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Abstract Book

ABSTRACTS

Listed alphabetically by first author's last name.

Adamski, Jonathan*, and **Thomas LaDuke** East Stroudsburg University, East Stroudsburg, PA 18301. *Surveying Disjunct Populations of Two Reptile Species in Northeast Pennsylvania.* — Two species of reptile, *Carphophis amoenus* and *Sceloporus undulatus*, exist in the Northeastern portion of Pennsylvania as disjunct populations greater than 90 miles from their nearest conspecifics. These species are generally found in the Southern reaches of the state and more commonly in the Southern portion of the country. It has been hypothesized that these species expanded northward during a global warming period in the early Holocene (hypsihermal period) and when they again retreated to the south during a subsequent cooling, these remnant populations were left in areas where suitable habitat remained. We have observed these populations for one field season and will continue to do so for several years. The *S.undulatus* population appears to be healthy and with each trip to the site, on viable days, several adults and young were seen. The next step in the study will be to expand our search to the surrounding areas to see if any satellite groups can be discovered. *C.amoenus* has proven to be more difficult to locate. We found none in the locations where they have been observed and reported in previous years. The only individual that has been found was located in the shale barrens habitat that *S.undulatus* inhabits, several miles away from the mixed forest flood plain habitat they are normally found in. We will continue to survey the shale barrens for additional individuals. In the next field season, we will add the use of coverboards to our surveys in their former range. We have several hypotheses to explain the apparent disappearance of this species in the flood plains that will be further investigated in the next field season. (125)

Alkurdi, Eman*, **Kateryna Popluzhna***, and **Eric P. Ingersoll** Penn State University-Abington, Abington, PA 19001. *Immunolocalization and Detection of Matrix Metalloproteinases in Breast Epithelial Cells.* — Every year, nearly a quarter million new cases of breast cancer are diagnosed in the United States. Matrix metalloproteinases (MMPs) are enzymes that degrade extracellular matrix proteins enabling cancer cells to invade neighboring tissues, enter the circulatory system, and form metastases. We have chosen to examine the expression of MMPs in four breast epithelial cell lines with characteristics ranging from transformed to invasive and tumorigenic to learn more about the role these enzymes play in the progression and development of breast cancer. Using immunoblots and immunohistolocalization, we have examined the expression of several MMPs in these cell lines. In addition, we have performed cell invasion assays in the presence and absence of MMP inhibitors. We will present data on the expression and function of MMPs in these varied breast epithelial cell lines. (15)

Bae, Alex*, **Blossom Jiang***, and **Megan Rothenberger** Lafayette College, Easton, PA 18042. *An Interdisciplinary Approach to Bioinvasion in an Urban Estuary.* — The Hudson-Raritan estuary (HRE) of New York and New Jersey, one of the most urbanized estuaries in the world, is particularly vulnerable to introductions of non-native species due to the large amount of international boat traffic. Non-native crustaceans *Hemigrapsus sanguineus* and *Eriocheir sinensis*, which have destroyed biodiversity and economic infrastructures in other estuaries, have made appearances in the HRE within the past decade. However, little is known about the size or distribution of these two non-native populations in this system. Additionally, there is no information on the public awareness or social perceptions of these populations in the HRE, making it difficult to predict and manage the environmental and social impacts of the invasion. Thus, the objectives of this study integrate aspects of both the natural and social sciences, and they were to 1) monitor the regional abundance and distribution of these non-natives in the Raritan system, 2) create and administer a survey to local commercial crab fishermen to assess their awareness of these non-native crabs, and 3) to spread awareness about bioinvaders in the HRE through informational brochures and a website. According to monitoring data, the relative abundance of invasive to native crabs is low, yet the native crab biodiversity has declined from 2011 to 2014. On the other hand, analysis of survey results indicated that > 50% of respondents had captured one or both of

these invasives and that half of those were egg-bearing females. Furthermore, approximately 80% of respondents were aware of these non-native crabs, perceived them as a threat to their livelihood, and had noted declines in the commercially important blue crab (*Callinectes sapidus*). The discrepancy observed between field results and survey results in this study indicates the value of collaborations between scientists and citizens in gathering data for large-scale ecological studies. (131)

Balascio, Joseph*, and Brian Gray York College of Pennsylvania, York, PA 17405. *Antibacterial Properties of Felis catus Saliva*. — The domestic shorthair feline, *Felis catus*, engages in extensive self-grooming behavior that may play a significant role in maintaining the health of their skin and in fighting infection. We hypothesized that, in a manner to lachrymal and salivary secretions in humans and other animals feline saliva contains anti-microbial components, and in this way grooming contributes to their overall well-being via the uniform spread of these molecules. Using a modified Kirby-Bauer style protocol we tested our hypothesis in comparison to the effects of available commercially-produced antibiotics, and looked at the zone of inhibition produced by *Felis catus* saliva against several species of opportunistic pathogens: *Escherichia coli*, *Staphylococcus aureus*, and *Serratia marcescens*. These species were chosen because of a feline's high likelihood of coming into contact with them on a regular basis. Also placed on the bacterial plates were kanamycin, penicillin, and tetracycline. Results indicated that cat saliva produced zones of inhibition larger than that of penicillin but similar to that of kanamycin and tetracycline, suggesting that there are potent antibacterial properties in the saliva of felines. (76)

Balasundram, Miriam*, and Anya Goldina Elizabethtown College, Elizabethtown, PA 17022. *Comparison of Individual Recognition Between Native and Invasive Crayfish, Orconectes obscurus and Orconectes rusticus*. — For most animals, the ability to distinguish neighbors from strangers is essential for conserving energy and minimizing aggression intensity. In this study I compared individual recognition in the crayfish *Orconectes obscurus* and the invasive species, *Orconectes rusticus*. I predicted that in species that exhibit individual recognition, aggression towards previously fought opponents would be less than towards unknown opponents of the same status. In Pennsylvania, *O. obscurus* and *O. rusticus* occupy the same habitats and compete for similar resources. However, since *O. rusticus* is larger and more aggressive, it might be equally aggressive towards all opponents regardless of previous experience, while *O. obscurus* would exhibit greater levels of individual recognition. All animals were socially isolated for 1 week. Following the isolation period two individuals were placed in a tank for a familiarization trial during which the winner of the interaction was considered dominant and loser a subordinate. Following the familiarization trial, each individual was paired with 3 opponents: 1) known opponent from the familiarization trial, 2) an unknown opponent of the same status as known opponent, and 3) a naïve individual. Aggression intensity was analyzed to determine if individuals act less aggressively towards previously fought opponents. Preliminary analysis show that while *O. rusticus* exhibit overall higher levels of aggression, compared to familiarization trials, dominants of both species do not change aggression levels towards known subordinates and naïve opponents, while decreasing aggression towards unknown subordinates. However, the behavior of subordinate individuals is species-specific. Compared to the familiarization trial, *O. rusticus* decrease aggression towards all subsequent opponents, while *O. obscurus* increase it. This differential behavior of subordinate individuals suggests that invasive and native species might utilize different aggression strategies. Thus, while dominant individuals modify their behavior based on previous interactions with their opponents, subordinate individuals modify overall aggression levels, regardless of opponent identity. (92)

Baylor, Jessica*, and Michael Butler Lafayette College, Easton, PA 18042. *Exploring Potential Protective Properties of Biliverdin During Immune Challenges in Northern Bobwhite*. — Birds experience challenges in their environments. These challenges, including bacteria and disease, activate the immune system as a defense. One primary defense is inflammation. Inflammation results in the release of molecules, including oxidants and cytokines, from lymphocytes that destroy offenders. Problematically,

these molecules can also damage the host. Fortunately, the body has a natural protecting mechanism through the release of antioxidants. Antioxidants are able to mitigate the damage by neutralizing oxidants. Recently, attention is on biliverdin, as it may be an inflammation-alleviating antioxidant. Biliverdin is a blue-green pigment stored in the bile of humans and animals. To discover more about the role of this pigment during immune challenges similar to those experienced in natural environments, Northern Bob White Quail were injected with two types of immunostimulants; phytohemagglutinin (PHA) and lipopolysaccharide (LPS). Liver, spleen, and plasma were removed for analysis. An increase in the plasma antioxidant levels, as measured by reactive oxygen species present in plasma, in the immunostimulant treatment groups supports the idea that biliverdin is indeed behaving similar to the body's natural antioxidant immune function. Important to provide a baseline for makeup and metabolic capacity, total triglyceride and glycerol was also measured in plasma. The spleen is a site of lymphocyte production, so a slight enlargement in treatment groups was expected however, the immune response was not great enough to result in a significant change. It is expected that biliverdin, if acting as part of the anti-inflammatory response, is present in a higher quantity in the liver of birds from the immune challenged treatments when compared to controls. Isolating biliverdin in response to pro-inflammatory conditions is an important step towards understanding its physiological function. (41)

Belanger, Julie, and Thomas Reidy* King's College, Wilkes-Barre, PA 18711. *Exploration of the Fluorescence Properties of the Hydrophobic Probe N-phenyl-1-naphthylamine (NPN) in Mixed Solvent Systems.* — N-phenyl-1-naphthylamine (NPN) is a hydrophobic fluorophore used in biological assays. Specifically NPN is often selected to embed within the hydrophobic regions of lipid membranes, and is introduced to these membranes through the use of water-miscible organic solvents. The advantage of NPN is that its fluorescence depends on the lipophilicity of its environment. This research explores the interactions of NPN with solvents of varying polarity using fluorescence spectroscopy. The solvents of interest are ethanol, water and dimethylsulfoxide (DMSO). The interaction of NPN with each solvent can be characterized by observing the shift in the emission spectra of NPN. Preliminary data has shown when NPN is dissolved in DMSO the maximum emission is observed at 436 nm. When NPN is dissolved in ethanol the maximum emission is observed at 418 nm. Experiments are ongoing to explore the effects of mixed solvents on the emission spectra and the linear concentration for NPN. Using this mixed solvent system will provide additional insight on how NPN, as nonpolar molecule, can be introduced to an aqueous environment and successfully incorporated into hydrophobic membranes. (33)

Birch, James *, N. Bharathan, and Seema Bharathan Indiana University of Pennsylvania, Indiana, PA 15705. *Protein Signatures of Wild-Type and Reduced Genomic Complements of Rhizoctonia solani.* — Amongst genetically isolated anastomosis groups (AG's), *Rhizoctonia solani*, a soil-borne, plant pathogenic fungus, shows an increased genetic variability between these groups. Sub-groups of these AG's groups can be further differentiated via colony morphology, virulence, genetic sequences, biochemical characteristics and host ranges. Data from specific protocols and standard operating procedures developed for protein purifications of filamentous fungi using ToPI-DIGE kit will be presented. Proteins were purified from select *R. solani* isolates that included wild-type, heterokaryons, and compared to those that had reduced genomic complements, homokaryons. The concentration and quality of the protein were assayed using Beckman-Coulter DU 800 Spectrophotometer. All such high-quality proteins were subjected to Agilent Protein Chip Technology protein separation and 2D-protein profiling. Preliminary results suggests considerable variation in the protein from the homokaryon and the wild-type isolates. ProteinsSpot statistics data from 2D-gel preparations indicated nearly 81% of the proteins were similar while there was an under expression of 10.4% in the wild-type and 8.7% over-expression in the homokaryon. Additional comparisons are being made between viral-infected versus non-infected *R. solani* isolates. (6)

Bischer, Andrew*, and Abdalla Aldras East Stroudsburg University, East Stroudsburg, PA 18301. *The Effects of Artificial Sweeteners and Probiotic on the Gut Microbiome and the Mucosal Immune Responses.* — The artificial sweeteners being utilized in this study: sucralose in Splenda®, aspartame in

Equal®, and saccharin in Sweet N Low®. The experiment involves the harvesting of mouse intestines and inoculation of TSA (tryptic soy agar) plates with swabs of the intestinal contents. The six most populous anaerobic bacterial species are being isolated and are being used in an *in vitro* study. Identification of these species is conducted via the use of biochemical tests and gram staining. Testing of the effect of the alternative sugars *in vitro* is done by adding artificial sweeteners or probiotics to the agar media, which is used for enumeration of the CFU's/mL and macroscopic characteristics of the colonies in comparison to the control. An *in vivo* study will be carried out to determine the effects of the sweeteners and probiotics in live mice. In groups of four, the mice will be fed one of the sweeteners or a probiotic for four weeks. One of the groups will be the control and will not be given any sweetener or probiotic. After four weeks, the mice will be euthanized and the bacterial contents of their intestine will be studied as we did in the *in vitro* study. To evaluate the effects on the mucosal immune responses, we will use anti-IgA antibodies in an ELISA to quantify the intestinal IgA. In addition, an ELISA will also be used to measure the murine TNF- α , IFN γ and IL-10. (100)

Bocetti, Julie*, Breanna Lincoski, and Paula Caffrey California University of PA, California, PA 15419. *The Effect of Grape Extracts and Their Component, Resveratrol, on the Population Growth of A2780 Human Ovarian Tumor Cells in Culture.* — Ovarian cancer remains the deadliest female reproductive cancer, and the search continues for more effective treatments. Grape extract (GE) and its component resveratrol have inhibitory effects on a variety of cancers. Thus we studied whether GE from different grape varieties, or pure resveratrol, can inhibit growth or survival of human ovarian tumor cells. Skins of red and black varieties of *Vitis vinifera* were weighed and placed in 80% ethanol for 30 minutes at 60°C. The resulting GEs were diluted into growth medium (Ham's F12/DMEM) so that the final resveratrol content would be approximately 23 μ M for Low Dose (LDGE) and 45 μ M for High Dose (HDGE), based on published findings of resveratrol content per gram dry grape skin. For comparison, resveratrol powder was weighed into growth medium and diluted to 23 μ M, and 45 μ M. Doses were pipetted onto replicate culture wells of A2780 cells, and incubated for three days at 37°C. Replicate control wells received growth media, with or without the ethanol concentration found in diluted GE (i.e. 3.0%). Cells were counted daily, and percent change (+/- s.d.) calculated. Black GE doses were more effective than Red GE at preventing cell proliferation, with the black HDGE resulting in a change of -48.4 (9.5) % compared to controls and a 25 (2.0) % decrease in surviving cells compared to starting cell count. The 45 μ M dose of pure resveratrol caused a -67.5 (7.6) % change in cell count compared to controls but no decrease in survival compared to starting count. Lower doses of GE and resveratrol also inhibited population growth but not survival. We conclude that both GE and resveratrol can inhibit the growth of ovarian tumor cells in culture, and may prove useful as co-treatments against ovarian cancer. (10)

Brennan, Lauren*, and Paul Wilson East Stroudsburg University, East Stroudsburg, PA 18301. *Water Quality Monitoring Using Macroinvertebrates as Biological Indicators in Pocono Mountain Creeks.* — The Delaware River Watershed Initiative (DRWI) focuses upon the restoration of the native ecology of the Delaware River basin ecosystem. Changes in agricultural and ecological practices over the last fifty to one hundred years have resulted in degradation of the ecological health and water quality of the Delaware River basin. A variety of projects along the entirety of the Delaware River basin under the DRWI are establishing baseline data in order to track the changing ecosystem quality as restoration and conservation projects are enacted. This study, focuses upon the headwaters of the Delaware River. ESU faculty and students are currently monitoring six sites on three drainages. These drainages are the Brodhead, Big Bushkill, and Little Bushkill Creeks. While various aspects of the physical and chemical nature of waterway can be measured and quantified, it is not possible to measure every parameter that might affect the health of a stream. It is, however, possible to quantify the overall quality of a waterway with an appropriate bioindicator. Aquatic macroinvertebrate communities are excellent bioindicators. Both the composition and diversity of macroinvertebrate communities give us valuable information about a stream. Changes in macroinvertebrate communities allow us to detect changes in watershed quality without directly measuring the underlying reasons for those changes. In this study

macroinvertebrates were collected from one site on each of our three monitored creeks. The semi-quantitative techniques for wadeable freestone riffle-run streams employed by PADEP were utilized (PA DEP, 2013). Members of aquatic macroinvertebrate families were identified and counted (PA DEP, 2013). Macroinvertebrate communities were assessed for diversity and percent EPT taxa and family level IBI scores were calculated. Macroinvertebrate communities in the three creeks were compared. In addition, macroinvertebrate community parameters were compared with water chemistry data and a rapid habitat assessment. (133)

Breymeier, Corinne *, and Cosima Wiese Misericordia University, Dallas, PA 18612. *Effects of Acid on Chlorophyll Production of Common Duckweed (*Lemna minor* L.). — *Lemna minor* L.* (common duckweed) is a small, vascular, freshwater plant that floats freely on the surface of water. The size, simplicity, asexual reproduction and short generation time makes duckweed suitable for laboratory testing and research (Coronado-Posada *et al.*, 2013). *L. minor* is used in water quality testing to monitor the impacts of pollutants such as heavy metals, industrial effluents, coal residues, and acid mine drainage on ecosystems. Acid mine drainage from abandoned coalmines is Pennsylvania's largest single source of pollution. The purpose of this study was to observe the effects of acidification on biomass and chlorophyll content in *L. minor*. The plants were grown in Hoagland E-medium with pH treatments of 4, 5.4, and 6.5 for 10-12 days under controlled conditions in a growth chamber. Samples were harvested for biomass determination and the extraction and quantification of chlorophyll. Exposure to pH 4 significantly reduced the biomass as compared to the pH 6.5 control treatment in one of the two replicate experiments conducted. However, exposure to pH 5.4 did not affect the *L. minor* biomass. Additionally, chlorophyll *a*, *b* and total chlorophyll quantity in *L. minor* were not affected by exposure to acidic conditions. The data suggest that acidic conditions did not have a consistent impact on growth and photosynthesis in *L. minor* after an exposure period of 10-12 days. Based on the results of this study, further work is needed to better understand the impact of acidification on *L. minor* biomass accumulation and to elucidate whether changes in biomass are related to reductions in photosynthetic capacity. (138)

Broholm, Tessa*, and Megan Rothenberger Lafayette College, Easton, PA 18042. *Effect of Road Proximity and Canopy Cover on Reproductive Effort and Movement Patterns of Salamanders.* — Salamanders and other amphibians are disproportionately threatened due to habitat loss and fragmentation, climate change, and other anthropogenic stressors. Most studies of vernal pool-breeding salamanders have focused exclusively on the conditions of the breeding pools to understand how to better conserve these species and replace vernal pools lost to urbanization. Though the pools are important for breeding, salamanders spend the majority of their lives in the upland forest habitat surrounding the pools and require certain areas of uninterrupted habitat around the pools called the "life zone." Roads represent one type of degradation to the "life zone." Roads may act as barriers to movement, degrade pool water quality, contribute to direct mortality, and reduce canopy cover. Therefore, the objective of this study was to investigate the relationship among road proximity, vernal pool hydrology and water chemistry, canopy cover, and reproductive effort and movement of salamanders. These parameters were compared between three isolated pools (> 1000 m from the nearest road) and two pools in a fragmented habitat (< 100 m from two roads) within a Pennsylvania state park. Preliminary results of this study indicate that road proximity does not have a significant effect on vernal pool water chemistry, and salamander egg mass abundance was greater in the fragmented location. However, significantly more adult salamanders were found at cover board sites in upland habitat surrounding isolated pools. Results for salamanders correspond with results of a previous study on wood frogs in the same location in which wood frogs in the fragmented location were trapped at a lower frequency near roads than expected by chance. Together, these two studies indicate that the presence of roads may reduce the amount of upland habitat utilized by amphibians. (98)

Brune, Brian*, Justin Hunter, Victoria Ditchkus, Robert Burns, and William Biggers Wilkes University, Wilkes-Barre, PA 18766 *Induction of Metamorphosis of the Polychaete *Capitella teleta* by Phylloquinone and Reactive Oxygen Species.* — Phylloquinone, a photosynthetic respiratory quinone

found in bacteria and algae as well as marine sediments, was found to induce settlement and metamorphosis of metatrochophore larvae of the marine polychaete annelid *Capitella teleta* in a concentration dependent manner when tested at micromolar concentrations. Fluorescence measurements using the specific fluorophore Cell Rox Deep Red indicate that the generation of superoxide anions is increased in larvae exposed to phylloquinone as well as menadione. The superoxide anion quencher Tiron was also found to inhibit settlement and metamorphosis in response to phylloquinone in a concentration dependent manner. These results indicate that phylloquinone may promote settlement and metamorphosis of these larvae in the natural marine environment through the generation of superoxide anions. (32)

Cabrera, Cindy*, John Cigliano, and Audrey Ettinger Cedar Crest College, Allentown, PA 18104. *The Physiological Effects of Ocean Acidification on Cephalopods*. — Ocean Acidification (OA) is caused by a high level of carbon dioxide (CO₂) reacting with ocean water, increasing its acidity. Currently, ocean pH levels are at approximately 8.3; however, by the year 2100, the Intergovernmental Panel on Climate Change predicts a worst-case pH level of 7.7. The drop in pH poses a threat to marine life, affecting both vertebrates and invertebrates via different mechanisms. OA lowers the production of carbonate ions, affecting calcification processes in invertebrate marine organisms. In contrast, high levels of CO₂ may interfere with neurotransmitter functions of vertebrate marine organisms leading to an upregulation of GABA_A receptors. These changes cause a disruption in animal behavior, and may have a detrimental outcome. Cephalopods are invertebrates but do not undergo calcification. Therefore, OA may disrupt the physiology of cephalopods via mechanisms more similar to those observed in vertebrates. The purpose of this project is to determine whether GABA_A receptors in the brains of cephalopods are being negatively affected by OA. The species studied is the *Octopus bimaculoides* from the west coast of California. Initially, adult female octopuses not exposed to OA will be used as an anatomical reference, for developing qRT-PCR primers, and for testing the effectiveness of the anti-GABA_A receptor antibody. To test the effect of OA on *O. bimaculoides*, wild caught gravid females will be obtained. In the lab, eggs produced will be separated into control and OA- simulated tanks for raising. Brains from OA treated and control conditions will be retrieved and compared. Two methods will be used to test for changes in GABA_A receptor levels: anti-GABA_A receptor antibody staining and qRT-PCR of GABA_A receptor gene expression. These experiments will allow us to determine if GABA_A receptor expression is affected by OA in an invertebrate non-calcifying organism. (144)

Cannon, Stefani*, and Thomas LaDuke East Stroudsburg University, East Stroudsburg, PA 18301. *Niche Partitioning by Shelter Site Selection in Neotropical Tree Frogs of Northeastern Costa Rica*. — Few studies have considered the need of arboreal frogs to avoid predators while sleeping. Here, we examine the ways that arboreal frogs (*Hylidae*, *Eleutherodactylidae*, and *Centrolenidae*) in the lowlands of Costa Rica specialize in particular daytime sleeping microhabitats. Some species have been found sheltering in unfurling leaves of large-leafed tropical plants; others have been observed sleeping on the surfaces of the leaves of large-leafed plants. In this study, we assess the sleeping positions of ten species of arboreal frogs with reference to habitat and microhabitat. We identify two fundamental sleeping positions: 1) ectophyllic- sleeping attached to the flat surface of a mature leaf, and 2) endophyllic- sleeping within the confines of an unfurling, but partially rolled leaf. Ectophyllic individuals were found either on the underside of the mature leaf, or on top of the large leaf. There were more endophyllic individuals (106 frogs) found compared to ectophyllic individuals (89 frogs) and some species prefer a specific sleeping position. There were other distinctions in sleeping microhabitat selection based on species, including a difference in the height of the frogs above the ground ($p < 0.001$), as well as differences in the leaf shape of the leaves used as shelter sites. It was found that the production of new leaves was slow in many large-leafed plants and this could indicate that those types of shelters are difficult to obtain. Shelter sites were checked for returning individuals and it was found that these frogs use a shelter shifting strategy, changing sites from one day to the next. While these frogs spend their daytime sleeping, various predators seek them out. We hypothesize that these

predators heavily influence sleeping microhabitat selection and the use of a shelter shifting strategy by frogs. (97)

