streams within the flood affected watershed for a period of 12 months following the flood (Oct. 2011-Sept 2012). Samples were then identified to generic level (family level for Chironomids) and QA/QC verified by a certified taxonomist. The results showed that abundance and diversity of benthic macroinvertebrates was greatly depressed in all sites immediately following the flood. Within 4 months, abundances had returned to pre-flood levels in 4 of the 5 sample sites, and diversity returned to pre-flood levels after one year. (156)

Smith, Brittany *, Sarah Landis, Christina Lehman, and Edward P. Levri. Penn State Altoona, Altoona, PA 16601. *Diet associated with different habitats influences the growth rate of the invasive New Zealand mud snail (Potamopyrgus antipodarum)*--The invasive New Zealand mud snail, *Potamopyrgus antipodarum,* has been present in the Laurentian Great Lakes for at least 20 years. Recently, the snail has spread to streams that empty into Lake Ontario. In the deep waters of Lake Ontario, detritus is the common food source for the snails; while in streams periphyton becomes an important part of their diet. This experiment tests the hypothesis that a diet of periphyton will lead to a higher growth rate. Benthic sediment was collected from the bottom of Lake Erie. Periphyton was grown on small rocks collected from Spring Run on the Penn State Altoona campus. Eighty juvenile snails (0.6-1.0 mm in length) were placed individually into plastic cups of four treatments: control snails that were fed *Spirulina* powder, snail kept in lake sediment, snails reared on rocks with periphyton growth, and snails in a combination habitat of rock and lake sediment. After six weeks, the snails were measured again. Snails in the periphyton only treatment had the highest growth rate while snails in the detritus plus periphyton treatment had the second highest growth rate. The control snails and detritus only snails had a similar low growth rate. These results suggest that the movement of these snails from a lake to a stream environment may increase their individual and possibly population growth rates, thus increasing their invasion success. (132)

Smith, Cara* and Alissa Packer. Susquehanna University, Selinsgrove, PA 17870. *Aboveground and belowground interaction of hydrogen cyanide and extrafloral nectary expression in Lima bean (Phaseolus lunatus)*--Plants defend themselves by use of physical, chemical, and biotic defenses. These defenses can exhibit constitutive and induced expressions. There appears to be an evolutionary explanation for different patterns of expression with regards to trade-offs. Plants exhibit a higher reliance on constitutive defenses when attack probability is high and induced defenses when attack probability is low. Constitutive defenses require more energy, but are ready to protect plants. There are also links between aboveground and belowground damage and defense. Damage to leaves can cause a defense response in roots and vice versa. Lima bean (Phaseolus lunatus) was used to investigate the aboveground and belowground interaction of plant defense regarding hydrogen cyanide (HCN), a constitutive defense, and extrafloral nectaries, an induced and constitutive defense. Plants will receive either no damage, leaf damage, root damage, or both leaf and root damage. Hydrogen cyanide potential (HCNp) will be measured spectrophotometrically using a spectroquant cyanide test. Number of extrafloral nectaries will be observed in comparison to damage and HCNp. We expect higher levels of HCNp in leaves when leaves are damaged over root damage, and higher levels in roots when roots are damaged over leaves. Highest levels of HCNp when both leaves and roots are damaged, and there will be higher levels in leaves than roots. Number of extrafloral nectaries will be higher when roots are damaged over leaf damage.There also appears to be a trade-off between HCNp and number of extrafloral nectaries. As HCNp increases, there will be a lower increase in extrafloral nectaries. More investment is directed towards HCN production as it is a more immediate defense that does not involve a third party. (164)

Smith, Loretta*, Darya Dimchenko*, and **Steven A. Bloomer.** Penn State Abington, Abington PA, 19001. *Evaluation of SIRT3 and MnSOD protein expression with aging and environmental heat stress* - The liver is crucial in regulating homeostasis; therefore, damage to this organ can have an adverse effect on overall well-being. A stressor