Carter, Ryan*, and Ron Kaltreider York College of Pennsylvania, York, PA 17405 *n-Hexane Increases Blood Vessel Formation in a Human U87 Glioblastoma in vivo Chicken Chorioallantoic Membrane (CAM) Culture System*. — Hexane is used in many industrial processes and has been shown a potential to negatively impact human health. While hexane has not been shown to be a human carcinogen, recent work has suggested it may lead to increased blood vessel formation (angiogenesis) in culture. As angiogenesis is critical for tumor cell growth, our study examined the effect of *n*-hexane treatments on blood vessel formation in an *in vivo* chicken chorioallantoic membrane (CAM) culture system. Human glioblastoma (U87) cells suspended in extracellular matrix were injected into viable 11 day old chicken embryos followed by treatments on day 14. CAMs were treated with *n*-Hexane (0.001M, 0.01M or 0.1M) or carrier agent as a control. On day 17, CAMs with tumors were excised, fixed in 4% paraformaldehyde, and blood vessel formation and density visually determined. All doses of *n*-Hexane dramatically increased blood vessel formation and density, while the carrier agent controls formed relatively few blood vessels. Our treatments had no effect on chicken embryo viability. These data suggest that an environmentally relevant dose of *n*-hexane (0.001M) can dramatically increase blood vessel formation *in vivo* and may play a role in the tumor cell proliferation process. (9)

Casey, Abigail*, and Amy Faivre Cedar Crest College, Allentown, PA 18104. *Protocol Development for DNA Extraction of Dried Plant Material of *Clitoria fragrans* (Fabaceae), for Future Microsatellite Analysis*. — *Clitoria fragrans*, commonly known as pigeon wings, is one of the many plant species endemic to the Lake Wales Ridge in central Florida. Due to the loss of habitat through agricultural and residential development, it is considered a federally threatened species and has experienced declines in numbers and sizes of its populations. To enhance on-going conservation efforts, this study aims to estimate patterns of gene flow and levels of genetic variation in some of the remaining populations of *C. fragrans* through the development of microsatellite markers, which will be used to assess genetic variation within and among the eight populations of *C. fragrans*. In order to do this, it was necessary to develop an optimal protocol for maximizing the concentration of extracted DNA from the silica-dried leaves of *C. fragrans*. After troubleshooting several modified protocols using a standard Qiagen kit, DNA was successfully extracted from *C. fragrans* using a protocol from MoBio and a BioSpec MiniBeadbeater 16. The protocol consistently produces DNA in concentrations ≥ 40 ng/uL, which can now be used for microsatellite primer development, eventually leading to population genetics studies. These data can be added to the current State and Federal Recovery Plans for *Clitoria fragrans*, and influence more effective conservation efforts. (118)

Chausse, Amber*, Kaitlin McDonald*, and Thomas Murray Elizabethtown College, Elizabethtown, PA 17022. *Macroinvertebrate Diversity and Sediment Composition in the Conewago Creek*. — The Conewago Creek is one of three US Department of Agriculture Showcase Watersheds in the Chesapeake Bay Drainage. Over 40 miles of the Conewago and its tributaries were listed on the Section 303(d) list of impaired waters in the late 1990s due to sediment and nutrient loading from agriculture. For more than a decade, a variety of best management practices have been employed throughout the watershed along with restoration projects along the main stem and its tributaries. This research assesses the current state of the Hershey Meadows, a restored portion of the Creek outside Elizabethtown, PA. At Hershey Meadows, more than 15 acres of wetlands and more than one mile of stream channel were restored. Three main channel locations along the Hershey Meadow Restoration Project were selected for sampling during the fall of 2015. The sites were chosen to capture the influence of an impaired tributary entering the site from the north. Sites were sampled three times during the fall of 2015 using the PA DEP's Instream Comprehensive Stream Evaluation Protocol. Habitat assessment, pebble counts and the Index of Biotic Integrity were determined at each site. The habitat assessment indicated poor conditions throughout, with increasing uniformity in fine particle sediments downstream. The pebble count indicated a shift in frequency from sand and gravel

to silt along that axis and the IBI results show that the macroinvertebrate community diversity decreased with distance as well. The most upstream site showed improved sediment and macroinvertebrate conditions from prior monitoring, and while still impaired, had fewer fine particles and greater diversity. The two downstream sites have yet to show changes in the bottom sediments and macroinvertebrate habitat, reflecting either the slow migration of fines being removed from the streambed upstream and/or the impact of the impaired tributary. (134)

Clement, Amadea*, Deborah Austin, Christine Proctor, and M. Dana Harriger Wilson College, Chambersburg, PA 17201. *An Analysis of Histamine Intolerance and its Correlation to Diet and Daily Activity*. — Histamine Intolerance (HIT) describes a non-immunologically mediated reaction caused by the intolerance to foods with high histamine levels and/or the inability to metabolize ingested histamine. Symptoms can mimic allergic reactions and other diseases making it difficult to diagnose. Estimates indicate that 1-8% of the population may be affected by HIT and nearly 80% of those experiencing HIT are women around age 40. Current research suggests factors such as stress, amount of sleep and exercise type can lead to an increase in histamine levels. This study focused on daily diet, stress, exercise, and sleep patterns of residential college students over a two week period. Volunteers were recruited, informed consent obtained and provided with an overview of the study. Participants maintained a diet and daily activity log for two consecutive weeks and provided urine samples at the end of each week. Histamine and its major metabolite, N-methyl histamine, are excreted in urine. A histamine sandwich ELISA was selected because of its sensitivity to both histamine and N-methyl histamine. Creatinine, a by-product of normal muscle contraction, is eliminated in urine at a constant rate. Creatinine levels were quantified using a creatinine colorimetric assay. Determination of the histamine/creatinine ratio for each urine sample accounts for the variable urine concentrations provided by participants, thus standardizing the histamine levels being analyzed statistically. The effect of the different variables on standardized histamine levels will be determined by a generalized linear model. A t-test will be used to compare standardized histamine levels from week one and week two. Results of this study may be used to further understand histamine intolerance and its correlation to diet and daily activity. (40)

Cobb, Jacquelyn*, Stephan Geneus*, and Eric Ho Lafayette College, Easton, PA 18042. *The Prevalence of Kozak Sequence in Mammalian Viruses*. — Protein translation is a cellular process by which mRNA sequence directs the incorporation of amino acids into protein. Ribosome is the major molecule to perform this function. To initiate protein translation in eukaryotes, the ribosome subunit 40S binds to the 5'-cap of an mRNA and scans for the translation initiation site in 5'-to-3' direction. The canonical sequence of the initiation site is AUG, namely the start codon. Mammalian start codon is usually found 10^2 - 10^3 nucleotides downstream from the 5' terminus of an mRNA. Skipping the first AUG sequence jeopardizes translation reading frame, resulting in abandoned or aberrant protein translation. In the 90's, studies mainly contributed by Prof. Marilyn Kozak discovered a sequence consensus gccRccAUGC, surrounding the start codon in vertebrate genes. Mutational studies of consensus sequence confirmed that its disruption caused aberrant translation initiation. As such the consensus sequence was named the Kozak sequence. Since viruses lack of ribosomal genes, the translation of viral proteins are performed by the host's ribosomes. Thus, we hypothesize that the flanking sequence of the translation initiation sites in viral genes should mimic the Kozak sequence of their host's genes in order to maximize protein translation efficiency. In this project, we devise a bioinformatics method to measure the coevolution of Kozak sequence between viruses and their hosts. We used the Positional Weight Matrix (PWM) method to capture the consensus sequence of 2,420 and 19,151 ORFs from mammalian viruses and human, respectively. The human PMW was used to score viral sequences, and vice versa. Results showed moderate mimicry between viral and human translation initiation sites. In the future, we are interested in identifying a subset of viral genes that shows strong mimicry to human initiation sites. These viral genes may shed light on infectious mechanism of the virus. (87)

Cohen, Ethan*, and Leocadia Paliulis Bucknell University, Lewisburg, PA 17837. *Annotation and Discovery of a Transcription Start Site in Contig 17 of the L Arm of Chromosome 3 in Drosophila*

elegans. — The fourth chromosome of *Drosophila melanogaster* is known as the dot chromosome. It is largely heterochromatic but has many genes that are expressed as abundantly as genes in euchromatic regions. The Genomics Education Partnership (GEP) uses the tools comparative genomics to study the unusual gene expression on the fourth chromosome in many species of *Drosophila* using the L arm of chromosome 3 as a control. This study focused on annotation of one of the control regions, contig 17 in the L arm of chromosome 3, an 8333 base pair sequence in *Drosophila elegans* (*D.elegans*), and obtaining the transcription start sites in this region (TSS). The project relied on the UCSC Genome Browser, Gene Record Finder, NCBI Basic Local Alignment Tool, Gene Model Checker and Flybase for information on both *D.elegans* and *D.melanogaster* (the reference species). The genomic region contained one gene with a single isoform, dele_ND-514.5AL, with no missing segments. When compared to *D.melanogaster*, this ortholog showed 66.9% identity conservation, indicating a high level of conservation between the two species. TSS for this gene were also annotated, using core promoters in *D.melanogaster* as a reference. The promoter was found to be peaked, indicating a single annotated TSS. Using the NCBI Basic Local Alignment Tool and the Genome Browser, blastn alignment, Multiz sequence conservation data, RNA-Seq coverage and TopHat splice junctions provided further evidence for the TSS location. This annotation will be combined with annotations of other members of the Genomics Education Partnership to help illuminate how gene expression is regulated in these regions of *Drosophila* genomes. (27)

Collare, Mark, and Paul Wilson* East Stroudsburg University, East Stroudsburg, PA 18301. *A Comparison of Decomposition Rates in Two Pocono Watersheds Using a Standardized Cotton Strip Assay*. — Traditional methods to assess the health of an aquatic ecosystem rely on measuring aspects of ecosystem structure such as macroinvertebrate diversity. However, ecosystem processes are often neglected in these assessments. One critical ecosystem process that has been measured is litter decomposition. Litter decomposition rates have been shown to be sensitive to human activities. Thus measurement of decomposition rates is a good candidate for assessing the condition of stream ecosystems. In the past litter decomposition rates have been measured using a litter-bag assay (Bocock and Gilbert, 1957). While these assays are inexpensive and easy to implement they do have shortcomings. Chief among these is variation in how the method is employed. Researchers have varied the bag size and mesh as well as the mass and makeup of the contents. Thus, it is difficult to compare studies using this method. Scott Tiegs and his coauthors have since developed a standardized method for measuring the decomposition of organic matter in streams using a cotton strip assay (Tiegs et. al., 2013). In the current study we utilize this method to compare three sites on the Brodhead Creek from its' headwaters at Rattlesnake Run to a point near its confluence with Paradise Creek. An additional segregated site on the Big Bushkill Creek was compared to these sites. Since decomposition rates are temperature dependent temperature loggers were deployed both in the creek and in the neighboring riparian habitat adjacent to the cotton strips at each site. Other physical characteristics such as discharge and substrate type were also measured. Finally, various aspects of water chemistry were assessed. These additional measurements allowed us to consider decomposition rates in light of both physical and chemical parameters. This work represents a contribution to the multinational study of stream decomposition rates currently being directed by Dr. Tiegs. (136)

Conboy, Andrew*, Mireille Atouelou*, and David Dunbar Cabrini College, Radnor, PA 19087. *The Isolation and Characterization of Arthrobacter Bacteriophage Species From Soil Sample Isolates*. — We have isolated and genomically characterized a group of *Arthrobacter* phages that infect the common host *Arthrobacter* sp. ATCC 21022 as part of a Viral Discovery course-based undergraduate research experience (CURE) hosted at Cabrini College and sponsored by the Howard Hughes Medical Institute (HHMI) and the South Eastern Consortium for Higher Education (SEPCHE). All nine phages isolated from soil samples have the myoviral morphotype and are very similar on the genomic level and are classified as being in Cluster AR according to the www.phagedsb website. Since cations have been shown to be important for phage infection we analyzed growth and infection conditions of all nine phages using different concentrations of calcium and magnesium ions using the bacterial

host *Arthrobacter sp.* ATCC 21022. All nine phages grow equally well with or without different amounts of calcium and magnesium ions. The genomes for the nine phages average approximately 70 kilobase pairs in length and contain on average 110 protein encoding genes. Comparative genomics analysis indicates all nine phages have the same gene homologs with a few minor exceptions of unique genes found in the left hand sides of the genomes. We have annotated the genomes of all nine phages and bioinformatically characterized and identified functions for many of the genes. Ongoing studies are aimed at experimentally determining the proteins that make up the purified virions using proteomics-based methods. (102)

Conway, John*, and Isaac VonRue King's College, Wilkes-Barre, PA 18711. *Investigating the Thermoreversible Gelation of Polycaprolactone Using Differential Scanning Calorimetry.* — Polycaprolactone (PCL) is a polymer of interest because of its potential use as part of drug delivery systems. This research was focused on better understanding the thermoreversible gelation that was observed in polycaprolactone (PCL) dissolved in *N,N*-dimethylformamide (DMF). PCL sample 6-24-11, with a molecular weight of 25,000 g/mol was dissolved in DMF with the mass fraction of PCL in solution varying between 0.215 and 0.312. Differential scanning calorimetry (DSC) was used to measure the transition temperature from gel to solution. Depending on the annealing temperature either one or two melting peaks were observed for PCL. When two melting peaks are present, the first melting peak is believed to be from the initial melting of poorly formed lamellae, which allows for partial recrystallization and then the second peak is from melting well-formed lamellae. PCL samples that were annealed close to the melting temperature showed a single melting peak. As the annealing temperature decreases a second higher temperature melting peak emerges and increases in size. While the relative proportion of poorly formed and well-formed lamellae changes, the total enthalpy of melting remained the same from approximately the annealing temperature at which the double peak first appeared down to lower annealing temperatures. Additionally, a direct relationship between the melting temperature and mass fraction of PCL was observed, with higher concentration samples melting at higher temperatures. (34)

Cooney, Deirdre*, and Barbara Fenner King's College, Wilkes-Barre, PA 18711. *The Effects of Oxidative Stress on the Heteroplasmic Regions of Mitochondrial DNA in SH-SY5Y cells.* — Parkinson's disease is a neurodegenerative disease characterized by the loss of enzymatic activity of the electron transport chain complex I. The loss of enzymatic function of complex I may be due to mutations in the heteroplasmic regions of mitochondrial DNA. Mitochondria are known to be particularly sensitive to oxidative stress; therefore, it is suspected that oxidative stress may play a role in mutating the mtDNA genome. In order to understand the effects of oxidative stress, it is important to first understand the effects that an oxidant has on overall cell survival. Hydrogen peroxide is a commonly used oxidant because it is a natural metabolite for many organisms and can be broken down into water and hydroxyl radicals. These hydroxyl radicals can act as a reactive oxygen species and may contribute to oxidative stress. This project examines the effect of hydrogen peroxide on cell survival of SHSY-5Y cells, an *in-vitro* model of neurodegeneration. SHSY-5Y cells were treated with various concentrations of hydrogen peroxide over different time spans in order to understand what conditions of hydrogen peroxide induce cell death. We initially hypothesized that treating cells at a concentration of 20 μ M H₂O₂ over the course of 96 hours would induce cell death. Our data support this initial hypothesis. Additionally, treating these cells with 10 μ M, 15 μ M, and 20 μ M hydrogen peroxide over the course of 120 hours also induced significant cell death. In light of these results, we want to use the concentration of hydrogen peroxide over the time span that does not significantly induce cell death. Therefore, the condition of hydrogen peroxide should be less than 20 μ M over a time of 96 hours or less because that was the shortest time shown to induce significant cell death. We now hypothesize that treating cells at a concentration of 15 μ M H₂O₂ over the course of 96 hours will induce oxidative stress in a population of SH-SY5Y cells. The mitochondrial DNA of these cells will be isolated and sequenced to see if the oxidative stress induced any mutations to the genome. When reading the sequence, particular focus will be spent on the gene that encodes for complex I in the heteroplasmic region to see if any mutations occurred. (69)

Corpus, Larry* Misericordia University, Dallas, PA 18612. *Leaf-miners of Luzerne County, Pennsylvania*. — The diversity, distribution, and host plant preferences of leaf-miners occurring at selected sites in Luzerne County was investigated during the summer and early fall, 2015. Leaf-miners collected during the study represented the Agromyzidae (Diptera) and the Gracillariidae (Lepidoptera). A total of 745 leaves of different shrubs and trees from different sites were visually inspected for leaf mines and the presence of larvae. Of that total, 145 leaves exhibited mine damage, and 90 had active larvae. Mined leaves were identified for host species records, photographed in the field, and taken back to the laboratory for further mine analysis. A total of 23 larvae of *Phytomyza* sp. (Diptera: Agromyzidae) were collected from 34 leaves of Trumpetweed, *Eupatorium fistulosum*. All of the agromyzid larvae produced blotch mines, whereby large sections of leaf mesophyll was consumed by 2-3 fly larvae. A total of 24 larvae of *Phyllocnistis* sp. (Lepidoptera: Gracillariidae) were collected from 56 leaves of Tartarian honeysuckle, *Lonicera tatarica*. All of the lepidopterous larvae were found in individual serpentine-shaped mines. Efforts at rearing pupae and adults from both leaf-miner species had limited success, as only three fly pupae and one adult were acquired by rearing, but research is continuing to determine what techniques may make rearing more efficient. (116)

Cuadrado, Venesa*, K. Joy Karnas, and Audrey Ettinger Cedar Crest College, Allentown, PA 18104. *Neuroprotective Effects of Crocin on Hydrogen Peroxide-Induced Apoptosis on Gallus gallus Bursal Lymphoblasts*. — Strokes are one of the leading causes of long-term disability worldwide and kill an average of one American every four minutes, according to the CDC. Ischemic strokes, those caused by blood vessel blockage in the brain, are the more prevalent type of stroke, comprising approximately 87% of all strokes. The leading treatment for ischemic strokes, tissue plasminogen activator (tPA), has a very constrained period of only three hours after stroke onset for effectiveness. Proper diagnostic testing must be performed to confirm an ischemic stroke, as administering tPA after hemorrhagic stroke could have fatal consequences. Even if tPA is administered in time, the brain tissue surrounding the site of the initial stroke is at risk of undergoing apoptosis, a type of programmed cell death. Apoptosis can continue weeks after the stroke and is thus a major target for pharmacological treatment to improve long term outcomes. Saffron has been used medicinally throughout history, particularly in South Asia; current research is testing whether any saffron components offer significant neuroprotection against apoptosis. The present study investigates crocin, a component of saffron, to determine if a crocin pretreatment of the chicken bursal lymphoma cell line DT40 can inhibit the progression of hydrogen peroxide-induced apoptosis. Hydrogen peroxide leads to apoptosis by activating the proteins Caspase-8 and Cytochrome C, and by negatively impacting mitochondrial membrane permeability. Results of previous studies indicate that crocin inhibits apoptosis by activating the PI3K/Akt pathway and increasing the expression ratio of Bcl2/BAX proteins. We show that pretreatment of cells with crocin allows for increased cell viability 24 hours after the induction of apoptosis via hydrogen peroxide when compared to control cells. Further experiments will investigate changes in gene expression that may account for the improved survival using PCR array analysis focused on apoptotic genes. (70)

Daly, Jennifer*, Juliann Jakeman, and Sheryl Fuller-Espie Cabrini College, Radnor, PA 19087. *Development of a Combined Boyden-Flow Cytometry Protocol to Investigate Cell Migration in Eisenia hortensis in Response to Chemotactic Agents*. — The ability of cells to migrate in response to various chemical signals is of key importance in normal cellular processes. It is known that mammals possess the ability to secrete specific chemicals to attract cells to different anatomical sites for a variety of purposes, for example the stimulation of immune responses through the production of chemokines and growth factors. Bacteria also possess the ability to carry out positive and negative chemotaxis in response to changes in the chemical composition of the environment that are favorable or toxic, respectively. Studies have been conducted using invertebrate models to test the conservative nature of the innate immune system in response to mammalian chemoattractants and growth factors, and pathogen associated molecular patterns (PAMPs). In contrast to traditional migration assays which utilize microscopic methods for post-migratory cell enumeration, the combined Boyden chamber-flow cytometry technique has proven to be more accurate and efficient based on studies involving

chemotaxis of human leukocytes. Using the earthworm *Eisenia hortensis* as our invertebrate model, our goal was to employ the combined technique using five different chemoattractants to develop a novel *in vitro* method for determining the conservation of chemotactic pathways. The chemoattractants included: the PAMP formyl-methyl-leucyl-phenylalanine (fMLP); the growth factors connective tissue growth factor (CTGF), vascular endothelial growth factor (VEGF), and transforming growth factor beta (TGF β); and the chemokine interleukin 8 (CXCL-8). As a positive control COS-7L cells were included in all assays performed. The data indicates significant migratory response towards TGF β compared to control samples following a 20h incubation period. However, this response was not reproducible in subsequent assays. Significant chemotactic responses to the remaining four chemoattractants VEGF, CTGF, CXCL-8, and fMLP were not observed. Concentrations of chemoattractants higher than what were used in this preliminary study may be required to stimulate chemotaxis in earthworm coelomocytes. (38)

De Salle, Samantha*, Thomas Kelly, and Sara Turner Mercyhurst University, Erie, PA 16546. *The Prevalence of Borrelia burgdorferi in Ixodes scapularis on Presque Isle.* — Deer ticks, *Ixodes scapularis*, can often be pathogen carriers for the bacteria *Borrelia burgdorferi*. When *I. scapularis* transmit the bacterium to humans through bite, it leads to Lyme disease. It has been documented that *I. scapularis* have spread throughout the Northeast United States over the past few decades. Surveys have shown that *I. scapularis* are present on Presque Isle State Park. More than four and a half million visitors come to Presque Isle annually, making it one of the most popular state parks in the United States. Due to the high traffic, it is crucial to monitor the *I. scapularis* population as it is often a vector for pathogens that may be fatal to humans and animals. While Lyme disease is often nonfatal, other pathogens carried by ticks such as the bacteria genus *Ehrlichia* can lead to Ehrlichiosis which has a fatality rate reaching 5%. DNA analysis of ticks collected by flagging to determine if they were vectors for *B. burgdorferi* was then conducted through the use of a Polymerase Chain Reaction and gel electrophoresis. All samples were tested to determine if DNA was present before being tested for Lyme disease. (1)

Dochat, Clare*, Georgie Scott*, Dr. Cynthia Keler, and Dr. Gregory George Delaware Valley University, Doylestown, PA 18901. *Prevalence of Salmonella typhimurium in House Sparrows on DVU Campus and Antibiotic Resistance Profiles.* — This project was designed to determine the prevalence of *Salmonella typhimurium* on the campus of Delaware Valley University. This was done by capturing and collecting fecal samples from House Sparrows (*Passer domesticus*), a commonly infected species, found on campus. The samples were then tested to find the presence of the bacterium. The samples positive for *Salmonella*, as well as several other strains of bacteria, were tested using the Kirby-Bauer method. Tetracycline (Te30), amoxicillin (AmC30), cefotaxime (CTX30), gentamicin (GM10) and Sulphamethoxazole/drimethoprim (SXT25), antibiotics commonly used against the Enterobacteriaceae family were used. Both samples of *Salmonella*, along with many of the other strains of bacteria found, were discovered to be either fully resistant or in the intermediate ranges of the antibiotics. SXT25 was the only antibiotic to have any of the bacteria show susceptibility. (79)

Dolcemasclo, Leigha*, Justin Liu, Bridgette Sission, and Robin P. Ertl Marywood University, Scranton, PA 18509. *Adaptation of Phytoplankton to Ocean Acidification.* — Similar to climate change, the increasing levels of CO₂ have had a significant impact on the pH of the world's oceans. The total effects of ocean acidification are largely unknown. Phytoplankton are ideal organisms to investigate these questions because they are on one of the lower tiers of the food chain, and, as single cell organisms they cannot defend against changes of more than half a pH unit. Conveniently, *Nannochloropsis gaditana* has been cryopreserved from the Great South Bay along the south shore of Long Island, NY since the early 1950s. Much like the ever-decreasing pH of the ocean's from 8.3 to the current 8.1, the Great South Bay's levels have also decreased to the current pH of 7.6. Thus, using this organism from this location, collected and cryopreserved over-time, permits the determination of how organisms adapt to changing environmental conditions. This model can be

extrapolated to understand how algae in the ocean may adapt if the ocean pH continues to fall. The work presented shows that *Nannochloropsis gaditana* collected in 1952 will not grow at a pH lower than 7.9, yet the same algae collected in 2015 is normally found growing at a pH of 7.6. This indicates that *Nannochloropsis gaditana* has adapted to changes in the environment over an evolutionary short period of time. These results not only have an implication on algal survival but also on the survival of organisms that directly or indirectly use them as a food source. Which types of algae survive may alter the diversity of organisms further up the food chain, and because of algae toxicity, these species may no longer be commercially viable for human consumption. (55)

Doran, Taylor*, Courtney Godbolt, Kelcy McIntyre*, and Amy Faivre Cedar Crest College, Allentown, PA 18104. *Variation in Pollen Viability at the Individual Plant Level Assessed in Christmas Cactus (*Schlumbergera xbuckleyi* var. Magenta) Following Time Since Flower Anthesis.* — The hybrid (*Schlumbergera x buckleyi*) has several hundred varieties, often known collectively as “Christmas cacti”. They have important economic value in both the United States and Europe where they are commonly purchased as house plants. Our lab has been studying the reproductive biology of one of these varieties (*Schlumbergera x buckleyi* var. Magenta). Plants in the greenhouse do not produce fruits or seeds. Thus, while one group in our lab has been studying the potential incompatibility system of this variety, we have been estimating its pollen viability. In this study samples of pollen grains were collected from flowers one, two and three days following anthesis and stained using a lactophenol-aniline blue stain. This stain is ideal as a fairly quick way to assess pollen viability. The presence of stained cytoplasm is used as a proxy for pollen viability. Thus far our results suggest fairly high pollen viability in the nine plants tested, regardless of time since anthesis. However, there is some variation in pollen viability among individual plants. These data are important for providing insight into the potential for fertilization success in this variety of Christmas cactus. (119)

Dunworth, Matthew*, and Steven James Gettysburg College, Gettysburg, PA 17325. *A Functional Analysis of the 5' Regulatory Region of the *Aspergillus nidulans* *snxA* Inhibitor of Cell Division.* — Here we report a functional analysis of the 5' regulatory region of the *snxA* (suppressor-of-nimX^{cdc2}) gene of *Aspergillus nidulans*. Recessive *snxA1* and *snxA2* mutations confer a cold-sensitive G1 cell cycle arrest and exhibit strong repression of mRNA and protein expression. *snxA* encodes two alternately spliced mRNAs, both of which are transcriptionally down-regulated in the mutants. To unravel the mechanism of transcriptional repression, the gene was exhaustively sequenced, and surprisingly contained no DNA mutations in the coding and flanking regulatory regions. Furthermore, non-overlapping plasmid-based DNA fragments spanning the *snxA* 5' regulatory region were able to complement, or partially complement *snxA1* cold-sensitivity. These paradoxical findings, *i.e.*, rescue by non-overlapping DNA fragments and absence of DNA sequence changes in the region corresponding to the complementing fragments, suggests that chromatin alterations in the *snxA* 5' regulatory region may account for decreased RNA and protein expression in the mutants. In order to better understand *snxA* transcriptional control, strategic 5' deletions are being used to map cis-acting elements that drive expression of the two alternate transcripts. To date, we have used a PCR-based approach to generate four different deletions, intended to identify required promoter regions for each of the alternate transcripts. The deletion constructs are being cloned into a targeting vector, after which they will be integrated at a heterologous locus in a strain harboring a complete deletion of *snxA*. Transformants will be assessed for rescue of *snxA* cold-sensitivity, followed by qRT-PCR to measure mRNA expression for each *snxA* transcript. Our ultimate goal is to identify, by chromatin immunoprecipitation (ChIP), epigenetic alterations that underlie transcriptional repression in the mutants. This project will help to locate the relevant 5' DNA regions for interrogation by ChIP experiments. (22)

Eastgate, Danielle*, and Cosima Wiese Misericordia University, Dallas, PA 18612. *Effects of Acidification on Biomass and Rubisco Content of the Aquatic Plant Duckweed (*Lemna minor*).* — In Pennsylvania, lack of control of acid mine drainage from abandoned coalmines is the largest single

source of pollution, leading to acidification in water sources (Smith & Skema, 2001). *Lemna minor*, or common duckweed, is regarded as a bioindicator of ecological relevance and may show visible signs of damage when exposed to environmental changes (Garczarska & Ratajczak, 2000). The objective of this study was to determine the effects of varying levels of acidification on growth and photosynthesis in the aquatic plant duckweed (*L. minor*). It was hypothesized that there is no significant difference in total biomass or Rubisco content between different pH treatments. Duckweed plants were grown in a modified Hoagland's solution at pH 4, 5.4, and 6.5 under controlled conditions in a growth chamber for 10-12 days. Total biomass and Rubisco quantity were determined for three replicates for each pH treatment in two independent experiments. There was no statistically significant difference in biomass between pH treatments for the first experiment; however, the second experiment showed significant declines in biomass accumulation resulting from plant exposure to a pH of 4 as compared to pH 6.5. This decrease in biomass was not related to changes in Rubisco, as Rubisco quantity did not differ between treatments at the end of the 10-day exposure period. This type of basic research can contribute to a broad understanding of how acidic conditions affect biochemical reactions in plants and what the larger implications of acidic conditions are for plant growth, reproduction and survival. (139)

Erney, Tiffany*, and Angela Asirvatham Misericordia University, Dallas, PA 18612. *The Effect of Nicotine on Anchoring Proteins and Phosphodiesterases in Rat Pheochromocytoma Cells*. — This study investigates the effect of nicotine on the expression of A-Kinase anchoring proteins (AKAPs) in the rat pheochromocytoma (PC12) cell model. In dopaminergic neurons of the central nervous system nicotine binds to the acetylcholine receptor to initiate dopamine secretion. Dopamine binds to its receptor which results in the activation of cyclic-AMP-protein kinase A-mediated signaling pathway. In the cell, protein kinase A is anchored by AKAPs a family of scaffolding proteins that bind several other signaling molecules. Not much is known about the effect of nicotine on downstream signaling effectors of the cAMP pathway. To determine the effects of nicotine on AKAPs, PC12 cells were incubated with medium only (control) or medium with increasing concentrations of nicotine at 3.115×10^{-5} M, 4.361×10^{-5} M and 62.3×10^{-5} M for 24 hours. Western blot analysis revealed that in comparison to control, PC12 cells incubated with nicotine at all concentrations showed a decrease in AKAP95 protein. However nicotine treatment at 4.361×10^{-5} M revealed an increase in AKAP95 in comparison to other treatments. The nicotine treated cells were also analyzed for the intracellular location of AKAP95 and the cAMP terminating enzyme phosphodiesterase 7A. Preliminary experiments using immunofluorescence analysis show that both AKAP95 and PDE7A are present in PC12 cells in the nucleus and cytoplasm respectively. Nicotine treatment of the PC12 cells did not cause any noticeable change in the location of the proteins. These findings suggest that nicotine treatment influences downstream signaling pathways in PC12 cells. (65)

Ertl, Robin P.* Marywood University, Scranton, PA 18509. *A SENCER Approach to Environmental Toxicology: Preparing Students for the Real World*. — The SENCER (Science Education for New Civic Engagements and Responsibilities) approach attempts to engage students in otherwise dull material by applying it to complex, contested, capacious, current, and unresolved public issues. It is hard now a days for standard lecture courses, which provide a solid foundation that hopefully can be used in the future, to compete with the current fast paced glitzy world that exists in the here and now. Students can see and do so much more on the internet that it becomes challenging to engage students in basic material. While students may have done or seen more advanced techniques in high school they don't fully grasp that information or have the ability to apply that knowledge. To get students to reexamine and fully understand this material requires the ability to captivate their attention. One approach is to attempt to solve a problem that excites the students and in the process work back to the basic information needed. Thus, in this approach you don't need to change the material covered in the course but merely the questions asked and the ultimate goal. This presentation examines the successes and failures of applying this approach to a first year college course in environmental toxicology. Students started by creating a position paper about an environmental issue that they were passionate about, considering it from all sides. They then distilled this information down to a 5 minute presentation in

order to lobby a congressional representative. In the process the students had to gain a strong grasp of the basic concepts in order to effectively lobby the issue. In the end they also gained an appreciation of what is needed to change public policy. (52)

Essick, Benjamin*, and Meda Higa York College of Pennsylvania, York, PA 17405. *Designing a Soluble Hantavirus Glycoprotein Construct as a Tool for Investigating Viral Entry in Host Cells.* — Hantavirus are enveloped, single stranded negative sense RNA viruses in the Bunyaviridae family. Hantaviruses can cause potentially fatal diseases in humans. The hantavirus genome is comprised of three negative sense RNA segments: small, medium, and large. Each segment encodes structural and proposed pathogenic components. The middle segment (M) encodes a polyprotein which is cleaved resulting in glycoproteins Gn and Gc. Specifically Gn has been found to play a role in viral entry into host cells. In order to determine the interaction between viral and host cells a construct was developed with the final goal to utilize Gibson assembly in order to analyze viral-host interactions. Gn glycoprotein was inserted into a GFP vector in order to visualize protein production. The overarching goal is to produce a cloned, tagged soluble fragment as a target antigen for antibody production. Antibodies will be further explored in order to understand the glycoprotein Gn's role in viral entry. (85)

Evans, Erica*, and Darlene Melchitzky Mercyhurst University, Erie, PA 16546. *Reciprocal Connections Between the Mediodorsal Thalamic Nucleus and Somatosensory and Posterior Parietal Cortices in the Macaque Monkey.* — The mediodorsal (MD) thalamic nucleus is the principal source of thalamic input to the prefrontal cortex, with less robust projections to other cortical areas in the frontal lobe, such as premotor cortex. However, projections from the MD to cortical regions outside the frontal lobe have not been as well examined. In this study, injections of a mixture of the retrograde tracer cholera toxin b subunit (CtB) and the anterograde tracer biotinylated dextran amine (BDA) were made into discrete locations in the lateral portion of the MD in two monkeys. As expected and as previously reported (Erickson and Lewis, J. Comp. Neurol., 473:107-127, 2004), projections to the frontal lobe were observed. Interestingly, in one animal, CM250, robust connections with S1, S2 and posterior parietal areas were also observed. Specifically, both CtB-labeled neurons as well as BDA-labeled axons were observed in all of these areas. In contrast, no projections between the MD and these parietal areas were seen in the other animal, CM228. In both animals, CtB-labeled neurons were also seen in medial temporal lobe structures, but BDA-labeled axons were only observed in CM228 in this region. These findings indicate that discrete locations within the MD project to non-prefrontal cortical areas in a topographically distinct pattern and suggest that the MD plays a more significant role in somatosensory information processing in the brain than previously realized. (43)

Felt, Kristen*, Alexander Nedo, Ryan Doan, Cassondra Andreychik, and Leocadia Paliulis Bucknell University, Lewisburg, PA 17837. *Coordinated Movements of X1 and X2 Chromosomes in the Absence of Physical Connection in Spider Spermatoocytes.* — During cell division, connections between chromosomes can guarantee that the chromosomes will move together. Interestingly, there are some cases where unconnected chromosomes move together. We use the sex chromosomes of male spiders in the $X_1X_1X_2X_2$ (female)/ X_1X_20 (male) sex determination system to study coordinated chromosome movements. The X_1 and X_2 chromosomes are nonhomologous and, in male meiosis, always associate with the same spindle pole from prometaphase I through telophase I. In some cells, X_1 and X_2 are separated by a gap, suggesting that they might not be connected. In addition, we found that X_1 and X_2 are easily separable by micromanipulation in metaphase I, which suggests that they are able to move together in the absence of physical connection. In general, X_1 and X_2 do not change position following their initial attachment. However, when X_1 and X_2 are removed from the spindle using a micromanipulation needle and placed in the center of the cell, they are able to attach to the spindle and move towards opposite poles. Placing X_1 and X_2 at opposite poles did not prevent the initiation of anaphase I, showing that the cell does not detect errors in sex chromosome distribution during the division process. We hypothesize, based on these results, that X_1 and X_2 form a very early attachment to the spindle—perhaps prior to nuclear envelope breakdown. Following the initial coordinated attachment, X_1 and X_2 are not monitored by the cell. We hypothesize that this lack of monitoring could

lead to catastrophic gain or loss of sex chromosomes if something causes the spindle to break down during meiosis I. (59)

Ferguson, Briana*, and Amy Faivre Cedar Crest College, Allentown, PA 18104. *Using Pollen-Tube Growth to Examine the Incompatibility System of Schlumbergera xbuckleyi var. Magenta.* — *Schlumbergera xbuckleyi* var. Magenta is one of many varieties of *S. xbuckleyi*, a hybrid commonly known as the Christmas cactus. Some species and varieties within the *Schlumbergera* genus have been reported to be self-incompatible, but at least one variety of *S. xbuckleyi*, has exhibited self-compatibility and has been able to produce fruits and viable seeds. Previous studies in our lab on self-crosses and out-crosses of *S. xbuckleyi* var. Magenta have given mixed results, with neither cross leading to pollen tube growth to the ovules. In this study flowers were left on the plant for seven days following hand-pollinations, approximately the amount of time between flower anthesis and flower dehiscence from the plant. Flowers were harvested, preserved, stained, and observed using fluorescence microscopy to determine pollen tube germination and extent of growth. Results show variable lengths in pollen tube growth among individual flowers, but no differences between self and outcrosses, and no pollen tubes reaching the ovules. Patterns of pollen tube growth will be determined on a per plant basis. This will allow for a comparison with the data collected from another group in our lab on pollen viability. This study will enable us to determine the compatibility system of this variety of *S. xbuckleyi*, and whether its inability to set seed is related to pollen quality. These data are beneficial to the horticultural field to enhance the preservation of this variety. (5)

Figueroa, Sabrina*, and Cosima Wiese Misericordia University, Dallas, PA 18612. *Effects of Zinc Accumulation on Lemna minor.* — Heavy metals are typically present in low concentrations in freshwater habitats. With pollution rising, this could increase the amount of heavy metals found in bodies of water (Horvat *et al.*, 2007). The metals accumulating in these freshwater areas are considered contaminants, which result in a decline in the environment and some of the native species (Saygideger and Dogan, 2004). The objective of this study was to measure the impacts of zinc exposure on key physiological processes in the model organism *Lemna minor* (or common duckweed), such as photosynthesis, and to examine its responses to stress conditions. *L. minor* was grown in a growth chamber in a modified Hoagland's solution containing three different concentrations of zinc, including 0, 2 and 4 µg/l. Impacts of zinc exposure on growth and photosynthesis were examined by measuring changes in biomass, chlorophyll content and Rubisco quantity after 10-12 days of exposure. Exposure to elevated zinc caused a significant decrease in the biomass and chlorophyll concentration of *L. minor* after a 10-day exposure period as compared to the control; however, Rubisco quantity remained unaffected by the zinc treatment. Reductions in chlorophyll content could negatively impact photosynthetic capacity and may, in part, explain the reduced biomass measured in the samples. Rubisco content was expected to decline concomitantly with the chlorophyll concentration, but this did not occur. Results indicate that elevated zinc levels can negatively affect aquatic ecosystems. (141)

Fisher, Andrew *, and Barbara Fenner King's College, Wilkes-Barre, PA 18711. *Effects of Retinol on Neuronal Phenotype, Morphology, and TrkB.T1 Expression in SH-SY5Y Cells.* — SH-SY5Y neuroblastoma cells are a thrice-cloned cell line used for *in vitro* research and are comprised of substrate (S-type) and neuronal (N-type) subpopulations which have different morphologies and characteristics. Previously, retinol (RA) has been shown to increase dendrite and axon growth and increase the N-type population of SH-SY5Y cells. Brain-derived neurotrophic factor (BDNF) signaling through TrkB receptors is one mechanism that mediates neurite outgrowth. Differentiated SH-SY5Y cells express the full-length TrkB receptor, but the expression of the truncated TrkB isoform (TrkB.T1) has not been characterized in SH-SY5Y cells. Therefore, we aimed to characterize the effects of RA on: the proportion of N-type versus S-type SH-SY5Y cells, dendrite and axon outgrowth, and the intensities of TrkB.T1 expression at different levels of differentiation. Triple-label immunofluorescence microscopy was used to identify TrkB.T1, axons, and dendrites within our cultures. Current studies are quantifying

neurite growth using ImageJ software. TrkB.T1 expression has not yet been characterized, but will be characterized using Metamorph software. (66)

Fogelman, Kaelyn*, and David Matlaga Susquehanna University, Selinsgrove, PA 17870. . *Effects of Japanese Knotweed (*Fallopia japonica*) Detritus on Benthic Macroinvertebrate Communities of the Susquehanna River Main Stem.* — Japanese Knotweed (*Fallopia japonica*) is an invasive species rapidly spreading throughout the understory of Riparian forests in Central Pennsylvania. There are concerns that this species may impact aquatic ecosystems because allocthonous material forms the basis for aquatic food webs and can impact benthic communities. This study assesses the effects of Japanese Knotweed leaf litter on the benthic macroinvertebrate communities of the Susquehanna River. Three distinct sites within the Susquehanna were chosen to compare benthic macroinvertebrate communities within Japanese knotweed and American sycamore (*Platanus occidentalis*) leaf packs. Experimental leaf packs were removed after 25 and 50 days of exposure. In addition, we are quantifying the accumulation of knotweed and sycamore biomass in naturally occurring leaf packs in the Susquehanna River. Sycamore and knotweed represented approximately half of the total biomass in naturally occurring leaf packs following abscission in the fall of 2015. We predict that macroinvertebrate communities within low-quality knotweed litter will have relatively low diversity compared to high-quality native sycamore litter. This study will begin to evaluate how the riparian invader, Japanese Knotweed, influences the benthic communities of the Susquehanna River. (132)

Frey, Tiffany*, Jordyn Sagner, Stephanie Dea, and Stephen Mech Albright College, Reading, PA 19604. *The Short and Long-Term Effects of Habitat Disturbances on *Peromyscus leucopus*.* — Habitat disturbances, such as logging and natural disasters, affect many species because they disrupt the local ecology. Fragmentation in habitats has a significant impact on small mammal populations. Small mammal species are good indicators of forest health. To determine the effects that logging and natural disturbances have on small mammal populations, we used mark-recapture methods in live trapping grids. We estimated population sizes of white-footed mice (*Peromyscus leucopus*) in a long-term grid and compared these values to historic data (2003 and 2004) to determine how a selective logging event in 2012 impacted this species. We also assessed mammalian densities in multiple disturbed areas of the forest to determine the short-term effects of habitat fragmentation. Additionally, we assessed vegetation surrounding trapping areas to determine how vegetation influences capture success. Within year comparisons showed higher population densities in unlogged versus logged areas. The magnitude of this effect depended on the type of disturbance, however, with the clear-cut site having the lowest population density. Comparing the post-logging densities to pre-logging densities, we found significantly higher densities pre-logging, but this was likely due to an abnormally high density in 2004. We found significant differences in vegetation patterns between pre- and post-logging data including the appearance and dominance of an invasive grass species. Within-site analysis of vegetation data revealed that horizontal and vertical cover are the best micro-habitat predictors of capture rates. Overall, we conclude that logging has some impact on small mammal populations, but these impacts are due primarily to microhabitat changes rather than changes in the community structure. (123)

Fry, Andrew *, Williams Nathaniel*, and Cavender Jane Elizabethtown College, Elizabethtown, PA 17022. *Cannabinoid Receptor 2 Expression and Its Role in Tumorigenesis.* — The Cannabinoid receptor 2 (CBR2), is a G-protein coupled receptor primarily expressed in inflammatory and immune-competent cells. The proposed mechanism of action in the immune system is that upon binding the ligand, the G-protein coupled receptor dissociates into α and $\beta\gamma$ subunits with the latter regulating phospholipase C isoforms and activating the MAP kinase signaling network. Recent research has shown tumor expression of CBR2, and it is postulated to be a target for chemotherapeutic treatment. The tumor cell expression has been correlated to a decreased patient prognosis yet the cellular pathway has not yet been elucidated. It is unknown if CBR2 expression in tumors is a cellular response to counter oncogenic stress or contributes to mitogenic stimulation. To gain a clearer understanding of CBR2 prevalence and expression levels we investigated commonly used cells in culture and tumor cell lines, specifically human keratinocyte (HaCAT), human diploid fibroblasts (HDF+tert), human embryonic stem cell (293T)

and monkey kidney fibroblast (CV1), HeLa (cervical carcinoma), and SaOs₂ (Osteosarcoma). CBR2 expression was found using immunofluorescence in all cell lines except the human diploid fibroblasts. Immunoblot analysis detected the highest level of expression in CV1, HeLa, HaCat and 293T. This high expression level was mirrored in IHC of several cervical and melanoma tumor sections. These results indicate that CBR2 expression is not solely the result of telomerase expression or an artifact of cell culture and experimental models may be a useful tool to investigate the role that CBR2 plays in the initiation and maintenance of cellular transformation and tumorigenesis. (107)

Gannon, David*, and Kurt Robert Lafayette College, Easton, PA 18042. *Effect of Palbociclib Treatment on Activity of CDK 4/6 Kinases in MCF-7*. — Breast cancer is a significant cause of death in females in the United States and the world. In 2014 there were 232,570 new cases of breast cancer, and 40,000 deaths in the United States. Traditional chemotherapies, surgery, and radiation produce harmful and damaging side effects. Patients will generally report 20 negative side effects due to a chemotherapy regimen. Palbociclib offers a solution to the harmful side effects of current treatments. The drug is a cytostatic agent; a newer but less prevalent treatment option that halts tumor or cancer cell growth without markedly affecting other rapidly dividing cells in the body. As a result, palbociclib potentially offers a more tolerable treatment option for patients with breast cancer. Here we evaluated the drug to determine its mechanism in vitro in the human breast cancer cell line MCF-7 (estrogen receptor positive). Initial studies examined the effects of 62nM to 1uM of palbociclib on MCF-7 cells and showed a marked decrease in cell proliferation compared to the control. Since others have reported that the drug disables cell proliferation by binding to the CDK 4 and CDK 6 kinases, which serve as important checkpoints in the cell cycle, we are comparing the sensitivity of palbociclib to each kinase in MCF-7 cells. To accomplish this we are using RNA interference to down-regulate each kinase and after treating the cells with palbociclib, cell proliferation, viability and kinase levels are being examined to determine whether CDK 4 or the CDK 6 kinase are a more important target of palbociclib. Ultimately, results from this study may lead to a better understanding of palbociclib mechanism which may lead to improved treatments of breast cancer. (111)

George, Gregory, and Scott Godshall* Delaware Valley University, Doylestown, PA 18901. *Determining Population Densities of the Cerulean Warbler (Setophaga cerulea) in the Delaware Water Gap National Recreation Area*. — The Cerulean Warbler (*Setophaga cerulea*) is a small, insectivorous, Neotropical migrant that breeds in mature deciduous forests of eastern North America and winters along the Andean montane subtropical forests of northern South America. They were once a common forest warbler until the population began to decline in the mid 1900s. Partners in Flight has ranked the Cerulean Warbler second overall, in the Northeast region, for species warranting immediate conservation action. Cerulean Warblers prefer mature deciduous forests with a diverse canopy structure including tall, large diameter, trees with an open under-story. Historically, Cerulean Warblers were primarily associated with mature floodplain forest, like the Delaware Water Gap National Recreation Area. Throughout their range, this habitat type has experienced substantial losses as floodplain forests have largely been converted to farmland. Northeastern Pennsylvania is one of the few areas showing growth in Cerulean Warbler population densities. This study examined how song rate variation might influence estimates of species density. An audio lure playback was used to elicit a response from birds in an attempt to see if augmenting traditional survey methods with audio playbacks influences our interpretation of species density. Territory density was quantified using spot-mapping techniques. We alternated between traditional passive spot-mapping and spot-mapping assisted with audio playback with eight survey bouts per method. Results showed a significant difference ($p < 0.01$) between detection rates based, on the two methods, when compared using a non-parametric Welch's t-test with minimal standard error. The audio playback method resulted in the identification of 18.75% more territories compared to traditional spot-mapping. Additionally, a territory accumulation analysis determined territory audio playback to be twice as efficient compared to traditional methods. Conservation implications from this project will assist in more accurate territory delineation and population estimates for this species of concern. (94)