that can injure liver cells is environmental heat stress. With aging, the effects of heat stress become more severe; older organisms display more liver damage after hyperthermia than younger organisms. The production of reactive oxygen species (ROS) from the mitochondria is also increased with aging, which contributes to liver injury. Cells have many proteins that defend against ROS. One family of proteins implicated in stress defense and longevity are the sirtuins, which are deacetylase enzymes. Sirtuin 3 (SIRT3) is a mitochondrial deacetylase that indirectly reduces ROS by deacetylating and therefore activating the ROS-scavenging enzyme, manganese superoxide dismutase (MnSOD). The purpose of this experiment was to evaluate the expression of SIRT3 and MnSOD via immunoblot in young (6 mo) and old (24 mo) Fischer 344 rats after a two-heat stress protocol. At 2 and 24 h after the second heat stress, livers were harvested from each age group, and then mitochondrial samples were isolated. Nonheated animals served as controls. There was an overall age effect, with old rats displaying higher levels of SIRT3 than the young rats. At 2 and 24 h after heat stress, the levels of SIRT3 increased in both age groups. MnSOD also increased at 24 h after heat stress, but there was no difference with aging. Our results show a novel response to heat stress in young and old rats. Since SIRT3 and MnSOD are both protective, their induction after heat stress may represent an adaptive response that protects against heat-induced damage. (197)

Steinhauser, Paul* and Cynthia Walter. Saint Vincent College. Latrobe, PA 15650. *Cell Cytotoxicity and Antimicrobial Properties of Extracts from the plant, Tamarindus indica* - With the bourgeoning advancements in the world of synthetic pharmaceuticals, the use of herbal substances may sometimes be overlooked. *Tamarindus indica* (*T. indica*) is a large evergreen tree grown throughout the tropics. Different tree tissues are used to treat different ailments ranging from gastrointestinal issues to surface wounds and infections. The antimicrobial properties of *T. indica* have been researched, yielding more than supportive results; however, this does not prove its practicality or safety in real world scenarios. The purpose of this study was test antimicrobial properties of extracts using different antibiotic resistant strains of *Staphylococcus aureus* bacteria, standard strain (SSSA) and methicillin resistant (MRSA), as well as human cell cytotoxicity. Fruit pulp and seeds (PS) and leaves (L) were boiled in water for 1 minute and extracts were macerated, centrifuged and passed through a 0.2 um filter. Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) assays were performed for SSSA and MRSA to ensure antimicrobial activity in a 24 hrs. exposure to extracts. Results showed significant antimicrobial activity for concentrations of both PS and L exceeding 16.56 mg/µL. Cytotoxicity testing of human dermal fibroblast cells treated before undergoing a Cell-Titer Blue Assay, a measure of mitochondrial metabolism, showed cell tolerance for PS concentrations of 6.22 mg/µL or below. At that dose, cell metabolism, when compared to controls, was decreased by 10% after 18 hrs. incubation and 62% after 24 hrs. In summary, more testing must be done regarding the practicality of *T. indica* application and the time frame needed to ensure effectiveness and safe use. (52)

Stilwell, Amber*, Kate Moran*, Bronte Seath, Andy Willis, Ryan Brodnick.and **J. Michael Campbell**. Mercyhurst University, Erie, PA 16546. *Restoration monitoring of Presque Isle Bay Watershed streams using benthic macroinvertebrates* -- Macroinvertebrate communities are excellent indicators of water quality degradation from nonpoint source pollution. We compared benthic macroinvertebrate communities sampled during winter 2012-13 at sites on several streams within the Presque Isle Bay watershed in Erie, PA, to communities found at the same sites ten years previously and prior to restoration work done within the watershed. The comparative analysis of benthic macroinvertebrates using Hilsenhoff Biotic Index and other metrics suggested that the streams are still in poor condition, suggesting that the restoration effort has so far been unsuccessful. The significant problems that remain to be addressed include extensive areas of impermeable surface that contribute urban runoff to the streams. (158)

Stine, Meghan*, Laura F. Altfeld, and **Deborah S. Austin.** Wilson College, Chambersburg, PA 17201. *Habitat effects on captive elephant reproduction: A study of size and quality of captive elephant habitats for both Asian and African elephants*--Acyclicity, or abnormal reproductive cycle, is a problem in captive elephants. The reason for this is unknown; however, if it is not addressed, captive elephant populations may die out. It is possible that acyclicity is due to environmental stress, including insufficient space in zoos and small group size of the captive elephants, leading researchers to ask whether it is more important to have a large quantity of space or a higher quality of space. This research is designed to address the effects of the size of captive environment on the reproductive status of female elephants. Surveys were sent to 66 zoos in Europe and the United States, asking for information regarding number, type, and sex of elephants, reproductive status, and total area of habitat. Behavioral observations were then conducted at five of the participating zoos within the United States. Biotic and abiotic variables were correlated with reproductive status as reported in surveys. Ethogram data from behavioral observations were quantitatively analyzed using cluster analysis on three categories of behavior: basic, social, and contact. The results indicate that specific size of the habitat does not have a direct effect on the reproductive status, but species and age of elephant did show differences in reproductive status. Social structure and behavior, however, varied based on the area of the captive environment. The results suggest that social structure and behavior of captive