Gerhard, Emily*, Gabrielle Montone, and Darl Swartz Delaware Valley University, Doylestown, PA 18901. *qPCR Assay for Rapid Sexing of Avian Species*. — Sex determination of avian species is important in wild birds and those used in the poultry industry. The research goal was to design a robust and rapid duplex qPCR assay using post-run high-resolution melt temperature (HRM) analysis to determine avian sex. A divergent gene region unique to the W chromosome is the HINTW gene. Sequence alignment of this gene region for avian species gave a phylogenetic tree showing two major clades, non-*Galliformes* and *Galliformes*. Sequence differences were too large for development of a single primer set for all species so focus was narrowed to *Galliformes*. Homologous regions were used as target sites for primer design and subsequent amplicon features. Another avian-specific gene (EEF2.8) was amplified to confirm the presence of DNA in crude samples. A duplex assay was designed to give unique amplicon melting temperatures for the HINTW and EEF2.8 amplicons. Rapid and inexpensive isolation of crude DNA from chicken feathers and embryo samples used Chelex treatment and heating. A DNA standard was obtained from adult female blood using traditional methods. Analysis of the standard showed amplification efficiencies of 96 – 103%, a higher copy number for the HINTW gene, distinct melting temperatures for each amplicon, and the duplex assay readily demonstrated the HINTW and EEF2.8 amplicons in the HRM analysis. To test robustness, adult sexed feathers and chick embryonic membranes were processed and assayed. Feather results showed that 97% had amplifiable DNA for the EEF2.8 gene (n=30) and a 100% success rate for sex determination (n=14 male and 15 female). Using chick 5d, 11d, and 15d embryonic membranes, 97% of the samples had amplifiable DNA (n=35) with 48.6% being female. The results show that the assay is effective, robust, potentially non-invasive, and amenable to high throughput development for the poultry industry. (31)

Gilvary, Coryander*, Nichole Rigby, and Rob Kulathinal Temple University, Philadelphia, PA 19119. *Genetic Architecture of Rapidly Evolving, Sexually Dimorphic Networks in *Drosophila melanogaster**. — Sexually dimorphic traits are among the most diverse characters in animal species, and have been implicated in a wide range of important evolutionary processes including sexual selection and reproductive isolation. However, we still know very little about the underlying genetic architecture of sexually dimorphic characters such as behavior, fertility, and morphology, including their pleiotropic and epistatic properties and how such phenotypes interact and co-evolve as networks. *Drosophila melanogaster* provides extensive data on phenotypes, associated genes and their alleles, estimates of sex-bias gene expression, and evolutionary histories making it an ideal model organism for this study. Here, we apply a network analysis across sexually dimorphic traits in the genetic model, *D. melanogaster*, to study topological characteristics as well as the co-evolution of their subgraphs. We will employ this systems-based approach of mapping phenotypes to genotypes to compare network properties and attributes of other classes of sex-limited phenotypes. We will identify spatial and temporal contributions by including developmental time-series RNAseq expression data. Our ultimate goal is to understand the evolutionary constraints of these networks in sexual selection models such as female choice, runaway selection, and sexual conflict, as well as their subsequent role in population divergence. (60)

Glaser, Patrick *, and Brad Rehnberg York College of Pennsylvania, York, PA 17405. *Effects of Exercise on Whole Gut Transit Time of Adult CD-1 Male Mice*. — Colorectal cancer is the second most common form of cancer in Western countries. Treatments that reduce gastrointestinal transit time have been shown to reduce the risk of colon cancer. Drugs such as polyethylene glycol (PEG) can decrease transit time and have been found to inhibit the growth of intestinal tumors. If exercise is found to decrease transit time, similar to PEG, it could be linked to reducing the risk of colon cancer. However, studies have produced contradictory results on the effects of exercise on whole gut transit. The purpose of the study was to determine how exercise influences whole gut transit time in mice. Whole gut transit time of mice taking low-dose polyethylene glycol and mice with no treatment were measured as controls. The hypothesis is that exercise will produce a greater decrease than polyethylene glycol on whole gut transit time. Thirty CD-1 mice were separated into 3 groups: negative control (no treatment), positive control (PEG), and experimental (voluntary exercise). The exercise group exhibited a longer

transit time than other groups. Average transit time of the polyethylene glycol group was only 5 min shorter than the transit time of the negative control group. The negative control group had the highest water content in the stool and exercise had the lowest water content. Explanations for these results could be linked to food and water consumption. Consuming large amounts of food without proper hydration can increase whole gut transit time and if not properly hydrated, exercise can increase transit time. (91)

Glavich, Kelsey*, and Cosima Wiese Misericordia University, Dallas, PA 18612. *Effects of Atrazine Exposure on Lemna minor*. — Atrazine, an agricultural herbicide, is one of the herbicides used in the United States that is designed to kill their targeted plants, specifically broadleaf weeds. Atrazine may enter bodies of water through run-off, potentially impacting non-target aquatic macrophyte plants such as *Lemna minor*. The purpose of this research was to observe and measure the toxicity and impacts of Atrazine on photosynthesis and growth of *L. minor*. For 10 days, *L. minor* was grown in a modified Hoagland solution with added Atrazine at concentrations of 0 µg/L, .1 µg/L and .3 µg/L in an environmental growth chamber. The toxicity of Atrazine on *L. minor* was assessed by measuring biomass, chlorophyll content and Rubisco quantity. Results showed a reduction in chlorophyll content of *L. minor* as the Atrazine concentration increased, while the final biomass and Rubisco content were not significantly affected by Atrazine exposure. (142)

Good, Clayton*, Mel Zimmerman, and Shawn Rummel Lycoming College, Williamsport, PA 17701. *Comparing the Growth Rates and Population Parameters of Salvelinus fontinalis of Hammersley Fork and Cross Fork in the Kettle Creek Watershed*. — Brook trout, *Salvelinus fontinalis*, were sampled in the Cross Fork and Hammersley Fork watersheds which are both tributaries to Kettle Creek in northcentral Pennsylvania. Growth rates were calculated using field measured lengths and weight, and aging scale samples that were analyzed in the lab. Growth rates were compared between fish in both watersheds as well as testing variables such as presence of crayfish and other fish species. Crayfish appeared to potentially have a negative impact on growth rates of brook trout, crayfish present 53mm/yr± 5.8, crayfish absent 57.0mm/yr±8.3 p=.062. Although this was not significant it provides a question that should be further researched, especially in first order headwater streams where there may be more interspecies competition for food sources. (128)

Greene, Katie *, Iane Charles, Hayley Sparks, and Cynthia Surmacz Bloomsburg University, Bloomsburg, PA 17815. *Is the Prevalence of Type 2 Diabetes Related to Income in PA Counties?* — In 2011, 291million individuals were diagnosed with Type 2 Diabetes Mellitus in low and middle income countries, a value 4 times higher than the number diagnosed in high income countries (International Diabetes Federation, 2011). Major risk factors for Type 2 Diabetes are obesity, inactivity, and poor diet. In low-income countries, these risk factors become heightened due to a variety of reasons that relate to the availability of resources for people in these communities. The purpose of this research is to determine if there is a relationship between median household income and the prevalence of Type 2 Diabetes Mellitus in Pennsylvania counties. Data were collected from the U.S. Census Bureau and the Centers for Disease Control and Prevention. SPSS software was used to conduct correlational analyses of the data. Our results showed an inverse correlation between median household income and the prevalence of Type 2 Diabetes (p=0.001) and obesity (p=0.000) and a direct correlation between median household income and education level (p=0.000). The results of this research can bring awareness of the need for further actions to improve the overall health care for those living with Type 2 Diabetes in low-income households. These include increased funding to improve the availability of affordable, healthy foods, development of high quality and low cost diabetes care, and implementation of educational programs that are aimed to reduce the risk factors of this population. (89)

Hand, Breath A.*, Laura A. Guertin, and Joshua D. Marquit Penn State-Brandywine, Media, PA 19063. *Penn State Brandywine Tree Removal Eco-Services Impact Survey*. — A biodiversity survey was conducted at Penn State Brandywine to catalog, map, and photograph trees on a plot of land that will be cleared to accommodate a new 31,000-square-foot, student union building. Species, circumference,

and location data for each tree were collected and uploaded into PhillyTreeMap, an online database built using software developed by the U.S. Forestry Service. This website calculates information on eco-services for individual trees, including carbon dioxide stored to date, carbon dioxide removed, energy conserved, air quality improvement, and storm water filtered per year, along with subsequent economic benefits. Data on the eco-services were aggregated to determine total species contributions and other variables of interest including growth rates and the age of each tree slated for removal. The biodiversity analysis found 43 trees of nine species including black cherry *Prunus serotina* ($n = 26$), white ash *Fraxinus americana* (5), sassafras *Sassafras albidum* (4), black walnut *Juglans nigra* (3), tulip poplar *Liriodendron tulipifera* (1), and four others. Preliminary results of this analysis indicate that the black cherry, white ash, and black walnut species, respectively, provided the greatest quantities of aggregate eco-service benefits. Eco-service contribution ranking is directly related to number of trees of each species in the survey, with the black cherry rating highest on all eco-service indicators. A notable exception to the top-three ranking is in the energy-conserved indicator, in which the sassafras is the third-highest performer. It is noteworthy that the white ash species provides the highest percentage of eco-services, relative to population proportion, across all eco-service categories. Data from this eco-services impact survey may be used to select and plant trees on campus to replace those that have been removed. (114)

Heid, Cassidy*, Angelena Campisi*, Fiana Fach, Claudia Nicolae*, Victoria Yeselevige-Rudovitz*, and Kenneth Klemow Wilkes University, Wilkes-Barre, PA 18766. *Vegetation Assessment of the Transco Pipeline Right of Way in Luzerne County Pennsylvania*. — The buildout of a projected 30,000 miles of natural gas pipelines in Pennsylvania over the next 20 years represents a significant potential impact to natural ecosystems in the Commonwealth. There is widespread concern that pipeline corridors represent likely avenues for the spread of alien and invasive plant species into areas currently dominated by native forests. To begin to understand the vegetation on existing pipeline corridors, a detailed assessment was conducted of a 1700' long section of the Transco interstate pipeline in east-central Luzerne County, PA. Plants were identified and their percent covers estimated in forty-eight 1m² quadrats distributed along three transects representing three ages of pipeline installation and mowing intensity during the summer of 2015. The transect along a pipeline constructed in the late 1950s revealed a plant community dominated by Ericaceous subshrubs and native graminoids typical of acidic soils. Their combined Shannon-Weiner index was 2.8. The other two transects along pipelines constructed in the 1970s and 1990s were dominated by meadow species like wrinkled goldenrod, swamp dewberry, and common cinquefoil. Plants in the latter two transects responded to mowing in late summer 2014 by decreased goldenrod dominance the following year. Their combined Shannon-Weiner indices were 2.0-2.1, indicating lower diversity. Vegetation samples transferred to a greenhouse and seed bank assessments revealed similar patterns, overall. The results showed unexpected species diversity and dominance by natives in this pipeline segment, indicating potential for smart ecological restoration in future pipeline restoration efforts. (115)

Helms, Margaret*, and Thomas Cook Mercyhurst University, Erie, PA 16546. *Development of an Environmental Health Indicator Database Combining the EPA's Toxic Release Inventory with County, State and Other Federal Data Sources*. — **Objective:** The Emergency Planning and Community Right-to-Know Act (EPCRA) led to the creation of the Toxic Release Inventory (TRI), the pollutant release and transfer registry (PRTR) system of the US Environmental Protection Agency (US EPA). We sought to enhance public use of the TRI and to determine if the TRI can be combined with other environmental indicators at multiple geographic scales (municipal, county, watershed) to create a model state-wide system of environmental health indicators using data for Pennsylvania as part of the EPA's TRI University Challenge program. **Methods:** The initial selection criteria for potential indicators was based on their scalability across geographic and temporal scales, completeness and validity. In addition to the TRI, 26 candidate indicators were extracted from county, state and federal agencies including the PA DEP, Pennsylvania Department of Health, Center for Disease Control, USGS and US EPA. Indicators were assessed for gaps in geographic coverage and missing data. A secondary consideration was the

availability of comparable indicators in other US states. **Results:** Combining indicators for all 67 Pennsylvania counties yielded a core set of indicators related to air, land and water exposures, sufficient to examine both cross-sectional relationships and temporal trends. For some indicators, combining adjacent counties or using DEP regions will allow for more reliable point estimates and examination of temporal trends. Use of counties and years were the most useful geographic and temporal units for assessing spatial-temporal trends across the most indicators. **Conclusion:** Our pilot environmental indicator database identified several candidate measures for use in a proposed, flexible national system with geographic and temporal overlap with the TRI. Other indicators lacking sufficient temporal or geographic overlap to fully integrate into a national databases may still be internally valid for answering local questions related to environmental exposures. Three case studies are presented to demonstrate the utility of the integrated data. (51)

Hoffman, Justin*, Russell Leinbach*, Joshua Reeder*, and Karen Campbell Albright College, Reading, PA 19604. *Surveying Bat Populations in Southeastern Pennsylvania: Captures vs. Acoustic Monitoring.* — Traditional summer surveys of bat populations have involved capture of flying bats. This approach allows direct observation of active individuals, and opportunities for taking specific anatomical measurements of individual bats, as well as the potential for placement of radio-transmitters to enable monitoring of activity budgets. With the current decline in bat populations in the northeastern states, acoustic monitoring has become critical to augment the available information about bat activity, taking advantage of the ultrasonic signals emitted by bats during echolocation. We report on information gathered using these different approaches during the summer of 2015. We conducted linked surveys of bat populations at 4 distinct sites in southeastern Pennsylvania: Valley Forge National Historic Park (VAFO), Hopewell Furnace National Historic Site (HOFU), Nockamixon State Park (NOX) and Nolde Forest Environmental Education Center (NOLDE). We placed mist-nets along potential bat flight corridors, and recorded acoustic activity at the same sites using AR125 ultrasonic receivers. We also acoustically surveyed areas not suitable for netting, and used a car-mounted acoustic detector to completed mobile transects at each of the sites. Over 95 net-nights, using 3-tier nets 9m in height, only 68 bats were captured (65 *E. fuscus* and 3 *L. borealis*). Over the same time period, at the same sites, acoustic recordings yielded 2736 identifiable bat passes, mostly representing the two species captured, but also including echolocation calls from bats of at least two other species. Driving transects were especially useful in directing the location of netting and acoustic survey efforts. We report on the relative merits of each technique, particularly relevant in times when National Parks and Environmental Centers are working to assess habitat use by candidate federally endangered species like *Myotis septentrionalis*, and are working to provide recommendations for habitat management and long-term monitoring of bat communities. (121)

Hoyt, Virginia*, and Megan Rothenberger Lafayette College, Easton, PA 18042. *An Integrative Approach to Predicting Ecosystem Responses to Dam Removal on the Bushkill Creek, PA.* — Dam removal has been embraced as an ecological restoration tool by resource management groups in the United States. However, very few of these dam removals (i.e., < 5%) have been accompanied by pre-removal monitoring of water quality and biota, legacy sediment analysis, toxicity assays, extensive follow-up studies, and peer-reviewed publications. This has led to uncertainty of potential negative impacts of dam removal. A local collaborative effort culminated in the submission of a proposal under the “2010 Open Rivers Initiative” to remove three dams along the Bushkill Creek in eastern Pennsylvania. This proposal provided an opportunity for multi-disciplinary research involving the collection of pre-removal data on water quality and macroinvertebrate assemblages, the analysis of heavy metals in sediment cores extracted from above the dams, and toxicity assays to determine the singular and interactive effects of copper, cadmium, and lead (i.e., metals measured in the sediment cores) on *Hyalella azteca* survival and behavior. Monitoring results indicate that oxygen levels, macroinvertebrate diversity, and the proportion of sensitive taxa were significantly lower at all sites surrounding the dams in comparison with free-flowing reference locations. The strong correlation between water quality and macroinvertebrates in this system implies that the removal of the lower three

dams would lead to improvements in water quality and biotic integrity in the lower Bushkill Creek. However, preliminary analysis of heavy metals in sediment cores extracted from behind one of the dams and associated toxicity assays indicate that copper and cadmium concentrations could lead to death or adverse physiological effects for stream biota. All together, these results suggest that dam removal along the Bushkill Creek should be carefully planned to mitigate potential environmental impacts of re-suspended sediments. (54)

Hutchison, Robbie*, and Stephanie Justice-Bitner King's College, Wilkes-Barre, PA
18711. *Bactericidal Effect of Clove and Tea Tree Essential Oils and Development of Resistance Against Tea Tree Oil in Escherichia coli and Staphylococcus epidermidis*. — Good hand hygiene is the key to good health. However, resistance to antimicrobials in hand sanitizing products, such as triclosan, is on the rise. This trend has caused the removal of products with triclosan from the general consumer market. Many natural products are known to have antimicrobial activity and seem like a good alternative; however, resistance to natural antimicrobials has not been well studied. The purpose of this study was to determine whether or not *Escherichia coli* and *Staphylococcus epidermidis* had the capability to develop resistance to clove and tea tree essential oils. These essential oils are naturally occurring biocides which can be used as antiseptics on the skin. Kirby Bauer assays were performed to determine the minimum inhibitory concentration and to assess the resistance response for each bacterial species. The bacteria used in each of the eight generational trials were sourced from colonies growing within and around the margin of each zone of clearance for the previous generation. The resistance assay was performed in triplicate for each generation, and the zones of clearance were measured from the edge of the paper disc to the edge of the zone. The zone of clearance around the clove oil discs for both *E. coli* and *S. epidermidis* stayed between 2.0 mm and 5.0 mm for the duration of the experiment, which indicated that no resistance was developing. The zone of clearance around the tea tree oil discs, however, showed a reduction, which suggested the development of bacterial resistance to tea tree oil in both *E. coli* and *S. epidermidis*. These results suggest that not all natural products may be good alternatives to traditional antibacterial compounds. (78)

Isenberg, Daniel*, Jon Niles, and Geoffrey Smith Susquehanna University, Selinsgrove, PA
17870. *Growth patterns of Channel Catfish in the Susquehanna River*. — Channel Catfish (*Ictalurus punctatus*) is a common species in aquaculture and recreational fisheries in North America. They naturally occur from northern Mexico to southern Canada, with a large portion of research on the species taking place in the central to southern Mississippi River basin. However, in Pennsylvania, little is known about population characteristics of Channel Catfish, including age and growth. Typically, northern populations of Channel Catfish show a tendency to have slower growth rates, while southern populations show a tendency for a faster growth rates. This study seeks to determine how the growth patterns of Channel Catfish shift throughout the length of the Susquehanna River. We attempted to create natural-state growth models for two reaches of the Susquehanna River in central Pennsylvania. These growth models will allow resource agencies to better manage Channel Catfish populations. (48)

Jakeman, Juliann*, Jennifer Daly, and Sheryl Fuller-Espie Cabrini College, Radnor, PA
19087. *Pathogen-Associated Molecular Patterns Induce Chemotaxis in Coelomocytes of the Earthworm Eisenia hortensis*. — At different stages of development, vertebrate leukocytes are influenced by the presence of chemoattractants to migrate to different anatomical locations. Vertebrate leukocytes perform a variety of physiological activities that contribute to innate and adaptive immune responses. Cell migration is essential for cellular processes such as wound healing, inflammation, immune response, angiogenesis, and embryonic development. In vertebrates, there is much known about the effects of chemotaxis on important cellular processes, but in invertebrates this knowledge is far more limited. Furthering the knowledge about chemotaxis in invertebrates, such as earthworms, was the driving force behind this research. In this *in vitro* study the earthworm *Eisenia hortensis* served as the model organism using coelomocytes which are easily extruded in large quantities for experimental treatments. We believe this is the first time that earthworms have been used to study chemotaxis. A combination of methodologies such as Boyden chamber assays and flow cytometry was used to

analyze earthworm coelomocyte migration in response to pathogen-associated molecular patterns (PAMPs) including laminarin, lipoteichoic acid, flagellin and lipopolysaccharide. A Boyden chamber functions by placing cells in an upper compartment that is separated by a porous membrane from the PAMP located in the lower compartment. The cells that cross the membrane during an allotted culture incubation time are counted in order to measure cell migration compared to media controls. In our study, coelomocytes were collected post-migration and then subsequently enumerated using flow cytometry, differing from most migration experiments that count migrating cells microscopically. This data was further analyzed to generate graphical representations and determine statistical significance. The earthworm coelomocytes exhibited significant and reproducible chemotactic responses to all of the PAMPs utilized in this study. These findings contribute meaningfully to the study of innate immunity in invertebrates and future research could include additional PAMPs which are encountered during pathogenic challenges. (39)

Kennedy, Timothy*, Michael Pheasant, and Barbara McCraith Misericordia University, Dallas, PA 18612. *Seasonal Variation of Benthic Macroinvertebrate Assemblages in Two Second-order Streams*. — Benthic macroinvertebrates are responsible for controlling the populations of lower trophic levels and accelerating detrital decomposition in stream ecosystems. Assessing their diversity and functional feeding group structure is important in order to examine the overall health of the stream ecosystem structure and function. This ongoing study was undertaken to analyze data to assess the diversity of benthic macroinvertebrates in Trout Brook and Leonard's Creek, Luzerne County, Pennsylvania. Our results indicate that both streams differed seasonally in species abundance, richness, evenness of benthic macroinvertebrates. Elmidae (Coleoptera) were the dominant family only in the early summer and Trichoptera families dominated other seasons. Fall collections had lower species richness and evenness than collections in the early summer and late summer. (135)

Keshari, Vishal*, Noriko Mikeasky, and Cuong Diep Indiana University of Pennsylvania, Indiana, PA 15705. *Characterizing the Molecular Function of the *lhx1a* Transcription Factor*. — Kidney disease is a major health concern and is mainly caused by diabetes and high blood pressure. Humans lack the ability to regenerate their kidneys after injury, and therefore kidney damage is usually irreversible. However, zebrafish can make new kidney tissue after injury and throughout their entire lives. The new tissue comes from specialized stem cells that express the gene *lhx1a*. Our lab recently showed that *lhx1a* forms a dimer in a genetic assay. Here, we show that deleting the LIM domain of *lhx1a* enhances dimerization. Others have shown that deleting the LIM domain also causes *lhx1a* to become an active transcription factor. Thus, we hypothesize that the LIM domain inhibits *lhx1a* activation by preventing dimerization. Understanding how *lhx1a* works to promote stem cell function may provide insight into designing a regenerative therapy for kidney disease. (58)

Kessler, Lyanna*, Colleen Donnelly*, Craig Stanley, and Rob Kulathinal Temple University, Philadelphia, PA 19119. *Genomics of Sexual Isolation in *Drosophila melanogaster**. — Behavioral isolation is thought to be among the first stages in forming new species. Among known populations of *D. melanogaster*, female fruit flies from Zimbabwe display a unique preference to mate with males of their own population and discriminate against foreigners, including those from neighboring Zambia and global populations such as those from North Carolina. This Zimbabwean population presents one of the few naturally occurring examples of incipient speciation, presenting an excellent model to study speciation. Using extensively sequenced genomes and populations, this study identifies novel candidate genes involved in sexual isolation by scanning genomic regions for highly differentiated SNPs (significant *F_{st}*) between Zimbabwean, Zambian, and North American populations. We are beginning to functionally assay these genes using high-throughput behavioral arenas and provide preliminary results for one of our top candidate genes, fruitless. This powerful combination of high-throughput genomics and phenomics will provide us with a detailed understanding of the evolutionary processes involved in population divergence and early species formation. (30)

Ki, Kwanho*, **Megan Mauriello***, **Erin Murray***, and **Michael Butler** Lafayette College, Easton, PA 18042. *Analysis of the Relationships of Ambient Temperature and Food Presence to Winter Roost Site Occupation*. — Birds seek out roosting sites during cold winter nights whether it be in tree cavities, in nest boxes, or under dense vegetation. Overwintering in such nesting sites helps prevent significant heat loss because nest boxes serve as a barrier to the external environment. Birds roosting in shelters such as natural cavities expend less energy for thermoregulation as compared to those that roost in the open. In our experiment, we attempted to measure whether ambient temperature and occupation of nest boxes were correlated as well as whether the presence of feeders would have a significant effect on nest box selection. We collected feces as an indicator of occupancy and recorded the number and mass of fecal deposits every two or three days for three weeks. Additionally, we used temperature data loggers to track temperature changes inside a subset of nest boxes. We found that the number of occupied boxes can be predicted by lower overnight minimum temperatures and warmer temperatures just prior to sunset, when birds begin to select roosting spots. However, boxes were still being used relatively inconsistently. This signifies that, of 80 boxes on a given day, there is not a pattern which could be used to predict whether birds would use even 10 of these boxes. In addition, the presence or lack of feeders seemed to have no effect on occupancy rates. We can conclude that the number of nest boxes used is influenced by both temperature prior to sunset and overnight temperature. This is most likely because it would be logical for birds to select the warmest nest box they can find before the temperature starts to drop in order to minimize their thermoregulatory costs. (124)

King, Andrew*, **Rebecca Price***, and **Cynthia Surmacz** Bloomsburg University, Bloomsburg, PA 17815. *Geodemography of Type 2 Diabetes in Pennsylvania*. — Type 2 Diabetes Mellitus (T2DM) is a complex, chronic disease afflicting individuals throughout the United States. The prevalence of T2DM doubled in 1990-2008 and continues to rise among disparate populations. Conditions in urban and rural settings are vastly different. Rural counties are often underserved and residents must travel greater distances to receive medical care compared to those in urban counties (Hale, 2010). Geodemography provides a novel way of observing trends or patterns in data related to disease. This information may provide insight and aid in finding trends or factors that contribute to finding at-risk populations for T2DM in Pennsylvania. Finding these at-risk populations will help target better interventions and education. The purpose of this research is to evaluate the prevalence and incidence of T2DM using geodemography for Pennsylvania. Data gathered from the Behavioral Risk Factor Surveillance System of the Centers for Disease Control and Prevention for all 67 counties in Pennsylvania were analyzed. The data were organized using cluster analysis. Clustering highlighted high-risk counties which were then compared using ANOVA, regression, and Student's t-test. Differences in prevalence and incidence of T2DM between a high-risk urban county, Philadelphia, and high-risk rural county, Fayette were examined. County level prevalence and incidence data were compared to state and national data from 2004 to 2012. Results suggest that there is a difference in prevalence and incidence between rural and urban counties, however there is not a difference between high risk urban (Philadelphia) and high risk rural (Fayette) counties. Prevalence of T2DM is higher in Philadelphia and Fayette counties than national and state levels. (90)

Koehler, Victoria*, and **John Harms** Messiah College, Mechanicsburg, PA 17055. *Cloning the Full-Length Gastrin Gene for Up-Regulation in Pancreatic Cancer Studies*. — Pancreatic cancer is the fourth leading cause of cancer mortality in the United States, leading to approximately 227,000 deaths each year worldwide. Previous research has indicated that abnormal expression of the gastrointestinal hormone, gastrin, is observed in pancreatic cancer cells following K-ras oncogenic activation. Down-regulation of gastrin in pancreatic cancer cells significantly decreases their tumor growth rate. Conversely, the up-regulation of progastrin has been shown to enable tumor formation in otherwise non-tumorigenic human embryonic kidney (HEK-293) cells. We hypothesize that the upregulation of gastrin alone in the context of wildtype K-ras will confer tumorigenicity in immortalized, non-tumorigenic human pancreatic ductal epithelial (HPDE) cells. To begin testing this hypothesis, a vector containing the full-length gastrin gene was constructed in preparation for transfection. The full-length human

gastrin gene (exons and introns; ~3750 bp) was amplified from genomic DNA by high-fidelity PCR, purified and cloned into pCR-Blunt II-TOPO. Exon sequences were confirmed by automated DNA sequencing. To permit selection of transfected clones, hygromycin resistance was next inserted into the vector pCAGEN and confirmed by diagnostic digests to determine proper assembly. The pCAGEN vector backbone contains an enhanced chicken beta-actin promoter allowing for constitutive expression at physiological levels. The gastrin gene was subcloned from pCR-Blunt II-gastrin into pCAGEN.hygro as a NotI-XhoI fragment. Positive colonies were screened by colony-PCR and successful construction of pCAGEN.hygro-hgastrin was further confirmed by diagnostic digest with a panel of restriction enzymes. Transfection and analysis of gene expression in HPDE cells is ongoing. (109)

Kraycer, Paul*, and Christopher Brey Marywood University, Scranton, PA 18509. *Caenorhabditis elegans* Krüppel-like Transcription Factor Family Genetic Analysis: Examining *klf-2/klf-3* double mutant. — The free-living nematode *Caenorhabditis elegans* is a model organism that contains genes in the Krüppel-like Transcription Factor family (*klf*) that are homologues to *klfs* found in humans. *Klfs* are important in the storage of lipids in the intestines of *C. elegans* and play a major part in the formation of adipose cells. Their control over adipose cells causes them to be linked to predisposition to obesity and type-2 diabetes in humans. Studies have shown that the *klf-2* and *klf-3* genes are both important in the storage and utilization of fatty acids within the intestine by promoting fatty acid β -oxidation, however little research has been done examining the interaction between these two transcription factors. The goal of this study was to create a *klf-2/klf-3* double mutant strain of *C. elegans*. *klf-3*(RB1603) hermaphrodites were mated with male CA151 mutant worms using standard genetic crosses to produce heterozygotes. After mating, worms were allowed to reproduce to the third generation. This process was again repeated with males from the previous mating and *klf-2* hermaphrodites. Single worm PCR was utilized to confirm the presence of the cross. With a double mutant strain we will be able to examine if the genes enhance or suppress one another by examining fat deposition levels (o-red-stain), fecundity and morphological differences. (56)

La Duke, Thomas , Nikolai Kolba*, and Shixiong Hu East Stroudsburg University, East Stroudsburg, PA 18301. *Application of Geographic Information Science in Long-term Population Monitoring of the Timber Rattlesnake (Crotalus horridus) in Pennsylvania*. — Pennsylvania constitutes an interesting biological region of the United States. Like most of the country, Pennsylvania has undergone large land-cover and land-use changes. These changes have serious implications for many biological species within this region. Pennsylvania includes part of the northern border of the range of the Timber Rattlesnake (*Crotalus horridus*) and its habitat has changed with time. Recent development in remote sensing technology and Geographic Information Systems (GIS) allow the use of a landscape ecology and spatial analysis approach to the problem of deforestation and biodiversity conservation around the world. Applications of this approach include analyses of land-cover and land-use change; estimation of disturbances around rattlesnake habitats from anthropogenic effects; examination of the spatial correlates of forest loss and the socioeconomic drivers of land-use change; analysis of the consequences of land cover and land use change on *C. horridus* habitat; and gap analysis using buffer zones around historic rattlesnake locations. This will provide the Pennsylvania Fish & Boat Commission useful perspective for application of GIS, remote sensing, and a landscape approach to conservation of the Timber Rattlesnake (*Crotalus horridus*). (96)

LaDuke, Thomas* East Stroudsburg University, East Stroudsburg, PA 18301. *Ecological Study of Temperate and Tropical Anuran Breeding Pools*. — Surveys of pool breeding frogs were conducted and compared across two biomes. Microhabitat ecology was observed to assess its effect on anuran communities. Temperate studies were conducted in Northeastern Pennsylvania, and tropical studies were conducted at El Zota Biological Station in Costa Rica. Pools were measured using several parameters including pH, conductivity and water temperature. Environmental patterns were recorded including cloud cover, wind speed, canopy cover, ambient air temperature, daily rainfall, weather conditions, and ice coverage. Vegetation diversity and the amount rainfall had the most significant

correlations with the number of species and individuals present in a pool respectively. Human impacts observed included habitat destruction, pollution and disease outbreak. Understanding the complex relationship between frog species and their environment is a crucial step towards preventing the worldwide decline of these exceptional amphibians. (44)

Laforgia, Michael*, Larry Laubach, Elizabeth McGovern, and Howard Whidden East Stroudsburg University, East Stroudsburg, PA 18301. *Continued Monitoring of Bat Populations in the Delaware Water Gap National Recreation Area*. — Since the emergence of white-nose syndrome (WNS) in February 2006, populations of hibernating bats have experienced severe declines throughout eastern North America. Our previous research on the impacts of WNS on the distribution and community composition of bats in the Delaware Water Gap National Recreation Area (DWGNRA) documented drastic declines in *Myotis lucifugus* (Little Brown Myotis) and *M. septentrionalis* (Northern Long-eared Myotis) after WNS, whereas *Eptesicus fuscus* (Big Brown Bats) and *Lasiurus borealis* (Eastern Red Bats) increased over this time period. In 2015, we continued emergence counts at 3 active summer maternity roosts to assess current population status and reproductive rates of Little Brown Myotis and Big Brown Bats. We also used an AR125 acoustic detector to record bat echolocation calls during mobile acoustic monitoring along 3 new transect routes in the DWGNRA. We identified echolocation calls to species using the SonoBat 3 autotransmitter and then plotted the locations of bats in the park using TransectPro. Our emergence counts suggest that populations at maternity roosts have stabilized and there is evidence of continuing reproduction. Along the new transect routes, the majority of recorded bat passes continued to be Big Brown Bats and Eastern Red Bats, and these species appear common and widespread in the DWGNRA. In contrast, Little Brown Myotis and *Perimyotis subflavus* (Tricolored Bats) were rarely detected and appear to have very restricted distributions in the park. (122)

Laul, Shannon*, and Angela Asirvatham Misericordia University, Dallas, PA 18612. *Characterization of Yotiao in Schwann Cell Lines*. — Yotiao, a scaffolding protein that belongs to a large family of protein A-kinase anchoring proteins (AKAPs), is involved in organizing temporal and spatial signaling of cyclic AMP signaling events in the neurons. A-kinase anchoring proteins anchor protein kinase A, an enzyme that binds cAMP the universal second messenger in the cell. Previous studies have shown that Schwann cells express AKAP95, AKAP150 and Ezrin. The purpose of this study was to determine the location and expression of Yotiao in Schwann cells when treated with the cAMP activating factor forskolin and heregulin, a growth factor secreted by neurons. To determine the location of Yotiao, immunofluorescence experiments were conducted. Schwann cells cultured with forskolin exhibited staining patterns confined mostly to the cytoplasm. Immunoblot analysis of rat Schwann cell lines treated with both heregulin and forskolin show an upregulation of Yotiao in comparison to control, forskolin or heregulin. These preliminary studies indicate that Yotiao may be involved in mitogen-mediated Schwann cell growth. (62)

Levy, Morgan*, Meagan McGurl, Aubrey Jones, and Anastasia Thevenin Lafayette College, Easton, PA 18042. *Expression and Purification of Gap Junction Protein Cx43 C-Terminal Domains for in vitro Binding Studies with Zona Occludens 1 (ZO-1)*. — Gap Junctions (GJs) are cellular structures that allow direct cell-cell communication, playing a key role in cellular homeostasis and in disease. GJ channels bridge plasma membranes of apposing cells and cluster into densely packed areas termed GJ plaques that typically consist of 100s-1000s of channels. GJ channels are assembled from four-pass transmembrane proteins termed “connexins (Cx). We are interested in Cx43 GJs and in understanding how their function is regulated through specific phosphorylation events. Phosphorylation of Cx43 is significant for GJ function, mediating almost all stages of the Cx43 life-cycle, altering its oligomerization behavior, forward trafficking from the ER to Golgi and plasma membrane, as well as GJ assembly, gating, and internalization. There are at least 15 different phosphorylation events occurring on the C-terminus of Cx43, regulated by several kinases. One binding partner of Cx43 is the scaffolding protein, Zona Occludens-1 (ZO-1). ZO-1 binds to the last 4 amino acids on Cx43 C-terminus and this interaction – dictated by Cx43 phosphorylation at specific sites - determines whether GJs are open or closed. To gain quantitative knowledge of how Cx43 phosphorylation regulates its interaction with ZO-1, and thus

GJ function, we aim to conduct *in vitro* binding studies between recombinant Cx43 and ZO-1. Because Cx43 is a membrane protein and ZO-1 interacts with the soluble C-terminal domain, we have generated a series of phosphomimetic and phospho-dead mutants of C-terminus of Cx43 at several serine sites. WT Cx43 C-terminus was expressed and purified from *E. coli*, along with a negative control Cx43 C-terminus lacking the ability to interact with ZO-1. Test expression studies of three Cx43 phospho-dead mutants were also carried out. Current work is focused on determining best binding conditions between WT Cx43 C-terminus and purified ZO-1 and on improving expression and purification conditions of the mutant Cx43 proteins. (25)

Little, Aaron*, and Michael Butler Lafayette College, Easton, PA 18042. *Stress-Induced Pigment Levels in the Feces, Liver, and Spleen of the European Starling (*Sturnus vulgaris*)*. — Biliverdin is the pigment responsible for the striking blue-green coloration of many bird eggs. As a product of heme degradation, it is found mostly in the liver and spleen. This pigment is known to serve as an antioxidant, anti-mutagenic agent, and anti-viral agent *in vitro*. Since the stress response induces many of these damaging effects, we hypothesized the stress response would result in a change of biliverdin concentration in tissues and the feces. To investigate this, the hormonal component of the stress response was mimicked in 12 European Starlings (*Sturnus vulgaris*) using the avian stress hormone corticosterone (CORT) suspended in dimethylsulfoxide (DMSO); 11 more were given a sham treatment of just DMSO. During sampling, treated birds were isolated in individual cages and the urates (the liquid part of bird droppings) were collected every 30 minutes in order to detect any temporal fluctuations of biliverdin. In the second phase of the experiment, the same birds were given similar treatments and sacrificed 90 minutes later, which we approximated to be the peak time of tissue response. The concentrations of biliverdin in the urates, liver and spleen were quantified using novel laboratory techniques. Preliminary data suggests a treatment effect is present in liver tissue and the urates—something confirmed based on visual observation; stressed birds produce feces noticeably greener than usual. Limited data analysis likewise indicates and that there is no difference in the spleen sizes of the different experimental groups. If any changes in tissue and fecal biliverdin are observed, that would suggest that biliverdin plays a role in an organism's stress response. (93)

Lollis, Eric*, Danielle Prestifilippo, and Abdalla Aldras East Stroudsburg University, East Stroudsburg, PA 18301. *In vitro Study of the Effects of Vitamin B-12 on *Propionibacterium acnes* and its Production of Porphyrin*. — *Propionibacterium acnes* is an anaerobic, gram positive bacilli that is a normal flora of the skin. One of the types of organic chemicals secreted by this bacteria is porphyrins, which can act as inflammatory compounds. When this bacteria becomes trapped in the pilosebaceous follicles of the skin, these porphyrins become more concentrated and cause an inflammatory response, and ultimately lead to acne. In this project, the effects of vitamin B12 *in vitro* porphyrin production by *Propionibacterium acnes* are being studied. Various concentrations of vitamin B12 have been infused into the blood agar and the bacteria are currently being grown anaerobically at 37 °C. We used ethanoic acid/ethyl acetate to extract and isolate the porphyrins, and a UV spectroscopy analysis is utilized to quantify the amount of porphyrins being produced. The effects of natural products on *Propionibacterium acnes* and its production of porphyrin will be studied in this study. (101)

Luft, Rebecca*, Bryce Brindle, Teresa Sirnic, and Edward Levri Penn State University-Altoona, Altoona, PA 16601. *Characterizing the Invasive New Zealand Mud Snail Population in Central Pennsylvania*. — The New Zealand mud snail (*Potamopyrgus antipodarum*) is a world-wide invasive species that is composed of multiple clonal genotypes. In North America, there are at least three genotypes present (US1, US2, and US3). Recently, a population of the mud snail was found in Centre County, PA. The purpose of this study was to compare the desiccation tolerance and behaviors related to foraging of various invasive populations of the New Zealand mud snail (*Potamopyrgus antipodarum*) including the central Pennsylvania population. To assess desiccation tolerance, snails were removed from water for periods of 0, 9, 18, 24, 36, and 48 hours and then assessed for survival. The results showed that the US1 population from Wyoming was more likely to survive desiccation than the PA population (US1) or the Great Lakes population (US2). To determine behavioral differences of genotypes

we examined the photokinetic, geotactic, and rheotactic responses of the three populations. The results demonstrated variation in the photokinetic, geotactic, and rheotactic responses of the different populations. Overall, these results suggest that there may be some behavioral variation between populations of the same genotype. (130)

Lutte, Kate*, and Brian Gray York College of Pennsylvania, York, PA 17405. *Expressing Fluorescence in Phalaenopsis equestris by Means of Agrobacterium tumefaciens Ti Plasmid.* — *Agrobacterium tumefaciens* possesses the innate ability to transfer genetic material horizontally into plants, providing us with a method to genetically modify agricultural plants, such as corn, and tomato. This method of using *A. tumefaciens* to modify the genetic makeup of roses has been used in the past, while orchids have not yet been modified; with the recent sequencing of the *Phalaenopsis equestris* genome this method of genetic transfer could be possible. Horse Phalaenopsis (*P. equestris*) is a commercially outbred orchid that expresses a pair of MADS-box genes, SEP1 and -3 in its floral organs, these flower-specific genes could prove to be ideal for modification. We decided that *A. tumefaciens* gene transfer in unison with selective cloning of the SEP gene promoters to produce a *P. equestris* that expresses a fluorescent protein in the petals/sepals of its floral organ, demonstrating proof-of-concept for the specificity of *A. tumefaciens* method of genetic transfer within orchids. A PCR-based strategy was designed to clone the SEP promoters out of *P. equestris*, then fused with the reporter gene mCherry, and ligated into a cured Ti plasmid. It is possible that the outbred nature of this orchid led to the successful amplification of only SEP3; sequencing results indicate a 45% base pair alignment of the fusion product versus its expected sequence. Post construction, the plasmid could be transformed into *A. tumefaciens* for use to infect *P. equestris* and modify these promoters to the end of fluorescent adult orchids. The objective of this research is to show *A. tumefaciens* ability to target and transform specific promoter regions within *P. equestris*, as well as to show the highly conserved nature of the SEP1 and 3 genes. (81)

Mack, Dr. James, and Jenies Grullon* Monmouth University, West Long Branch, New Jersey 07764. *Using Essential Oils to Combat the Threat of Multidrug Resistant Bacteria, Pseudomonas aeruginosa.* — The increased occurrence of multidrug resistant bacterial infections has developed to be a major threat in global healthcare settings due to the overuse of antibiotic treatments. The pace at which bacteria are acquiring this resistance is much faster than the development of new drugs to combat this threat. The purpose of our research was to determine if particular essential oils could be used as an alternative method to treat the multidrug resistant bacterium, *Pseudomonas aeruginosa*. Treatment of such infections with essential oils could make a major global impact on the survival of those who now live in underdeveloped countries with limited access to antibiotics. Through our research many essential oils were tested for their ability to inhibit the growth of *Pseudomonas aeruginosa*. Cinnamon Bark and Cassia essential oils were found to be the most effective. Methylglyoxal, the major component of Manuka honey, also had excellent results. Applying essential oils directly to the skin can cause irritation so for our research the essential oils and methylglyoxal were diluted with Lanolin and Jojoba oils to be used as an emollient for safer application. At the minimum inhibitory concentration (MIC) of these emollients their effectiveness in inhibiting *Pseudomonas aeruginosa* was found to be equal to or more than standard antibiotics that are currently used such as Amikacin and Tobramycin. Their MIC however, was not as effective as Ciproflaxin which according to the U.S. Food and Drug Administration has many adverse side effects such as tendinitis and the possibility for permanent nerve damage. Combinations of essential oils and the antibiotic discs together were also tested but were not found to be more effective than the emollient combinations. The emollients we tested show great promise for their use in topically treating patients with *Pseudomonas aeruginosa* infection in health care settings worldwide. (77)

Marvin, Joelle *, and Barbara Fenner King's College, Wilkes-Barre, PA 18711. *The Effects of Ethanol on Undifferentiated and Differentiated SH-SY5Y Cells.* — The SH-SY5Y cell line is a neuroblastoma cell line that adopts a neuronal phenotype when differentiation by retinoic acid. Retinoic acid may help

protect against neurotoxicity, which high ethanol concentrations induce. Ethanol exposure induces oxidative stress in SH-SY5Y cells because it produces more reactive oxygen species than the cell produces antioxidants. Oxidative stress may lead to apoptosis of the neurons. The purpose of this study was to investigate differences in cell morphology and cell survival between the undifferentiated and differentiated SH-SY5Y cells. We hypothesized that concentrations of ethanol greater than 50mM would cause cell death in the undifferentiated and differentiated SH-SY5Y cells. Shorter neurites were expected at 25 mM of ethanol in undifferentiated cells. Cell morphology was characterized using bright field microscopy and cell survival was characterized using the AlamarBlue assay. The results suggested that 50mM of ethanol caused an increase in cell death in undifferentiated and differentiated SH-SY5Y cells. Differentiated SH-SY5Y cells had longer neurites than undifferentiated cells at 25 mM of ethanol. (68)

McCabe, Rebecca *, Laurie Goodrich, David Barber, Keith Bildstein, and Terry Master East Stroudsburg University, East Stroudsburg, PA 18301. *Migration and Habitat Use of Migrating Broad-winged Hawks (*Buteo platypterus*)*. — Broad-winged Hawks are the most numerous migrating raptor in eastern North America, yet little is known about their behavior and habitat use during this critical period. Although still relatively common, the Broadwing's range in Pennsylvania has declined by 16% in the last 20 years. As part of a comprehensive study of breeding, migrating and wintering ecology, we attached 9.5 g, solar-powered satellite transmitters to eight Pennsylvania birds in 2014 and 2015 to better understand migration behavior and habitat use. Preliminary 2014 results on four tagged birds, three juveniles and one adult, show dates of departure from the nesting territory differ between the adult and juveniles by 21-31 days. Daily distance traveled per day by the adult during fall migration was greater than for juveniles. All four 2014 tagged birds initiated migration between 27 August and 29 August, left Pennsylvania between 29 August and 8 September and were south of Texas by 1 October. Two migration routes were used south of Texas, along both the Gulf of Mexico and the Pacific coast. Transmission from all three juveniles was lost by 22 November 2014. The remaining adult arrived at the wintering area on 22 November 2014 in Brazil, having spent 94 days migrating. Stopover roost locations in North America occurred primarily in large forests based on land cover within 1 km of the stopover site. Four adult birds are currently being tracked from their Pennsylvania nesting territories, along with a juvenile bird that was tagged during migration. We intend to compare autumn migration behavior and habitat use of 2014 and 2015 birds. (95)