elephants can be manipulated through maintenance of the captive environment, and may lead to differences in the reproductive status of those females within the habitat. (91)

Sulon, Sarah and Jane F Cavender. Elizabethtown College, Elizabethtown, PA 17022. *Nuclear Trafficking of Cullin 7 by Simian Virus 40 T antigen* -The SV40 virus induces cellular transformation through the expression of the nuclear oncoprotein T antigen (Tag). Specifically, Tag binds several host proteins involved in cell cycle regulation, most notably, the retinoblastoma gene product and p53. In addition to these, Tag binds to Cullin 7(Cul7) to increase rates of proliferation and anchorage independence. Cul7 is an E3 ubiquitin ligase which resides in the cytoplasm, functioning to tag proteins for proteasome degradation. The fact that Tag is targeted to the nucleus and Cul7 is cytoplasmic, raises the question of the final location of this complex. Recent studies have not been able to determine the location of the complex due to the high levels of Tag expression relative to the low amount of complex. Cul7binding has been mapped to the N-terminus of T antigen, specifically requiring amino acid 98. Fortuitously, our lab has mapped the epitope of pAB416 antibody to amino acid 98 as well. The following study was designed to employ this shared binding region in a novel method of co-immunoprecipitation to isolate Tag/Cul7 and determine whether it can be detected in the cytoplasmic or nuclear extracts of B6 MEFs. It was hypothesized that via the NLS, Tag would traffic and redirect the functions of Cul 7 into the nucleus. B6MEF cells expressing Tag will be immuoprecipitated with AB416, effective clearing Tag molecules that are not bound to Cul7. Cleared lysates will then be immunoprecipitated with Cul7 or Tag antibody directed to the N- and C-terminus, followed by PAGE and Western blotting. Our results have shown lysates even with pre-clearing with 416 antibody the Cul7 complex has not been detected. This is primarily due to adequate Cul7 antibodies, but we have also found that the Cul7 expression is not maintained in our cell lines even though they are of embryonic origin. (150)

Szczytkowski-Thomson, Jennifer*[1], Christina Lebonville [2] and **Donald Lysle[2].** [1]Messiah College, Grantham, PA 17055; [2] The University of North Carolina at Chapel Hill, Chapel Hill, NC 27599. *Opioids prevent the expression of fear in an animal model of post-traumatic stress disorder*- -Post-traumatic stress disorder (PTSD) is a chronic and debilitating anxiety disorder characterized by exaggerated fear and/or anxiety that may develop as a result of exposure to a traumatic event. The current study utilizes the stress enhanced fear learning (SEFL) animal model of PTSD to investigate the pharmacotherapeutic use of opioids as a preventative treatment for PTSD. Rats are exposed to a severe stressor (15 foot shocks) in one environment (Context A) and then subsequently exposed to a milder form of the same stressor (single foot shock) in a different environment (Context B). Animals that did not receive prior shock treatment exhibit fear responsiveness to Context B in line with the severity of the single shock given in this context. As with previous studies, animals that had received prior shock treatment in Context A exhibit an exaggerated fear response to Context B. Furthermore, animals receiving a single dose of morphine immediately following the severe stressor in Context A continue to show an enhanced fear response in Context B. However, animals receiving repeated morphine administration (three injections separated by 24 hours) after exposure to the severe stressor in Context A or a single dose of morphine at 48 hours after the severe stressor did not exhibit an enhancement in fear learning to Context B. These results indicate that morphine treatment following a severe stressor may be useful in preventing or reducing the severity of PTSD in at-risk populations. (67)