McIntyre, Kelcy*, Francesca Prendes*, Audrey Ettinger, and K. Joy Karnas Cedar Crest College, Allentown, PA 18104. *An-Over-the-Counter Ginkgo biloba Extract Impedes Cell Death via Gene Regulation in the Apoptotic Pathway*. — Ischemic stroke is a major human health concern and current treatment options are limited. Cellular apoptosis pathways are known to be active after the initial injury, expanding the area of damage. As the damage spreads over a period of days, there may be time for therapeutic intervention to reduce this cell death. Antioxidants can provide a useful strategy to blocking the expansion of apoptosis to neighboring cells. *Ginkgo biloba* leaf extract, long used as an herbal remedy in traditional medicine, has been shown to contain several components with antioxidant properties. Previous work has demonstrated that the purified extract of *Ginkgo biloba* (EGB761) has a neuroprotective effect on cells grown in culture, blocking apoptosis. The aim of this study was to extend those experiments, studying the effects of an over-the-counter version of this herbal supplement, which people could easily access as either a prophylactic or an acute treatment. The main study focused on primary brain and body cell isolates from *Gallus gallus* embryos, and was also supported by experiments in a *Gallus gallus* cell line (DT40 cells). Prophylactic treatment with the herbal supplement (or PBS as a negative control) was followed by apoptosis induction by hydrogen peroxide. Cell viability was assessed by trypan blue exclusion at 0-24 hours post-treatment, demonstrating that the treated cells had improved short-term survival. This result supports the use of a commercially available crude herbal supplement to convey protection from apoptosis. In addition, developing embryos were treated with injected herbal supplement, and increased blood was observed, consistent with reported findings of increased circulation in humans following purified extract ingestion. Apoptotic gene expression

differences were investigated via PCR arrays, and other future work will investigate apoptosis directly using a fluorescent microscopy assay. (71)

Metzger, Madeline*, and Carlos Iudica Susquehanna University, Selinsgrove, PA 17870. *Does Canis latrans' Winter Diet Show Similarities to That of Canis lupus?* — Are coyotes in Pennsylvania still displaying solitary hunting strategies or are they behaving more like pack predators, as a consequence of their recent hybridization? Coyotes (*Canis latrans*) have been rapidly expanding into the Northeastern Region of the United States since the mid 1900's most likely due to anthropogenic changes in their habitat. Several studies suggest that in addition to being top predators, coyotes are opportunistic feeders and are able to switch prey based on availability and density. We hypothesized that coyote diets could resemble that of the gray wolves (*Canis lupus*) since coyotes in Pennsylvania show a degree of hybridization and are currently playing an apex predator role in our local ecosystems. For our research, one hundred and sixty eight coyote stomachs were obtained throughout Pennsylvania from 2009-2012 and were dissected to define coyote winter diet. We expect to find insights that may allow us to answer the title question and gain knowledge that may prove useful for future management practices in the Commonwealth. (146)

Michno, Kassondra*, and Frank Varriale King's College, Wilkes-Barre, PA 18711. *Dental Microwear as an Indicator of Diet in the Basal Ceratopsian Psittacosaurus (Dinosauria: Ornithischia).* — *Psittacosaurus* is a well-known Early Cretaceous basal ceratopsian genus from Asia. It is one of the few ceratopsians represented by multiple species and specimens. The genus spans a 23 million year range, present in rocks from the Barremian to Albian stages. Due to this impressive chronologic span, we hypothesize that different species of *Psittacosaurus* will show quantitative differences in microwear features related to diet. Microscopic dental wear from at least four species distributed over five specimens of the ceratopsian dinosaur *Psittacosaurus* were examined to test the hypothesis of dietary shift in these taxa. Lengths and widths of microwear striations were compared among different teeth within the same specimen, and among different species. In many cases different teeth within the same specimen showed no significant difference for length or width of striations. When differences were present they could often be attributed to micrographs showing preservative, or other obstructions in microwear. To compare microwear between specimens, a representative micrograph from each was used. The representative was determined to be free of the most obstructions, glue, or scratches from museum preparation. Significant differences in length or width of striations could not be found among specimens/species of *Psittacosaurus* (Kruskal-Wallis: Length, $p = 0.271$; Width, $p = 0.092$). Our results failed to refute the null hypothesis and support an observed shift in diet among different species of *Psittacosaurus*. This may indicate that dietary constituents between the *Psittacosaurus* species observed are truly similar. However, we consider our results preliminary because of the small sample that was available to us. Only four of the nearly 10 recognized species were present in our sample, and all samples were limited to only one specimen. Further analysis and incorporation of more specimens and species may reveal differences that were not present in this analysis. (147)

Middleton, Ashley*, and Jessica Nolan York College of Pennsylvania, York, PA 17405. *Incorporation of Citizen Science in the Conservation of the Red-bellied Turtle (Pseudemys rubriventris) in Lake Marburg in Hanover, PA.* — Incorporation of citizen science has been shown to be effective in monitoring populations of threatened or endangered species for conservation purposes. Red-bellied turtles are native to Pennsylvania and are considered threatened due to habitat loss. They may also be impacted by competition with invasive red-eared sliders. In this study, we tested the idea that marking turtles with a visible number and letter on each side of the turtle's shell would aid in the monitoring of red-bellied turtles and other basking turtle populations in Lake Marburg in Hanover, PA. We marked 14 turtles using white nail polish and observed basking turtles in several coves, heavily utilized by the public, to determine tag duration and number of re-sightings. We also encouraged the community to view the turtles and report the turtles' locations throughout the summer season. Several coves were frequented by red-bellied turtles and also utilized by the public for fishing and kayaking, which make them ideal for the establishment of a citizen science program. The use of white nail polish in the tagging

of the turtles was successful and tags were visible for the length of the peak turtle basking season (June through the end of July). The tags could clearly be seen on the turtles while in the water as well on the basking platforms. Citizens reported sightings of several tagged turtles indicating non-experts could be helpful in monitoring turtles within the lake if the turtles are tagged. Ultimately, conservation efforts for this population of red-bellied turtles will be furthered through the establishment of a citizen science program at Lake Marburg that will lead both to increased education of the public and increased monitoring of the red-bellied turtle population. (127)

Milway, Samantha*, and Brad Rehnberg York College of Pennsylvania, York, PA 17405. *Sleep Deprivation and Spatial Memory in Mice (*Mus musculus*): Does Exercise Help?* — Sleep is critical for many animals and insufficient sleep can wreak havoc on the mind and body. Regular exercise is thought to help combat the effects of sleep deprivation. Type of environment (exercise or sedentary) and the type of sleep treatment (sleep deprived or non-sleep deprived) were investigated to determine if female CD-1 mice could recall previously acquired spatial memories using a Barnes Maze. Mice from the exercise/non-sleep deprived treatment performed the best with spatial recall. Sedentary/sleep deprived treatment mice performed the worst when evaluating incorrect number of holes searched, time it took to reach the hide-hole, directionality, and search strategy used. Overall there was a significant effect on spatial memory recall based on the type of environment and the sleep treatment. When environment and sleep treatment were combined there was also a significant effect on memory. Sleep deprived mice suffered a greater deficit in spatial memory recall than non-sleep deprived mice but exercised mice were able to overcome the deficit caused from sleep deprivation. Our research provided evidence that regular voluntary exercise can reduce the effect of sleep deprivation on spatial memory recall. Perhaps exercise could also mitigate other effects of sleep deprivation such as reduced reaction time, decreased transcription, and increased stress. Exercise might even be able to increase synaptic plasticity, neurogenesis, and synaptic strength which would make learning easier. (72)

Mondulick, Noelle*, Shawna Stevens, and Angela Asirvatham Misericordia University, Dallas, PA 18612. *Phosphodiesterase 7A Expression and Location within Immortalized Schwann Cells.* — Schwann cells, which are primarily located within the peripheral nervous system (PNS), are stimulated by the neuregulin family of growth factors and proliferation of these cells is reliant on the cAMP pathway. This pathway utilizes A-kinase anchoring proteins (AKAPs) and phosphodiesterases (PDEs) for signaling. To examine the expression of PDE 7A within Schwann cells a protein analysis was conducted via western blotting on cells grown and treated with various growth factors: heregulin, the cAMP-activating agent forskolin, and heregulin plus forskolin. Intracellular location of the protein was examined using immunofluorescent microscopy with antibodies for PDE 7A as well as AKAPs 95 and 150 to identify any co-localization patterns within the nucleus or cytoplasm. It was found that PDE 7A is expressed within Schwann cells and is most abundant when in the presence of heregulin while treatments with forskolin showed a decrease in expression. The location of PDE 7A was determined to be cytoplasmic as there was no co-localized staining with AKAP 95, which is a known nuclear protein. There was slight co-localization between AKAP 150, a known cytoplasmic protein, and PDE 7A. The above data suggests that the location of PDE 7A protein is more cytoplasmic than nuclear. (63)

Monico, Jennifer*, and Mel Zimmerman Lycoming College, Williamsport, PA 17701. *Investigation of the Ecological Impact of Japanese Knotweed (*Polygonum cuspidatum*) on the Riparian Plant Community and its Potential Use as a Food Source for Macro-invertebrates.* — This study focused on Japanese knotweed (*Polygonum cuspidatum*) populations at two sites along the lower West Branch of the Susquehanna. The ecological impact of Japanese knotweed on the riparian buffer zone was assessed by collecting data on plant density, tree population, and soil characteristics, as well as quantifying the knotweed biomass and allelopathic capabilities. At each site, herbaceous plants were assessed using a transect and meter-squared plot method and tree population was assessed using the Point-Quarter method. The light reaching the knotweed canopy and the ground level was measured using a light meter at both sites. The above-ground biomass of Japanese knotweed and the percent organic content of those samples were found at one site. A preliminary laboratory experiment testing Knotweed's

allelopathic properties on Jewelweed (*Impatiens capensis*) is currently underway at Lycoming College. A comparative study of macro-invertebrate ability to process Knotweed leaves versus Pin Oak and Silver Maple was also performed during summer and fall. Leaf surface area was recorded before and after incubation to quantify the decomposition rates of each species. Macro-invertebrates in the leaf packs were collected and identified to analyze the populations colonizing each leaf species. Ergosterol content of the post-incubation leaves was analyzed using High Pressure Liquid Chromatography (HPLC) and will be used to quantify the amount of fungal biomass on a leaf indicating the leaf palatability for macro-invertebrates. (7)

Morgan, Brady*, Sarah McCarron, and Diane Bridge Elizabethtown College, Elizabethtown, PA 17022. *Use of CRISPR/Cas9 to Alter PTEN Expression in Hydra vulgaris*. — The tumor suppressor PTEN acts as an antagonist of insulin signaling. Increased PTEN activity extends lifespan in mice and nematodes, and PTEN plays a role in regulating stem cell self-renewal. We are examining the role of PTEN in the invertebrate *Hydra vulgaris*. Existing data suggest that members of this species may be able to survive indefinitely without a decline in health or an increase in mortality rates. Previous work in our lab has established that the *Hydra* PTEN homologue is expressed at high levels in the stem cells of adult *Hydra*. To investigate the function of PTEN in *Hydra*, we are using CRISPR/Cas9 to produce transgenic *Hydra vulgaris* in which the PTEN gene is replaced by a gene encoding GFP. We have designed and produced guide RNAs and have determined that they cut the *H. vulgaris* PTEN gene in vitro. These guide RNAs will be microinjected into *Hydra* embryos, along with Cas9 protein. Once *Hydra* with a copy of PTEN deleted are produced, their cell composition will be characterized to see if stem cell numbers are reduced. (19)

Morrison, Megan*, Shannon McGee*, Constance Selinsky, Hadley Wellen, Amy Reese, Lindsey Welch, and Andre Walther Cedar Crest College, Allentown, PA 18104. *Analysis of Mutant Cryptococcus neoformans Strains as a Viable, Renewable Biodiesel Source*. — Fossil fuels such as coal, natural gas, and crude oil supply roughly 81% of the energy that is consumed each year in the United States, but these fuels are in finite supply and their combustion is harmful to the environment. There has been active research into the development of renewable systems capable of generating the large amount of fatty acids need to develop biodiesels that can serve as fossil fuel alternatives. A number of oleaginous yeasts capable of producing 20% fatty acid content/biomass have been identified, but they are limited because they have few if any molecular tools that could be used to increase fatty acid production beyond wild-type levels. *Cryptococcus neoformans* is an oleaginous yeast that has well developed molecular tools for genetic manipulation, but it has never been considered for biodiesel production because it is an opportunistic pathogen in immunocompromised individuals. Our lab has explored mutated strains of the *C. neoformans* that are acapsular and therefore avirulent. The yeast were grown at 30°C for 5-7 days in a basal media and then lyophilized prior to lipid extraction. The lyophilized cells underwent cell disruption by agitation in a mixture of 2:1 chloroform:methanol. After centrifugation, the lipid fraction was isolated through rotary evaporation. Transesterification of the lipid fraction in methanol yielded fatty acid methyl esters (FAME), which were quantified with gas chromatography-mass spectrometry (GC/MS) for their composition of methyl palmitate, methyl stearate and methyl oleate. Our data will show that mutated strains of the oleaginous yeast *Cryptococcus neoformans* that are nonpathogenic can be used to generate fatty acids for biofuels, and for the first time this provides an oleaginous yeast system with molecular tools to allow for the direct genetic manipulation of fatty acid production. (83)

Myers, Pam, Ashley Gonzalez*, Katelyn Starr*, and Kelly Orlando Immaculata University, Immaculata, PA 19345. *Neofunctionalization of Candida Glabrata Pmu3 and the Newly Discovered Importance of Region 2 in the Pmu Gene Family*. — *Candida glabrata* is evolutionarily related to the well-characterized budding yeast *Saccharomyces cerevisiae*, which is commonly utilized in baking and in alcohol fermentation. However, *C. glabrata* lacks homologs for the phosphatases required for a number of vital pathways in *S. cerevisiae*, including thiamine (Vitamin B1) uptake. Survival of single-

celled organisms is contingent on this pathway; therefore, there must be other enzyme(s) replacing this necessary function in *C. glabrata*. The Wykoff lab at Villanova University has uncovered a family of genes in *C. glabrata* (CgPMU1, CgPMU2, and CgPMU3) created by gene duplication whose members seem to have neofunctionalized in order to replace various missing phosphatases. Preliminary studies from the Wykoff lab and from our lab suggest that CgPMU3 encodes an enzyme that can remove phosphate from TPP, a phosphorylated form of thiamine, which then allows it to be taken into the cell. Our objective for this study is to uncover the amino acid changes in the ancestral PMU sequence necessary to generate this novel CgPMU3 activity. We have conducted assays on multiple fusions between CgPMU1 and CgPMU3 and have concluded thus far that regions 2, 3 and 4 play some role in CgPMU3 function. Since a previous study has determined that specific point mutations in regions 3 and 4 are important for the neofunctionalization of CgPMU2 as a general phosphatase as compared to CgPMU1, we have decided to first focus on potential point mutations in region 2. Our goal is to determine if the point mutations we have created can alter the enzymatic activity of CgPMU1 to be like CgPMU3. (29)

Mylin, Lawrence*, Lauren Wilson, Ben Katowa, Saidon Mbambara, Natasha Laban, Mwiche Siame, Jennifer Stevenson, and Philip Thuma Messiah College, Mechanicsburg, PA 17055. *Capacity Building: Establishing Laboratory Culture of Plasmodium falciparum Laboratory Strain NF54 and Patient Isolates at the Macha Research Trust/ Malaria Institute at Macha, Choma, Zambia.* — The Macha Research Trust was established in rural southern Zambia adjacent to Macha Hospital in collaboration with Johns Hopkins University in 2005. Infrastructure and capacity for conducting research was built initially for malaria and then for other health conditions, including HIV and tuberculosis. Malaria research programs of MRT currently employ a variety of PCR- and ELISA-based technologies to analyse *Plasmodium sp.* (parasite) genetic diversity and prevalence and *Anopheles sp.* (vector) infectivity, and are supported by fully functional insectary facilities. However, the capacity to conduct routine laboratory cultivation of the malaria parasite *Plasmodium falciparum* remained undeveloped. Addition of several small pieces of equipment, media and reagents, and permission from the Zambian National Health Research Ethics Committee to import *P. falciparum* laboratory strains and human serum allowed existing equipment and facilities to be repurposed to support successful cultivation of the laboratory strain NF54. Related techniques were used to culture and preserve multiple isolates of *P. falciparum* from venous blood drawn from consenting patients presenting with a positive HRPII RDT (rapid diagnostic test for malaria infection) at the Macha Mission Hospital or surrounding Rural Health Clinics. Red blood cells from uninfected human donors are required for laboratory propagation of *P. falciparum*. Our studies reveal that media-washed red blood cells obtained from individuals undergoing malaria prophylaxis with either Doxycycline or Deltaprim support ongoing propagation of asexual forms of the parasite as well as the development of morphologically mature gametocytes. The availability of cultured parasites provides opportunities to prepare standards for ongoing molecular diagnostic analyses as well as for the production of infectious sexual gametocyte forms which can be used for future studies of mosquito infection using artificial membrane feeding system(s). This newly acquired capacity should enhance research opportunities at the Zambian field location of the Johns Hopkins Bloomberg School of Public Health. (3)

Namous, Fadia*, Briana Hill, and Andre Walther Cedar Crest College, Allentown, PA 18104. *Examining the Role of Replication Protein A Phosphorylation in Regulating the Cellular Response to Chemotherapeutic Drugs in Saccharomyces cerevisiae.* — According to the American Cancer Society, in 2016 there will be approximately 1.6 million new cancer diagnoses and ~600,000 Americans are expected to die of cancer, therefore there is a dire need to better understand this disease. The budding yeast *Saccharomyces cerevisiae* has been widely used as a model organism to understand the underlying causes of cancer because of the significant level of homology in cell cycle and DNA maintenance pathways. Our lab is focused on the highly conserved, single-stranded DNA binding protein Replication Protein A (RPA). RPA plays central roles in DNA replication, DNA repair, cell cycle control, and telomere synthesis, which are pathways often dysfunctional in human cancerous cells. RPA

is phosphorylated in a cell cycle dependent manner and in response to DNA damaging agents suggesting a possible role in regulating the cellular response to DNA damage. We have previously shown that RPA phosphorylation plays a role in allowing yeast cells to survive in the presence of DNA damage. Our aim is to elucidate the role of RPA phosphorylation in regulating genetic pathways responsible for responding to different DNA damaging chemotherapeutic drugs including: camptothecin, phleomycin, and hydroxyurea. We have generated strains with mutations in the repair or DNA damage checkpoint genes *KU70*, *RAD52*, *RAD9*, and *MEC1*, either alone or in combination with mutations that affect RPA phosphorylation. We have placed serial dilutions of each yeast strain on plate media containing each type of chemotherapeutic agent, incubated for 2-3 days, and observed the viability of each mutant strain. We will present results showing that RPA phosphorylation affects genetic interactions with a number of repair and checkpoint pathways. A better understanding of RPA's role in each of these pathways in response to different chemotherapeutic drugs will provide insights into choosing proper chemotherapeutic drug that better target specific cancers. (12)

Namous, Nadia*, and Andre Walther Cedar Crest College, Allentown, PA 18104. *Analysis of the Role of KU70, CDC5, and RPA in the Cell Cycle Adaptation to Unrepairable DNA Damage.* — During the somatic mitotic cell cycle there are checkpoints that act to protect cells from external stresses and internal errors. The cell cycle is highly regulated and activation of each phase is dependent on the proper progression of the previous phase. The presence of DNA damage leads to the activation of cell cycle checkpoint pathways that pause the cell cycle to allow DNA repair mechanisms to fix the DNA damage before the cell can resume the cell cycle. When the DNA damage cannot be repaired some cells that have maintained a prolonged arrest at the checkpoint will eventually resume the cell cycle in a process called adaptation. Cancer cells often behave this way, and the aim of this project is to use the model organism *Saccharomyces cerevisiae* to examine the role of the genes *KU70*, *RFA1*, *RFA2*, and *CDC5* in adaptation. Of particular interest are the *RFA* genes that make up the highly conserved Replication Protein A (RPA), which is phosphorylated during different parts of the cell cycle. Adaptation was measured by inducing a single unrepairable double-stranded DNA break using the site specific HO-endonuclease under the control of a galactose inducible promoter. Cell cycle progression of individual yeast cells with DNA damage was monitored microscopically over 48 hours. Approximately 8 hours after inducing the DNA damage, most cells arrested at the G2 checkpoint, and by 24 or 48 hours some stains had released from the checkpoint even though DNA damage was still present. Our data suggest that RPA phosphorylation plays an important role in regulating adaptation and that RPA genetically interacts with *KU70* and *CDC5* during adaptation. Understanding the mechanism of adaptation in yeast cells will give insights of the mechanisms involved in cancer cells bypassing checkpoint arrest and will help develop newer and more reliable treatments in the future. (21)

Nevin, Andrew*, Holly Ross, Daniel Yeisley, Thomas Soerens, Erik Lindquist, and Lawrence Mylin Messiah College, Mechanicsburg, PA 17055. *A Study on the Long-Term Performance of the Sawyer PointONE™ Filter in the Developing World.* — Lack of sustainable access to safe water and sanitation services dramatically impacts the health and productivity of many people living in low-income countries. Infrastructure improvements needed to provide such services are costly and slow to implement. A number of NGOs have sought instead to distribute low-cost household water filtration units in community-focused programs while providing basic training in filter use and health education. The Sawyer PointONE™ Filter has been used in both relief and development settings; however, some NGOs have been reticent to adopt these filters, citing factors such as uncertain longevity in the field, culture/NGO-related challenges associated with filter use, and limits for repair or replacement of broken filters/filter components. In fact, one study (Murray *et al.*, *Journal of Water, Sanitation and Hygiene for Development*, *in press*) reports serious, negative claims regarding breakage and fouling-related failure of these filters. Such claims would call into question the ability of these filters to produce adequately disinfected effluent water after two years of household use. We conducted a two-nation study that included collection of Sawyer PointONE™ Filters that had been in use for five or more years in Cochabamba, Bolivia and Nadi, Fiji. Microbial loading and turbidity in source and effluent water from

unmanipulated or chlorine-backwashed filters were tested in the field and later under controlled laboratory conditions. Field and laboratory results from quantifying total coliforms and *E. coli* loads and turbidity in source and effluent water will be presented. While relatively few filters were located five or more years following initial distribution, a majority of those collected did reduce bacterial loads in effluent water to comply with WHO guidelines. Based on these and other results, our study will help to answer important questions about longevity for these hollow micro-fiber filters. (106)

Newsom-Stewart, Catherine*, Caroline McCauley*, Lysa Diarra*, and Eric Ho Lafayette College, Easton, PA 18042. *An Annotated Geminivirus Database*. — Geminivirus is a prevalent plant virus that infects crops globally, causing serious economic loss to agriculture especially in developing countries. It is a fast-evolving virus due to its single stranded DNA genome. Studies had shown substitution rate in single stranded DNA virus is comparable to RNA viruses. As a result, diverse viable genomes are prevailing worldwide. Currently, NCBI Viral Genome provides a centralized repository of all viral genomes in which researchers can conveniently access the data in one location. However, unlike animals and plants, structure of viral genomes exhibits myriad variations between families. Thus, a unified annotation scheme for all viruses may downplay unique features of each virus. In particular, the most pervasive genus of Geminivirus, Begomovirus, encapsulates two circular genomes in one virion, namely the bipartite genome. Intriguingly, the bipartite genomes shared a pair of highly homologous non-coding regions with a distinctive hairpin secondary structure, which are important for replication. Besides, the monopartite Begomovirus is often propagated with a small satellite genome, which has been shown to complement virulence. But their association with the main genome is often missing from NCBI Viral Genome. Our goal is to build a comprehensive set of Geminivirus genomics data with manual annotation such as the sequence of the homologous regions shared between the bipartite viruses. We manually curated 283 Geminivirus including satellite genomes. Since the homologous region serves an important function to viral replication, we used the homologous regions to build a phylogenetic tree and compared it with another phylogenetic tree based on the replication protein of the virus. Result indicated that the two phylogenetic trees are correlated. We will harness this result as an alternative method for viral classification. (88)

Nickerson, Stephanie*, and Daniel Stroembom Lafayette College, Easton, PA 18042. *Modeling Self-Organization and Escape Waves in Moving Animal Groups*. — Animal groups on the move, for example schools of fish and bands of locusts, can coordinate themselves in various ways without a leader or coordinator. Despite being made up of many autonomous individuals the group as a whole often behave as one organism when, for example, migrating or responding to predator attacks. These phenomena have previously been investigated using models based on attraction, repulsion, and the assumption that individuals align their headings with their nearest neighbors (orientation). However, in recent years indications from both theoretical and experimental work suggest that attraction and repulsion alone may be responsible for many of the group behaviors observed. Here we present a model based on attraction and repulsion alone and analyze it using computer simulations. We compare the behaviors produced by our model with those observed in experiments with prawns, marching locusts and schools of fish exposed to simulated predator attacks, and well-known orientation-based models currently used to explain these phenomena. We find that in several situations attraction and repulsion alone are sufficient to produce the observed group behaviors. Providing further evidence suggesting that the role of orientation in coordinating moving animal groups may be less important than previously thought. (99)

Ogozaly, Susanna*, and Lindsey Welch Cedar Crest College, Allentown, PA 18104. *Analysis of Products From the Liquid Phase Reaction of Furfural Under Reducing Conditions*. — Furfural, a biomass conversion intermediate, was reacted in the liquid phase under mild, reducing conditions with supported palladium catalysts. The effects of metal salt additives (e.g. NiCl₂, CuCl₂, SnCl₂) in the liquid phase were analyzed. Commercial alumina- and carbon-supported palladium catalysts were used for reactions in isopropyl alcohol in atmospheric pressure of hydrogen using a balloon. Products were identified with a combination of gas chromatography-mass spectrometry (GC/MS) and gas

chromatography-infrared spectroscopy (GC/IR). The catalyst support and the type of metal salt additive significantly altered the activity and selectivity of the reactions. In addition to expected hydrogenation products such as furfuryl alcohol and tetrahydrofurfuryl alcohol, other larger products were detected. Highest furfural conversion was achieved with reactions catalyzed by Pd/C with NiCl₂ and FeCl₃ as additives. Comparative reactions in other alcohol solvents were investigated to determine the role of the solvent in possible etherification pathways. A nitrogen atmosphere was also observed to examine the role of the solvent as a proton donor. Proposed reaction schemes will be presented and compared to recent literature in the field of biomass conversion. (35)

Page, Natasha*, Jonathan Niles, and Dan Ressler Susquehanna University, Selinsgrove, PA 17870. *Predicting Water Temperatures of Head-Water Streams Within Brook Trout Habitat Without Visiting Them.* — Brook trout are a native and keystone species in Pennsylvania and often used as an indicator of environmental quality due to their sensitivity to water temperature. In order to analyze the potential habitat quality for brook trout, water temperature data is required. Land use and terrain variables have been used to predict brook trout presence, but it is clear that the anthropogenic impact of climate change, as well as mining, drilling, and development will affect our ability to predict fish populations. We are using trout population data collected in 615 first and second order tributaries in north central and central Pennsylvania. The USGS has collected stream water temperature data on larger order streams, but not on the first and second order streams. 60% of sites were randomly selected to calibrate the regression equations between elevation, site location, and water temperature. The remaining 40% of sites were used as a comparison group to determine the predictive ability of the model. The predicted water temperatures were used with landscape characteristics like land use, terrain, and soil properties to see if these variables were enough to predict brook trout populations in three watersheds in central and northern PA. Streams containing brook trout are given a higher level of environmental protection than streams without the species in Pennsylvania and of the 62,725 streams in PA, only 8,224 of them have been sampled by the Pennsylvania Fish and Boat Commission. Our goal is to accurately predict water temperature which will be helpful to the PFBC to allow for targeted selection of sampling sites for biological monitoring. (129)

Pates, Hunter*, and Barbara McCraith Misericordia University, Dallas, PA 18612. *A Living Shoreline Approach to Erosion Prevention and its Effect on Fiddler Crab (*Uca spp.*) Burrow Densities on Mordecai Island, Barnegat Bay, and Money Island, Cumberland County, New Jersey.* — Shoreline erosion has become a significant issue in salt marshes along the east coast as sea levels rise and land development continues to impact intertidal habitats. Living shorelines, an alternative to traditional hardened structures, are believed to support a stable, diversely colonized bio-based shoreline. The important ecological role fiddler crabs (*Uca spp.*) play in salt marsh ecosystems makes them a key species to study how erosion affects burrow density, and if living shorelines are being actively colonized by native fauna. To determine the most effective living shoreline design, several methods have been implemented in Delaware and New Jersey. The main objective of this study is to gather baseline data on fiddler crab burrow abundance and diameter in an area of preliminary hybrid living shoreline construction (geotubes) on Mordecai Island, Barnegat Bay as compared to an established, organic-based living shoreline at Money Island, Cumberland County. This study determined the effect the use of living shorelines has on fiddler crab burrow abundance and recruitment. Mean burrow abundance at Mordecai Island was significantly greater on the control transect compared to the experimental transect (geotubes). Mean burrow abundance was not significantly different between the control and experimental transect (organic living shoreline) at Money Island. Mean burrow diameter at Money Island was significantly smaller along living shoreline transects than control transects in the low marsh. The mean burrow diameter along Money Island's living shoreline transect was significantly smaller than along Mordecai's geotube transect. Our results suggest that the use of organic material is a more effective living shoreline method in enhancing fiddler crab recruitment and in reestablishing marsh habitat as compared to the use of geotubes. (46)

Pecko, Katherine*, Rebecca Grady, and Andre Walther Cedar Crest College, Allentown, PA 18104. *Examination of Homologous Recombination in *Saccharomyces cerevisiae* Using Quantitative PCR*. — Cancer is a disease that touches everyone's lives either directly or indirectly. While significant advances have been made in the treatment of cancer, many current anti-cancer drug therapies have either limited success or have significant side effects that make the treatment extremely difficult to withstand. There is a strong need to better understand the mechanism of cancers in order to develop more targeted and effective treatments that have fewer side-effects. A significant underlying cause of all cancers is genomic instability, which results from the improper cellular response to DNA damage. DNA damage occurs in our cells every day due to the inherent intracellular environment that contains oxygen free radicals, and due to environmental factors such as exposure to UV light or chemicals. Defects in DNA damage recognition and/or repair result in the accumulation of mutations that causes cells to have defects in cell cycle regulation and to adopt cancerous cell behaviors. My project is focused on homologous recombination, which is a mechanism for repairing double stranded breaks in the backbone of DNA. Our lab uses the model organism *Saccharomyces cerevisiae*, because it performs homologous recombination in a very similar fashion to humans. Our lab has been working to develop a novel qPCR assay to measure homologous recombination undergoing mating type switching. To switch mating type, the yeast express the site specific HO endonuclease that causes a single double stranded break at the MAT locus that is then repaired by a homologous recombination mechanism. We are using this assay to examine the function of mutant alleles of DNA repair genes in the homologous recombination pathway. An improved understanding of homologous recombination will provide insights into the underlying mechanisms that lead to the accumulation of potentially cancer causing mutations. (20)

Perez, Alexis*, and Barbara Fenner King's College, Wilkes-Barre, PA 18711. *The Effects of Glutamate on Calcium Release in SH-SY5Y cells*. — Oxidative stress is a common feature of many neurodegenerative disorders, such as Alzheimer's disease, Parkinson's disease, Amyotrophic lateral Sclerosis and Huntington's disease. Oxytosis, or glutamate-induced oxidative stress, is a commonly used model of neurodegenerative disease. Furthermore, there is evidence of glutamate-induced excitotoxicity in disorders such as stroke, Post Traumatic Stress Disorder, and Traumatic Brain Injury. This is because excessive glutamate can act like a neurotoxin inducing cell death. For our studies, we model neurodegeneration using glutamate-induced oxidative stress in SH-SY5Y cells. The present study aims to investigate whether glutamate toxicity in SH-SY5Y cells has an effect of the intracellular levels of calcium. Preliminary studies showed that Glutamate concentrations over 300mM induce cell death. Therefore, we hypothesize that glutamate concentrations between 10mM and 300mM will increase intracellular calcium without cell death. Intracellular calcium concentrations are being quantified using the fluo-4 cell permeable calcium indicator. (67)

Pheasant, Michael S.*, Timothy A. Kennedy, and Barbara J. McCraith Misericordia University, Dallas, PA 18612. *Feeding Preference of Fish in Two Mountain Streams in Northeastern Pennsylvania*. — The diets of fish communities of Trout Brook and Leonard's Creek, two small streams located in northeastern Pennsylvania, were analyzed in relation to the benthic macroinvertebrates present. Overlap was examined between the benthic macroinvertebrates present and the diets of the fish. Benthic macroinvertebrates and fish were concurrently collected at two sites in Trout Brook and Leonard's Creek in the summer, fall and winter of 2014. Creek chub (*Semotilus atromaculatus*) and blacknose dace (*Rhinichthys atratulus*) were found in both creeks; brown trout (*Salmo trutta*) were only found in Trout Brook. The benthic macroinvertebrates collected in Trout Brook were similar to those collected in Leonard's Creek. Overall Ephemeroptera dominated the benthic macroinvertebrate communities of both Leonard's Creek and Trout Brook. However, Trichoptera were the most abundant benthic macroinvertebrate found in the fish diets in Trout Brook and Diptera were the most abundant benthic macroinvertebrate found in the fish diets in Leonard's Creek. These results suggest that the food preferences of the fish in Trout Brook differed from those of the fish in Leonard's Creek. Overall our results suggest that fish feeding preference was not directly based on abundance of benthic

macroinvertebrates in either of the creeks. The fish appeared to selectively sample benthic macroinvertebrates. (47)

Phuong, Tiffany*, Chun Wai Liew, and Robert Kurt Lafayette College, Easton, PA 18042. *A Computer Model of the TLR4-Myd88 Signaling Cascade with Negative Feedback to Predict Tumor Progression.* — Inflammation provides a microenvironment that enables tumor cells to proliferate. Previously, we created a model of the TLR4-Myd88 signaling cascade which is correlated with CCL2 expression and tumor-associated inflammation. We are specifically studying 4T1, a metastatic murine mammary carcinoma which we previously showed has constitutive TLR4-Myd88 signaling, and we are using dendritic cells (DC) which exhibit proto-typical TLR signaling as a control. Because 4T1 exhibit constitutive TLR signaling we hypothesized that the tumor cells lack a negative feedback mechanism for this signaling cascade, and we were interested in identifying a protein that could halt this inflammation associated signaling cascade. For this purpose we decided to look into expression of genes encoding TLR inhibitory proteins in 4T1 and DC. We looked at genes encoding four upstream inhibitory proteins, RP105, MD-1, Myd88s, and IRAK-M using qRT-PCR and we found that different genes exhibited varying expression in 4T1 and DC. We decided to further investigate IRAK-M because it was the inhibitor that gave us the most consistent results and exhibited an increase in gene expression at 48 hours; similar to other well-known inhibitory proteins. Interestingly, we found IRAK-M gene expression was elevated in both the tumor cells and DC. From these data we hypothesized that although normally IRAK-M does function as an inhibitory protein in normal TLR4 signaling, IRAK-M does not function as an inhibitory protein in 4T1 TLR4 signaling. We are in the process of using RNA interference to determine whether IRAK-M functions as an inhibitory protein in these cells. If our data reveal that the tumor cells lack a negative feedback mechanism, then this information may explain one of the reasons that tumor cells constitutively express pro-inflammatory mediators such as CCL2. Ultimately, having the ability to target the protein that halts constitutive inflammatory responses may slow tumor progression. (112)

Powers, Ellen*, and Anya Goldina Elizabethtown College, Elizabethtown, PA 17022. *Repeated Social Interactions Decrease Aggression but do Not Stabilize Social Hierarchy in the Crayfish Orconectes obscurus.* — Social interaction is essential for survival of most animals. While some species are solitary and only come together to mate, other species establish hierarchies and maintain stable social networks. Within these social networks individuals recognize members of their group as well as their respective social status. Individuals within a social network interact with multiple individuals and are likely differentially influenced by these interactions. To understand how social experience shapes future interaction, it is essential to consider the complex social environment of each individual. In this study, we utilized a simplified social network of three individuals to assess how repeated interactions affect social dynamics of the crayfish *Orconectes obscurus* (n=4 groups of three individuals each). Size-matched females were placed in a tank to establish a dominance hierarchy. Following this initial interaction, individuals were isolated and re-introduced into the tank five times to assess hierarchy and social status stability. All interactions were video recorded. Aggression intensity, and frequency of defensive and offensive behaviors were compared within and between interactions for each individual within a group. Preliminary analyses show that over the course of repeated trials, aggression intensity and quantity of offensive behaviors decreased, while defensive behaviors stabilize. Despite changes in aggression, we did not observe stabilization of social hierarchy within each group. Within each group, individual social status was not maintained from one interaction to the next. Furthermore, changes in social status were equally likely in all directions (decrease in status from dominant to intermediate to subordinate, and increase in status from subordinate to intermediate, and dominant). Even though repeated social interactions cause a decrease in overall offensive behaviors and aggression intensity, they do not affect dominance hierarchy, which continues to fluctuate. Our preliminary results suggest that while stable social networks decrease aggression, they do not necessarily stabilize social hierarchy. (45)

Rabon, Meghan*, Ayatt Damra, and T. Michelle Jones-Wilson East Stroudsburg University, East Stroudsburg, PA 18301. *Determination of Thermodynamic Parameters for the Hydrolysis of PNPP Using the van't Hoff.* — The catalysis of *p*-nitrophenylphosphate (PNPP) by the enzyme acid phosphatase is used frequently for undergraduate enzyme kinetic laboratories. When hydrolyzed, PNPP produces the yellow product *p*-nitrophenol (PNP), which has a high extinction coefficient at 405 nm. Small quantities of PNP can be measured and quantified using UV spectroscopy with Beer's Law. The focus of this work is to develop a protocol suitable for the undergraduate laboratory to determine the thermodynamic functions for this reaction using the van't Hoff equation. This allows for the comparison of PNPP hydrolysis both thermodynamically and kinetically. The hydrolysis of PNPP takes place over time in water; in this experiment, we explored the use of HCl to decrease the time needed for this reaction to reach equilibrium. Optimal conditions for the hydrolysis of PNPP were explored by changing the concentrations of substrate and acid catalyst. Reaction tubes containing 50 μ L 0.1M PNPP and 2 mL 0.2M HCl were incubated for 40 minutes at various temperatures. The reactions were terminated by the addition of NaOH. The absorbance of each solution was read and recorded. Using the van't Hoff equation, the enthalpy and entropy of the reaction were calculated with values in agreement with the literature. Traditional experiments used to measure enthalpy use bomb calorimetry which is expensive and technically difficult. Entropy is difficult to measure directly, and is generally calculated. The primary purpose of this experiment was to develop parameters to investigate the thermodynamics of the hydrolysis reaction of PNPP, and to illustrate the use of the van't Hoff equation. This experiment has several advantages to traditional experiments; it may be performed in a three-hour lab period, with easily controlled environmental factors. In addition, the substrate is inexpensive, and the necessary equipment is present in undergraduate biochemistry laboratories. (36)

Rabon, Meghan*, Lian Mlodzienski, and T. Michelle Jones-Wilson East Stroudsburg University, East Stroudsburg, PA 18301. *Illustrating pH Dependent Hydrophobic Behavior of Small Biological Molecules – an Experiment for Biochemistry Laboratories.* — The study of partition coefficients, the ratio of concentrations of a compound in a mixture of two immiscible phases at equilibrium, is an important concept in biochemistry. This ratio can be used to illustrate, approximate and quantitate hydrophobic behaviors of molecules. Investigation of thermodynamic parameters of molecules in a biological membrane model environment is traditionally performed using octanol/DI water partition experiments.

Partition coefficients are calculated as a ratio between octanol and water, where

$$K_{OW} = \frac{[\text{Solute}]_{\text{octanol}}}{[\text{Solute}]_{\text{water}}}$$

A primary goal of our work is develop an undergraduate laboratory experiment to illustrate pH dependent partition behavior of small biological molecules. Octanol is expensive, hazardous, and odorous. We are exploring greener alternatives to octanol as the lipophilic phase. Mineral and other oils are being investigated as a less expensive and less hazardous alternatives to octanol. We have substituted buffers of varying pH for the traditional distilled water aqueous phase to illustrate the connection between pH and hydrophobicity/hydrophilicity. Three amino acids (tryptophan, phenylalanine, and tyrosine) were chosen for analysis. These amino acids are easily quantified using UV spectroscopy. Additionally, depending on pKa values for the analytes, partition coefficients can be affected by pH. Ionization states and charge distribution are sensitive to pH resulting in a change in the hydrophobic character of the molecules. By determining partition coefficients at three different pH values, the experiment illustrates how charge and charge distribution affects hydrophobicity and hydrophilicity. This allows quantification of hydrophobic behavior of small molecules in relationship to their acid base equilibria. Initial results illustrate the expected distribution of the chosen amino acids under varying conditions of pH and lipophilic layer. Current progress of the project tested in a 300 level biochemical energetics laboratory will be reported. (37)

Raugh, Arielle*, Matthew Lauver, Jeremy Haley, Todd Schell, and Lawrence Mylin Messiah College, Mechanicsburg, PA 17055. *Characterization of CD4+ T Lymphocyte Responses to the Simian Virus 40 Large Tumor Antigen (SV40 T ag) in C57Bl/6 Mice.* — The induction of T cell responses by

multiple CD8 epitopes located within the Simian Virus 40 Large Tumor Antigen (SV40 T ag) has been well characterized. We have now identified multiple CD4 epitopes within the T ag and have begun to characterize their role(s) in controlling cellular immune responses to the T ag. Our long-term goal is to understand how to effectively utilize vaccination to counter the effects of peripheral or tumor-induced tolerance to generate and maintain elevated levels of long-lived, effective, tumor-specific CD8+ T lymphocytes. In this study, the cytokines expressed by CD4+ T cells specific for three epitopes in T ag were monitored by ELISPOT. Mice were immunized with one of two cell lines (B6/K-0, and K145) and the frequencies of epitope-specific T cells expressing the cytokines IFN-g (pro-inflammatory), IL-4 or IL-10 (inhibitory) were measured in separate ELISPOT assays prepared in parallel from the same splenocyte suspensions. B6/K-0 cells express the “wild type” SV40 T ag while the CD8 epitopes have been silenced by substitution in or removed by deletion from the mutated T ag expressed by B6/K145 cells. CD4+ cytokine expression patterns were also compared following primary and secondary immunizations using only the B6/K145 cells. Stronger responses (higher frequencies of epitope-specific CD4+ T cells) were detected following secondary immunizations for both pro-inflammatory and inhibitory cytokines, especially for the 529 epitope. (113)

Raymond, Jacqueline *, **Margaret Matthews**, **Sara Turner**, and **Thomas Cook** Mercyhurst University, Erie, PA 16546. *Prevalence of Toxoplasma gondii in the Environment*. — Background: *Toxoplasma gondii* is a unicellular parasite that can be found throughout the globe that is approximated to have infected 25% - 30% of the human population. This parasite poses a serious problem for pregnant women and immunocompromised individuals. Humans can be infected in many ways including contact with infected cat feces, drinking contaminated water, contact with contaminated soil, and vertical transmission from mother to fetus among other routes. This study examines the prevalence of *T. gondii* in rural and urban areas around Erie County, PA. It is predicted that urban areas would have higher rates of *T. gondii* than the peripheral areas because outdoor/stray/feral cats would be concentrated in the city with greater access to food, dumping of cats at shelters, and rodent populations serving as intermediate host. Methodology: On one day in September 2014, twenty soil samples were collected. The soil was put into a sealed plastic bag until the DNA could be extracted using the E.Z.N.A. soil DNA kit. PCR was used to amplify the B1 gene, which is present in six strains of *T. gondii*. The samples were then run against a positive sample of *Toxoplasma gondii* using gel electrophoresis. Out of the twenty samples, ten were positive. All samples that were considered positive had both the B1 gene and the 529 base pair repetitive fragment. Conclusion: The results that ten of the twenty samples taken were positive for *T.gondii* indicated there is a prevalence of the parasite throughout Erie, Pennsylvania. Additional samples have been collected in rural areas and are currently being tested for the parasite. In the United States, no testing has been done on the environment for *T. gondii* so these findings are significant. Currently the only data that is collected for this parasite in the U.S. is on pregnant women and on individuals in the military. (2)

Redline, Matthew*, and **Meda Higa** York College of Pennsylvania, York, PA 17405. *Investigating Potential Differences in Interferon Regulation by the Zaire and Reston Strains of Ebola VP35 Protein*. — Ebola is a filovirus which causes hemorrhagic fever in human and non-human primates. Currently, there are five sub-types, most notably being Ebola Zaire (ZEBOV). Of these sub-types only Ebola Reston (REBOV) does not cause lethal disease in humans. Previous studies have shown that Virus Protein 35 (VP35) inhibits interferon- β (IFN- β) through the Interferon Inhibitory Domain (IID). In addition, only 14 residual differences exist between the IID of Reston and Zaire. To determine if differences in the IID cause REBOV VP35 to function differently than ZEBOV VP35, we will measure the levels of IFN- β production/inhibition in vitro. Currently we are creating the REBOV IID using the Gibson Assembly and inserting it in place of the ZEBOV IID. We will then transfect HEK-293T cells with ZEBOV VP35 containing either REBOV or ZEBOV IID as well as IGK-IFN-LUC, an IFN- β promoter with luciferase reporter gene. Following transfection we will view the transfected HEK-293T cells using a luciferase assay to determine levels of IFN- β inhibition. Because REBOV does not cause lethal disease in humans, we expect to see IFN- β levels significantly higher than that of ZEBOV. The results of this

experiment will help to determine whether REBOV VP35 plays a role in its inability to cause lethal disease in humans. (86)

Reed, Morgann*, Keira McGrath*, and Jodi Yorty Elizabethtown College, Elizabethtown, PA 17022. *Determining the Effect of CD40 Stimulation and Corticosterone on Pro-Survival Protein Expression in Murine BMDCs*. — Dendritic cells (DCs) are antigen presenting cells which play a crucial role in bridging the innate and adaptive branches of the immune system. An immature DC constantly samples its surroundings, and when foreign antigens are detected, DC maturation begins. This maturation allows the DC to change its gene expression and function to present foreign antigens to T cells of the adaptive immune response. Corticosterone (CORT) is an adrenal, steroid hormone associated with stress and diminishes DC populations *in vivo*. Use of α -CD40 antibodies to stimulate CD40, a costimulatory protein on antigen presenting cells, mitigates the loss of CORT-treated populations of DCs in an *in vivo* mouse model. The mechanism of this phenomenon involving the differential effects of CORT and α -CD40 is unknown, but may rely on changes in expression of pro-survival proteins. The purpose of this study is to analyze the presence of two key pro-survival proteins, BCL-2 and BCL-XL, in primary murine bone marrow dendritic cells (BMDCs) exposed to α -CD40 and CORT *in vitro*. It is hypothesized that exposure to CORT decreases expression of these two proteins while treatment with α -CD40 rescues expression of these proteins and thus promotes the survival of the BMDCs. Thus far, the BMDC cultures have been characterized and the majority are immature DCs and express BCL-XL. Current efforts are leading to the detection of BCL-2 from BMDC cultures and determination of the effect of α -CD40 and CORT on expression levels of these proteins. (73)

Reichard, Elizabeth*, Molly Schnaubelt, Kristina Cramp, Magdalena Dammer, and Andre Walther Cedar Crest College, Allentown, PA 18104. *Development of Molecular tools for Rapid Genotyping of Yeast Strains Used in Beer Production*. — Beer is the top alcoholic beverage consumed in the United States with 191.98 million barrels produced in 2014. Beer brewing involves the fermentation of sugars extracted from malted grains using different species of brewing yeasts. The two most prevalent types of yeasts used in beer brewing include the top fermenting yeasts species *Saccharomyces cerevisiae* used in the brewing of ales, and the bottom fermenting yeasts species *Saccharomyces pastorianus* used in the brewing of lagers. Since different strains of yeasts lead to different flavor, alcohol, and color profiles, it is important to use the proper yeast strain in order to obtain the correct beer. Breweries sometimes have contamination in their brewing tanks from incorrect yeast strains that carry over from previous fermentations in the same tank, or from wild yeasts present in the environment. If not identified quickly, these contaminating yeasts can cause the beer to have undesirable profiles and result in significant financial losses. Current methods to identify yeast contamination use biochemical and metabolic tests that may take up to a week to obtain results, at which time large volumes of beer may have been tainted by the contaminating yeast. Our research focuses on developing a rapid molecular analysis tools to genetically identify beer yeasts using techniques such as quantitative polymerase chain reaction (qPCR) with high resolution melting analysis (HRM). We are characterizing PCR primers targeted at genomic loci with Short Tandem Repeat (STR) sequences in the *S. cerevisiae* genome, and the sequence variability in the PCR amplicons is being measured by high resolution melt analysis to identify strain-specific melting temperatures. This novel genotyping process can be used for identifying trace amounts of contamination within hours of sample collection, allowing brewers to quickly address contamination issues before they result in significant loss in the beer production. (82)