Tesfayohannes, Mengsteab*. Susquehanna University, Selinsgrove, PA, 17870. *The Important Role of Entrepreneurs in the Knowledge Creation, Application and Commercialization Process for Development*- The importance of research and development (R&D) Eco-System for socio-economic, scientific and technological developmental continuum is apparent. The R&D Eco-System itself is made-up of knowledge creation, application and commercialization components. The role of knowledge creation in socio-economic and technological development is clear if one considers how the created knowledge complements the application of knowledge and commercialization. This means, the relevance of basic research can be made clearer if one considers how the created knowledge complements the application and commercialization of knowledge. If the created knowledge is not applied and commercialized, the socio-economic returns cannot be achieved as desired. Moreover, if this mandatory complementarity process is effective and efficient, it can lead to successful innovation, development and design of new products, new services and better processes that are vital for the advancement of knowledge based society. In sum, the acquisition and diffusion of knowledge helps to create conditions in which practical achievements can flourish. The end result is ostensible: nations can achieve competitive advantage and a cutting edge of vital development dynamics. There are important actors who are actively involved to make this complex and multi-dimensional complementary process effective, realizable and efficient. The Entrepreneurial Eco-System in general and Entrepreneurs in particular have a pivotal role to play in promoting this vital complementarity dialectic. The purpose of this conceptual paper is therefore to engage in an inquiry focused on: what should be done to enhance the role of entrepreneurs in this holistic process? The paper also aims to provide helpful recommendations and strategies that are centered on establishing a framework suggesting how entrepreneurs can coordinate their mandate with the activities of other major players in the scene. (162)

Thomas, Sean*, Connor Zale*, Luke Dombert, Kristopher Krawchuk and Lisa Kadlec, Wilkes University, Wilkes-Barre, PA 18766. *Investigation of novel epidermal growth factor receptor target genes implicated in multiple aspects of Drosophila development* – The *Drosophila* epidermal growth factor receptor (Egfr) gene encodes a protein that impacts multiple aspects of development including determination of body axes during oogenesis and proper formation of wings and eyes in later development. Our research follows from microarray screens performed to identify downstream targets of the Egfr pathway in the *Drosophila* ovary. These screens compared gene expression in ovaries of flies in which activity of the pathway was reduced, normal, or constitutively active. RT-PCR has confirmed the up-regulation of a number of targets originally seen by microarray. We have been employing a variety of approaches to investigate the expression, biological function, and mechanism of action of several putative targets. Target genes of interest include a number of genes whose function is currently unknown (including CG13299, CG11381, CG13083 and CG14309). Screening for biological function using UAS-RNAi suggests roles for several target genes of unknown function in eggshell production and/or integrity, wing morphogenesis, or both. Several putative targets have been shown to exhibit developmentally regulated expression in the ovary, and in some cases this expression has been shown to be altered in response to changes in levels of Egfr signaling. We are currently using *in situ* hybridization and RT-PCR to investigate target gene expression in wing imaginal discs. A neutral red uptake assay was performed to further explore observed eggshell defects, and suggests defects in vitelline membrane integrity in compromised eggshells. Additionally, we are utilizing the UAS-RNAi system to attempt to identify candidate target genes which may play roles in the development of the eye. (65)

Tillquist, Richard*, Eric S. Ho. Lafayette College, Easton, PA 18042, USA. *A COncurrent Next GEneration Sequencing simulaTor – CONGEST.* Next generation sequencing (NGS) techniques allow for the sequencing of hundreds of thousands of pieces of DNA in parallel. This has drastically reduced the cost of sequencing DNA while simultaneously increasing the amount of data being generated. The accuracy of these methods depends in large part upon the composition and complexity of the genome being sequenced. A-runs and GC-repeats, for example, make sequencing more difficult and result in missing sequenced bases and lower phred quality scores. The quality of these reads is also dependent on the sequencing method used, i.e. reversible terminator from Illumina and proton sequencing from Ion Torrent. We aim to produce a NGS simulator as a means of creating realistic sequence data for use in analyzing currently available tools as well as for use in creating, building, and studying new algorithms. Our simulator provides user-specified parameters that mimic the output of real NGS results such as mean and standard deviation of normally distributed read lengths, the total number of reads, error rates, etc. For sequencing error handling, we model sequencing errors using a Poisson distribution. Short reads generated by our simulator are formatted in standard FASTQ file, which is fully compatible with downstream NGS analysis tools such as BWA, SAMtools, etc. As the new targeted sequencing method is widely used in cancer diagnosis, our simulator provides option for user to specify targeted genomic regions for sequencing, which is not available in existing simulators. As the generation of millions of short reads is a demanding task, our simulator expedites this processing by harnessing multiprocessors hardware system in which the whole simulation is split into multiple concurrent subprocesses. In the future, we plan to speed up this implementation further to allow for faster turnover in the analysis process. (45)

Trapolsi, Donald*, Meaghan Bird, Thomas F. Rounsville Jr., Shawqui Darwish, and Jane E. Huffman East Stroudsburg University DNA Wildlife Lab, East Stroudsburg PA 18301. *Implementing a disease detection panel based approach to mapping tick borne pathogens using probe based qPCR* – The results of this study will be part of a continuing effort by the Northeast Infectious Disease Diagnostic Laboratory to characterize and map zoonoses carried by ticks and will focus specifically on *Ixodes scapularis*. The panel design includes *Babesia microti, Borellia burgdorferi, Borellia miyamotoi, Bartonella henselae, Anaplasma phagocytophilium,* Deer Tick Virus (Powassan Lineage II), and Powassan Virus. The goals of the study include building a panel to expand the amount of information being obtained through current diagnostic procedures, offsetting the cost and time required to gain data through operational efficiencies and gains in throughput, and build a framework for the inclusion and monitoring of emerging tick-borne zoonoses. (135)

Van Dyke, Davis*, Ronie Stephan*, and **Robert L. Hale.** Shippensburg University, Shippensburg, PA 17257. *Relation of Antisocial Personality Disorder Symptoms to 2D:4D Finger Length among College Students* – The study was conducted to examine a theorized relationship between prenatal sex hormone exposure, measured with finger length ratios of the 2nd and 4th digits from the thumb, and Antisocial Personality Disorder (APD) symptoms. Studies have found that the ratios of the fingers digit 2:digit 4 in adulthood indicates the amount of exposure in utero to testosterone or estrogen. Additionally, high testosterone levels are connected to aggressive, criminal, and antisocial behaviors. Students were recruited for the study through SONA Systems, Shippensburg University's sign-up system for research, and had received extra credit for their participation. Participants completed on-line the Edinburgh Handedness Scale, *Subtypes of Antisocial* Behavior Questionnaire (STAB), Wechsler's 1994 survey, and a drug questionnaire.

After this, measurements were taken from both left and right hands of each subject and from photocopies of their hands to generate 2D:4D ratios. Our research hypothesis was that students scoring higher on Antisocial Personality Disorder (APD) symptoms, as measured by their STAB scores, would have higher in utero testosterone levels, as measured by their 2D:4D digit ratios. Multiple Regression analyses and MANOVA were used to our hypothesis. (68)

Webber, Jessica*, Evelyn Neunteufel. Misericordia University, Dallas, PA 18612. *Flight Initiation Distance in Eastern Gray Squirrels (Sciurus carolinensis) Based on Different Characteristics of Human Predator's "Eyes"* – In order for prey to assess risk properly, it needs to be aware of many cues that a predator displays when predator and prey are in close contact. Studies have been conducted to determine what attributes prey attend to when assessing risk. This study aimed to determine the effects of eye coverings in predator-prey interactions. The hypothesis was that flight initiation distances would vary based on the type of eye coverings of approaching prey. We explored how humans exhibiting no eye contact, direct eye contact, eye contact wearing sunglasses, and eye contact wearing binoculars affected flight initiation distance (FID). The prediction was that the larger the eye coverings, the greater the FID would be in Eastern gray squirrels, with no eye covering having the smallest FID. Eastern gray squirrels (*Sciurus carolinensis*) located at Kirby Park in Kingston, Pennsylvania were approached by a human and their flight initiation distances were recorded. Preliminary results of mean FID were as follows: no eye contact: 4.80 m, direct eye contact: 4.52 m, eye contact wearing sunglasses: 4.38 m, and eye contact with binoculars: 3.62 m. Additional data will be collected and analyzed to determine the significance of these results. (130)

Welker, Ryan* and Diane Bridge. Elizabethtown College, Elizabethtown, PA 17022. *Expression of Hsp70 genes in two Hydra species with different lifespans* – Two similar species of the freshwater cnidarian *Hydra* (*H. vulgaris* and *H. oligactis*) have very different lifespans. *H. vulgaris* is known to live at least six years without showing any signs of physical deterioration while *H. oligactis* lives only about four months after the start of sexual reproduction. *H. oligactis* also differs from *H. vulgaris* in producing lower levels of heat shock proteins in response to stress. Heat shock proteins are crucial molecular chaperones that fold denatured peptides and promote the degradation of severely damaged proteins. In mammals, the heat shock response declines with age, decreasing protein quality control. To address the potential role of members of the heat shock protein (Hsp) 70 family in *Hydra* aging we have examined the expression of Hsp70 family genes in *H. vulgaris* and *H. oligactis* using Western blots and RNA in situ hybridization. In situ hybridization shows that the *Hsp70*, *Hsc70*, and *mortalin* genes are strongly expressed in the stem cells of adult *Hydra* of both species. (18)

Wilk, Ryan* Susquehanna University, Selinsgrove, PA 17870. *Preferred forest density and tree species nesting conditions of Bald Eagles in central Pennsylvania* - The once abundant population of bald eagles in central Pennsylvania almost experienced a local extinction 30 years ago. Recently, however, recovery efforts by agencies such as the Pennsylvania Game Commission helped increase the number of local bald eagle nests so that there are now up to 250 in the state. Knowledge of the kind of environment that eagles live in will allow people to better help new eagles thrive in central Pennsylvania. This project has studied environmental conditions such as tree height, species, and forest density at 5 different nest locations along the Susquehanna River. A clinometer and a range finder were used to find the tree height, and the four-point method was used to find the surrounding forest density. The results show that the trees with nests in them have been between 27 and 32 meters high, the total tree density has been between 250 and 400 Hectares, and eagles seem to prefer to nest in sycamore trees compared to other species. Since tall sycamores in dense forests appear to be the preferred nesting site for Susquehanna River eagles, increased protection of these trees may be a first step in assuring suitable nesting sites in the future. (123)

Wills, Janelle S.*, Deborah S. Austin and **M. Dana Harriger.** Wilson College, Chambersburg, PA 17201. *Quantification of Estradiol in Bovine Milk from Cattle Fed Diets Supplemented with Salvia hispanica and Linum usitatissimum* - Each year, 300,000 people in the United States are diagnosed with breast cancer and 44,000 die from the disease (American Cancer Society, 2013.) It is the leading cause of cancer deaths among American women aged forty to fifty-five years. One key factor in the development of breast cancer is elevated levels of estrogen. Studies have indicated that levels of hormonal estrogen can be lowered by phytoestrogens. Chia (*Salvia hispanica*) and flax (*Linum usitatissimum*) contain high levels of phytoestrogens in their seed embryo. In this study, Holstein dairy cows were given chia or flax seed to supplement their standard diet for 30 days. Whole milk samples were collected daily during this period. The milk samples were aliquoted and frozen at -80°C until analysis. Samples were then thawed and an ELISA was conducted to quantify the estradiol concentration levels. The data were then analyzed using ANOVA at significance level of .05 to determine which diet more effectively decreased the amount of estradiol. No observable trends were seen throughout the data; however, less variation in estradiol concentration was seen within the chia group compared to that of the flax and control groups. Future research may include feed additives using an animal model and their relationship to improving human health. This could provide consumers an option, when purchasing milk, to lower their

estradiol levels and decrease their risk for cancer naturally. (151)

Wingard, Katherine*, Micah Richardson, Elisabeth Stewart, Fred J. Brenner Ph.D., and Durwood Ray, Ph.D. Grove City College, Grove City, PA 16127. *LD-50s of Resveratrol and Quercetin in a Cancerous Mouse Cell Line* – The purpose of this study was to determine the LD-50s of two natural compounds in a cancerous cell line. LD-50, or lethal dose 50%, is the amount of a substance required to kill 50% of the test population. The compounds tested were resveratrol (3, 4', 5-trihydroxy-trans-stilbene), a phenolic phytoalexin, and quercetin (2-(3, 4-dihydroxyphenyl)-3, 5, 7-trihydroxy-4H-chromen-4-one), a flavonoid. The cell line used in these experiments was Grove City College's T3-HA hepatic mouse cancer cell line. T3-HA cells were plated 3 days prior to the start of the experiment so that the average confluency of the cells on day 1 was approximately 1-10%. Confluency refers to the amount of the cell culture dish that is covered by cells. Quercetin and resveratrol were dissolved in DMSO and then prepared in media such that all solutions had a final DMSO concentration of 0.1%. T3-HA cells were treated with either resveratrol or quercetin in a range of concentrations from 0-300μM. Photomicrographs were taken of six randomly preselected 2mm^2 regions on days 1-5. LD-50s for each compound were calculated using the average number of adherent cells. The LD-50 of resveratrol on T3-HA cells was 63±12μM (std dev, n=4) on day 4, and the LD-50 of quercetin on T3-HA cells was 8.9±4.7μM (std dev, n=3) on day 4. In conclusion, both resveratrol and quercetin had a dose-dependent cytotoxic effect on T3-HA cancer cells. Normal cells were not killed within the tested concentration range. The potential synergistic effect of combining resveratrol and quercetin will be tested in future studies. (22)

Zawacki, Alexander* and **Ahmed Lachhab**. Susquehanna University, Selinsgrove, PA 17870, *The Use of Complementary GPR Surveys with Different Grid Spacing to Locate Graves in Sharon Lutheran Church, PA* - Ground-penetrating radar (GPR) is a geophysical survey tool with many archaeological applications, including the search for graves. A 400 megahertz GPR was employed to locate unmarked graves and buried headstones in a neglected Pennsylvania cemetery dating from the 19th century. The site was initially scanned using a grid pattern with 50cm transect spacings. A smaller site within the cemetery was then selected and scanned at a higher 'resolution,' using smaller transect spacings, to determine whether this improved the accuracy of the findings. Supplementary perpendicular transects were also added. A number of potential sources of error were identified and their consequences were outlined. Short transects with small spacings were found to significantly improve the quality of the obtained data, as was the addition of perpendicular transects. The results are applicable to the search for graves and, more broadly, the use of GPR to identify and locate other subsurface features. (149)

Zimmerman, Mel* and Lynette Dooley. Lycoming College, Williamsport, PA 17701. *Water Quality Assessment of the Lower West Branch-Susquehanna River: Focus on Sewage Treatment Plants*-- The object of this study was to describe and determine water quality at eight sites along the West Branch of the Susquehanna River between Lock Haven and Milton. Sites were selected in relation to location of sewage treatment plants along this stretch of river. Water chemistry (pH, alkalinity, nitrate nitrogen, nitrite nitrogen, dissolved oxygen, temperature, conductivity, orthophosphorus, total phosphorus, TDS, and turbidity) are presented from 2005 to 2013. Macroinvertebrate rock basket, kick and Hester-Dendy samples were collected from sample sites in summer 2013 and compared to data collected in 2005. These data were subjected to the EPA Rapid Bioassessment Protocol II (RBA-Family Level), Hillsenhoff Biotic Index and Shannon-Wiener Diversity Index in an attempt to describe water quality. All seven of the sewage treatment plants in this section of the river have made improvements to address combined sewer overflows (CSO's) in the last eight years. The overall quality of the water appears to have improved as a number of Chesapeake Bay Initiatives on sewage treatment plants has taken place. Noticeable success by these new standards for sewage treatment plants that have been upgraded or are currently being upgraded will need continued monitoring to demonstrate overall water quality improvements. (85)

Zuidervliet, Brian*, **Ahmed Lachhab**. Susquehanna University, Selinsgrove, PA 17870. *Lateral Mixing of the North and West Branches of Susquehanna River at Hummels Warf, PA*-- The mixing zone of the north and west branches of the Susquehanna River at a site downstream from the merging point (Sunbury, PA) was studied to understand how these two streams and the rain events, associated with their corresponding watersheds are affecting this lateral mixing. Continuous data sampling from the Shady Nook site was used to collect multiple transects from August 2009 to August 2013 to identify the transition zone between the west and north branches. The specific conductivity of the water yielded the strongest correlation to the two branches' mixing zone and provided accurately tracking of the lateral shifting during both wet and dry conditions. Based on this correlation, predictions can be made to explain movement of pollutants and their mixing. Precipitation and discharge data was examined to study the influence of rain events on the location of the mixing zone. Results have shown that as the discharge of the mainstem increases, the mixing zone shifts lateral away from the Shady Nook shoreline until it reaches a threshold discharge of 12300ft^3/s, and then the mixing zone shifts backward as the discharge increases beyond this threshold discharge. (111)