Rimal, Abhimannu*, GuoZhi Zhang*, Matthew Junker*, and Carsten Sanders* Kutztown University, Kutztown, PA 19530. *The Role of Glutamic Acid Residue E133 in the Catalytic Activity of Yeast Cytochrome c Heme Lyase*. — Cytochrome c is an electron carrier protein essential for the mitochondrial electron transport chain. Functional cytochrome c (holoform) contains a covalently attached heme group. In fungi, metazoans, and some protozoa, heme ligation to the apoform of cytochrome c is catalyzed by an enzyme known as cytochrome c heme lyase (CCHL). In humans, a

mutation of a conserved glutamic acid at position 159 to lysine (E159K) is lethal in males and causes *Microphthalmia with linear skin defects (MLS) syndrome* in females. In this study, we used the yeast CCHL homolog as a model. In this model, E159 in human CCHL is a position 133 (E133). We created five different mutations of E133 by site-directed mutagenesis (E133K, E133Q, E133D, E133S, and E133C). Co-expression of the generated CCHL mutants with yeast cytochrome *c* in *Escherichia coli* and subsequent analysis of holocytochrome *c* production revealed decreasing catalytic activities of these CCHL mutants in the following order: E133 (wildtype/WT) > E133D > E133Q > E133S > E133C > E133K, whereby E133K was still able to form approximately 5% of WT levels. These results confirm the importance of E133 in yeast CCHL (as similar to E159 in human CCHL) for the catalytic activity of this enzyme essential for cytochrome *c* biogenesis. (84)

Ritenour, Laura*, and John Harms Messiah College, Mechanicsburg, PA 17055. *Characterizing Monoclonal Antibodies Against the Cholecystokinin 2 Receptor and a Splice Variant for Use in Pancreatic Cancer Studies*. — Pancreatic cancer is one of the most aggressive cancers with a five-year survival rate of less than 6%, largely due to the lack of early detection and effective treatment options. A better understanding of the mechanisms leading to malignant transformation is necessary to improve patient outcomes. One known contributor to tumor aggression is the cholecystokinin 2 receptor (CCK2R), a G-protein coupled receptor that binds the gastrointestinal hormones CCK and gastrin. A constitutively-active form of the receptor, the intron 4 splice variant (CCK2_{i4sv}R), has also been observed in cancer cells. To facilitate studies of this receptor and its splice variant, two monoclonal antibodies have been developed: one binds an extracellular site common to all forms of CCK2R, while a second binds an epitope located on the inserted sequence in CCK2_{i4sv}R. Both antibodies have achieved clear immunofluorescent (IF) staining with minimal background fluorescence in HEK293 cells transiently transfected with CCK2_{i4sv}R. Each produced primarily membranous staining patterns, co-localizing with a commercially available anti-CCK2R polyclonal antibody. Detection by IF and confocal microscopy in cancer lines stably expressing lower levels of receptor have been inconsistent to date. Characterization of the antibodies in immunohistochemistry (IHC) and Western blotting applications is ongoing. (108)

Ross, Brandon*, and Manuel Ospina-Giraldo Lafayette College, Easton, PA 18042. *Comparison of Expression Profiles during Colonization of Resistant and Susceptible Hosts by *Phytophthora sojae* Race 5*. — The soybean root rot pathogen *P. sojae* causes millions of dollars of damage to soybean crops yearly. This oomycete likely uses different proteins during colonization and infection of host plants. Some, known as CAZymes, have been implicated in disease progression based on their roles in carbohydrate degradation and processing, allowing entry of the pathogen through plant cell walls. Others, known as effectors, modulate host defenses in order to limit the hypersensitive response and targeted cell death, which are characteristic of the plant defense response to pathogen attack. In this study, expression levels of the Avr1b effector and two glycoside hydrolase family 3 genes (EGL12B and EGL12G) were examined at 4 time-points after inoculation of soybean plants. Hypocotyls from a susceptible cultivar (c.v. Williams) and a resistant cultivar (c.v. Williams 82) were inoculated with *P. sojae* Race 5, in order to compare the gene expression profiles during infection and colonization in susceptible and resistant cultivars, respectively. These levels were compared to basal expression levels in mycelium. Total RNA extracted from infected leaves was used for real-time PCR using sequence-specific primers. Expression profiles were created over a 48-hour period and used for comparison of pathogen gene expression based on cultivar of host used. Results indicate that for Avr1b and EGL12G, upregulation of expression was greater in the resistant cultivar than in the susceptible one, with both genes displaying the highest expression level early in the colonization of the resistant cultivar. For EGL12B, expression levels were relatively constant through the 48-time period in the susceptible cultivar, but in the resistant cultivar greater upregulation was seen in the last 48 hours. These results suggest that in *P. sojae* race 5, the host environment may play a role in expression of genes thought to be important for pathogenesis. (4)

Ross, Holly*, and John Harms Messiah College, Mechanicsburg, PA 17055. *Quantifying an Increase in the Stability and Expression of Green Fluorescent Protein in Pancreatic Cancer Cells.* — Pancreatic cancer is the fourth leading cause of cancer death in the United States, with only 11% of patients diagnosed with metastatic disease surviving the first year. Even so, few studies exist to characterize the mechanism of metastasis in this highly aggressive form of cancer. Consequently, it is imperative that techniques, such as tagging cells with green fluorescent protein (GFP), are developed to track cancerous cells over the course of their spread. Unfortunately, the existing GFP vector contains a cytomegalovirus promoter, which is readily silenced by cells and decreases the vector's usefulness for long-term studies *in vivo*. It was hypothesized that the insertion of the enhanced GFP gene downstream from a beta-actin promoter with CMV enhancers would increase expression and long-term stability of GFP in pancreatic cancer cells. Using restriction digests with *EcoRI* and *NotI*, the enhanced GFP gene was removed from the pEGFP-N1 vector and then ligated into pCAGEN.puro. Murine pancreatic cancer cells (PANC02) were transfected with either pCAGEN.puro-EGFP or pEGFP-N1, and fluorescence intensity and stability were assessed through flow cytometry. Preliminary findings reveal that the beta-actin promoter resulted in a greater percentage of cells fluorescing after two months of culture than cells with GFP expressed under a CMV promoter. Additionally, fluorescence intensity of selected clones was at least one order of magnitude greater than clones transfected with pEGFP-N1. *In vivo* tumor growth assays to compare stability and whole-tumor fluorescence are currently underway. (110)

Sabaday, Zachary*, and Cosima Wiese Misericordia University, Dallas, PA 18612. *Effect of Copper Accumulation on Common Duckweed (*Lemna minor*).* — Common duckweed, specifically *Lemna minor*, is a small free-floating macrophyte native to North America. It is known to be a hyperaccumulator of heavy metals such as lead, zinc, and copper. Copper is used in pesticides and fertilizers and can be found in elevated concentrations in waterways resulting from agricultural runoff. Plant exposure to copper is known to reduce the biomass, asexual reproduction rates, and overall health of *L. minor*. The objective of this experiment was to understand the impacts of elevated copper concentrations on growth and photosynthesis of *L. minor* by measuring changes in biomass accumulation, chlorophyll, and Rubisco content. The experiment used one control group and two treatments: *L. minor* cultured in a modified Hoagland's solution containing 0 μM CuSO_4 (control group) and 5 or 12 μM CuSO_4 . All samples were grown in a growth chamber with controlled variables such as light exposure and temperature for 10 days. The results obtained from this experiment show that the biomass of *L. minor* decreased significantly when exposed to 5 μM CuSO_4 as compared to the control group. However, the chlorophyll and Rubisco content were not significantly different in the 5 μM CuSO_4 treatment as compared to the control group. Also, there were no significant differences for biomass, chlorophyll, or Rubisco content between *L. minor* exposed to 12 μM CuSO_4 and the control group. The data presented here show little evidence that minimally elevated copper concentrations have a negative impact on the health of *L. minor*. However, higher concentrations of copper could show greater impacts on *L. minor*, such as decreased biomass accumulation, chlorophyll, and Rubisco content. (140)

Sarnese, Lauren*, and Matthew Wallace East Stroudsburg University, East Stroudsburg, PA 18301. *Using Morphology, Geography, and Seasonality to Help Distinguish Three "Entities" in the Treehopper Genus *Telamona* (Insecta: Hemiptera: Membracidae: Telamonini).* — Treehoppers are not commonly known animals among the scientific community. They are sap-sucking insects in the family Membracidae and are often characterized by their strangely shaped pronotal (first section of the thorax) features which decorate the space between their head and abdomen. Of the approximately 3,000 species of treehoppers worldwide, approximately 29 belong to the genus *Telamona*, all native to North America. Members of the genus *Telamona* have a characteristic quadrangular pronotal hump that helps distinguish them from other genera. However, pronotal features are not the only morphological characteristics used to classify treehoppers--the head, wings, and genitalia are also useful features for classification. The objective of this study was to compare the morphology, distribution, and seasonality

of three taxa in the genus *Telamona* that are considered “taxonomically uncertain,” and thus provide taxonomic clarity and stability. The three entities we studied were *Telamona salvini* Distant, its junior synonym *T. subfalcata* Van Duzee, and a currently undescribed species in *Telamona*. From our results, we show that *T. salvini* and *T. subfalcata* are likely two separate species. Further, with more research, such as host plant preference and collection of the nymphs with proper rearing, the third entity we examined may be the first new treehopper species described from the United States since 1970. (117)

Schmidt, Robert*, Ugo Uguru*, and David Dunbar Cabrini College, Radnor, PA 19087. *The Isolation and Characterization of Two AK Cluster Arthrobacter Bacteriophages Huntingdon and Suppi From Soil Sample Isolates*. — We have isolated and genomically characterized two *Arthrobacter* phages that infect the common host *Arthrobacter sp.* ATCC 21022 as part of a Viral Discovery course-based undergraduate research experience (CURE) hosted at Cabrini College and sponsored by the Howard Hughes Medical Institute (HHMI) and the South Eastern Consortium for Higher Education (SEPCHE). Both phages, named Huntingdon and Suppi, were isolated from soil samples in Southeastern Pennsylvania and have the siphoviral morphotype. They are both very similar on the genomic level and are classified as being in Cluster AK according to the [www.phagedsb](http://www.phagedsb.com) website. The genomes for the two phages average approximately 43 kilobase pairs in length and contain on average 60 protein encoding genes. Comparative genomics analysis indicates that both phages have the same gene homologs with a few minor exceptions. We have annotated the genomes of all both phages and bioinformatically characterized and identified functions for many of the genes. The genes encoding structural/assembly genes are located on the left side of the genomes and the non-structural/regulatory genes are located on the right side of the genomes. Ongoing studies are aimed at experimentally determining the proteins that make up the purified virions using proteomics-based methods. (103)

Schwark, Ryan*, and Diane Bridge Elizabethtown College, Elizabethtown, PA 17022. *TOR Complex and Neurogenesis in Hydra*. — The invertebrate *Hydra vulgaris* is unusual in showing no increase in mortality with age; this may be mediated by the continuous proliferation of stem cells in adult *Hydra*. The TOR complex TORC1, a kinase involved in nutrient-sensing pathways, is of particular interest for study in *Hydra*, since it affects lifespan in other animal models. The drug rapamycin, which inhibits TORC1, has been shown to modulate senescence and stem cell differentiation in other organisms. Specifically, rapamycin confers anti-aging effects in mice and modulates the process of neurogenesis in *Drosophila* and chicken. We have confirmed rapamycin-mediated inhibition of TOR in *Hydra* using Western Blotting. We are investigating the effects of rapamycin on neurogenesis in *Hydra* by characterizing the cellular composition of treated and untreated animals. These data should provide insight into the maintenance of neuron populations in *Hydra* and into the role of TOR in neurogenesis. (61)

Seitz, Leslie*, Luisa Filpo*, Adam Bothwell*, and Daniel Stroembom Lafayette College, Easton, PA 18042. *Exploring the Effects of Neighbor Selection and (A)Synchrony in Models of Collective Motion*. — Moving animal groups, such as schools of fish and flocks of birds, often move in a highly coordinated fashion. This is accomplished despite the fact that each member only experiences its immediate surroundings, and there is no obvious leader. How does that work? To address this question different models have been proposed over the past few decades. These models differ in the social interaction rules included (e.g. attraction, repulsion and orientation) and in how the neighbors of an individual are selected. In some models the neighbors of an individual are all other individuals within a certain distance (metric interactions), and in some models the neighbors of an individual are a fixed number of nearest individuals (topological interactions). It was recently discovered that depending on whether individuals update their headings in synchrony or asynchronously the behavior of a particular model with metric interactions was significantly affected. Here we extend this work by investigating the effects of using asynchronous and synchronous update schemes in a model with topological interactions, and compare the results with the metric version of the same model. We find that not only do the choice of update scheme have a profound effect on the behavior of the topological model itself, but the choice of

update scheme affects the metric and topological models differently. Suggesting that in order to properly investigate how animals coordinate themselves in moving groups using a modeling approach more subtle assumptions, beyond social interactions and neighbor selection schemes, must be considered. In addition, these particular results may potentially be used to infer whether metric or topological interactions are being used in a given real world flock or school. (148)

Sheagley, Jordan*, and Christopher Brey Marywood University, Scranton, PA 18509. *Molecular Characterization of Krüppel-like Transcription Factor, klf2, Expression in *Caenorhabditis elegans**. — Krüppel-Like Transcription Factors (KLFs) act as regulators for many important metabolic processes in mammals, such as fat storage and transportation. For example, Klf-14 in humans has been linked to the onset of type-2 diabetes and obesity, implicating this gene family in several prominent metabolic disorders. *Caenorhabditis elegans* have three KLF genes analogous to human KLFs, and both klf-1 and klf-3 have been shown to express in the intestine of the worm. We are currently working on the characterization of the less studied klf-2 gene and expect to find similar results for the localization of expression. We have designed a plasmid construct to test this expression that includes the promoter of klf-2 and several exons of the protein encoding sequence. The localization of klf-2 expression can then be observed by attaching this fragment into a GFP expression vector and microinjecting the construct into the distal gonad of adult *C. elegans* along with the selectable marker plasmid pRF4. The worm's progeny are analyzed for the marker phenotype and several generations of transformants must be established before checking for GFP expression under a fluorescence microscope. In addition to the aforementioned construct, another plasmid with the full protein coding sequence will be tested and the results will be posted at the meeting. (57)

Shupp, Brittney*, Nisha Pradhan, Krista Vadaketh, Jeannette Dumas, and Aikaterini Skokotas Rosemont College, Rosemont, PA 19010. *Detection of Coliform Bacteria in the Rosemont College Campus Ponds*. — To assess the health of the Rosemont College campus ponds, their level of microbiological contamination was measured. Water samples were collected each month and the number of coliform bacteria was counted using the membrane filter technique. Seasonal changes in water quality variables such as temperature and salinity were also evaluated along with coliform activity. A seasonal increase in coliform concentration was observed ranging from 150 CFU/100ml in October to 16,100 CFU/100ml in February. A corresponding increase in salt concentration from 26 mg/L to 42 mg/L and a change in temperature from 14 to 5°C were not significant factors affecting the growth of bacteria. However, the increase in coliform concentration does correlate with the return of geese on our campus in January and the presence of bird feces on the grounds near the ponds. In conclusion, we believe that runoff of bird feces in the campus stream is the main contributing factor in the increase of coliform bacteria in our ponds. (80)

Sirnic, Teresa*, Rebecca Luft, Bryce Brindle, and Edward Levri Penn State University-Altoona, Altoona, PA 16601. *The Distribution of the Invasive New Zealand Mud Snail (*Potamopyrgus Antipodarum*) in Central Pennsylvania*. — The New Zealand mud snail (NZMS) (*Potamopyrgus antipodarum*) is a world wide invasive including throughout much of the United States. The invasive populations are distinct asexual clones of which at least three occur in the US. Recently a population of the NZMS was discovered in central Pennsylvania. The purposes of this study were to determine the extent of the Pennsylvania invasion, examine the rate of its spread, and determine which clonal genotype exists in central PA. The snail was found in 16 sites in the Bald Eagle River and Spring Creek watersheds in Centre County in the summer of 2014. In the summer of 2015, we found the NZMS to be present in all but one of the sites where it was found in 2014, but we did not find any new NZMS locations. We also found no evidence of the snail in popular fishing locations in surrounding counties. Snails collected from three sites were genotyped using allozyme electrophoresis which revealed that the central PA population is made up of the US1 clone which is the most invasive and widespread of the North American genotypes and is most common in the western US. (8)

Smith, Jasmine*, **Donna Sarara**, **Sarah Jane Groves**, **Micahela Ortiz**, and **Andre Walther** Cedar Crest College, Allentown, PA 18104. *Identification of Proteins That Interact with Replication Protein A in a Phosphorylation-Dependent Manner Using Yeast Two Hybrid Analysis*. — Cancer is a deadly disease that affects a large population of people and can be caused by the failure to repair DNA damage that can lead to mutations inactivating genes required for proper regulation of cellular functions. Maintenance of genomic integrity requires the proper function of pathways involved in DNA replication, DNA repair, cell cycle regulation, and telomere maintenance. There are a large number of genes involved in these genomic integrity pathways, but a central player that is involved in all of them is Replication Protein A (RPA). RPA is a highly conserved, single stranded DNA binding protein that interacts with a large number of other proteins involved in maintaining genomic integrity. RPA is composed of three subunits, and the second subunit (RPA2) is phosphorylated in a cell cycle dependent manner and in response to DNA damaging agents. Phosphorylation of RPA can affect its ability to physically interact with other proteins suggesting that RPA phosphorylation may play an important role in regulating DNA repair and cell cycle pathways by modulating physical interactions. Our project is focused on identifying proteins that are interacting with RPA in a phosphorylation dependent manner using a Yeast Two Hybrid (Y2H) analysis in the model organism *Saccharomyces cerevisiae*. Constitutively phosphorylated RPA was used as a “bait” to screen a cDNA library of yeast proteins to identify proteins that specifically interact with RPA. After screening over 1×10^6 transformants, we identified 380 candidate proteins that interact with a constitutively phosphorylated version of RPA and we have begun to determine whether those candidate proteins also interact with un-phosphorylated RPA. We are in the process of identifying the genes for the physically interacting candidates by cDNA library plasmid isolation, DNA sequencing, and Basic Local Alignment Search Tool (BLAST) analysis. (13)

Spagnoli, Angela*, **Maureen Levri**, and **Edward Levri** Penn State University-Altoona, Altoona, PA 16601. *The Influence of Seasonal Weather Patterns on Reproductive Effort in Mountain Laurel (*Kalmia latifolia*)*. — Reproductive effort within an individual can change over time. Mountain laurel (*Kalmia latifolia*) produces variable numbers of inflorescences per plant, and the number of inflorescences on an individual varies between years. This variation may be affected by environmental factors. The purpose of this study was to determine the influence of various weather related factors (temperature, precipitation, and snowfall) on the reproductive effort of mountain laurel. One hundred twenty-five plants were assessed in the Seminar Forest on the Penn State Altoona campus. The number of inflorescences was determined for each plant over the course of five consecutive years. We then correlated weather data with inflorescence production. A preliminary analysis of data suggests that temperature has little effect on reproductive effort. However, increased snowfall appears to negatively correlate with the average number of inflorescences a plant produces each season. (120)

Spitz, Mia*, and **Megan Rothenberger** Lafayette College, Easton, PA 18042. *Interactive Effects of Human and Climatic Disturbance on Water Quality and Fisheries in An Urban Estuary*. — Coastal ecosystems are arguably some of the most valuable areas of our country given their environmental, economic, and social importance. Coastal conservation becomes increasingly important as the damage caused by a combination of water degradation and increasingly severe climatic events becomes more apparent. Understanding how human-induced ecological change interacts with climatic change to affect the structure and function of estuaries is an important area of research. The Hudson-Raritan estuary (HRE) of New York and New Jersey is a useful case study for this type of research for a number of reasons: 1) it is one of the most urbanized estuaries in the United States, 2) it has a long history of environmental degradation, 3) it has been the site of monthly water quality monitoring since 2010, and 4) it was severely impacted by Hurricane Sandy in 2012. Although a number of studies in other systems have reported acute, short-term impacts of hurricanes on estuaries, very few have reported the longer-term impacts of major storms on estuarine water quality and biota. In addition, even fewer studies have attempted to integrate biological and social analyses to assess ecosystem response and resilience following major storms. Therefore, the objectives of this study were to evaluate the acute

and long-term impacts of Hurricane Sandy on water quality, plankton, and fisheries landings and to use an interview based approach to document change in the Raritan Bay fishing community. Preliminary results indicate significant decreases in oxygen, increases in nutrient levels, and decreases in bottom-dwelling fish populations. Interviews are suggesting that social impacts may be longer-lasting than water quality impacts. This integrative approach is vital to developing better recovery and management solutions as coastal communities become more threatened. (49)

Staniforth, Stephany*, and Jodi Yorty Elizabethtown College, Elizabethtown, PA 17022. *The Effects of Vitamin D Treatment on Dendritic Cell Maturation and Signaling*. — It is estimated that more than one billion people around the world are Vitamin D deficient. Recent evidence suggests that Vitamin D not only regulates calcium homeostasis and maintenance of bone metabolism, but also plays important roles in both innate and adaptive immunity. Furthermore, Vitamin D deficiency has been linked to various inflammatory diseases including inflammatory bowel diseases (IBDs) and asthma, suggesting that Vitamin D supplementation may be beneficial in decreasing adverse outcomes of inflammatory disease. Despite this, the mechanism by which Vitamin D reduces inflammation and regulates the immune response are poorly understood. In this study, we are investigating the immunological affects of 1,25-dihydroxyvitaminD₃ (1,25-[OH]₂D₃) on bone marrow dendritic cells (BMDC) and the cell line DC2.4 after stimulation with LPS and/or Vitamin D. Maturation of BMDCs was assessed using flow cytometry. While results were inconsistent, Vitamin D generally decreased protein expression while LPS induced maturation. Toll-like receptor (TLR) 4 signaling is also thought to be modulated by Vitamin D. It has been previously reported that the actions of Vitamin D decrease TLR-mediated inflammation in other cell types such as PMBCs and macrophages. Expression of TLR-4 and other surface markers will be assessed with flow cytometry and western blotting in the presence and absence of Vitamin D. This study will be useful in further elucidating the effects of Vitamin D treatment on maturation and immunological signaling of dendritic cells. (74)

Steinitz, Lauren *, Chun Wai Liew, and Robert Kurt Lafayette College, Easton, PA 18042. *Analyzing Levels of Perforin Produced by the CXCR4-CXCL12 Signaling Cascade*. — When activated, the CXCR4-CXCL12 pathway results in various responses, one of which is the production of perforin. While it is currently understood that a decrease in the level of CXCR4 will result in a decrease in perforin production, it has not been determined how a change in the concentration of CXCL12 will affect perforin production. Therefore, the goal of this project was to determine how an alteration in CXCL12 concentration would affect perforin production when CXCR4 levels remain constant. It has been proposed that as the concentration of CXCL12 increases, CXCR4 signaling in CD8+ T cells will increase, and the level of perforin produced by the signaling cascade will also increase. In order to test this hypothesis, CD8+ T cells were extracted from the spleen of naive *Mus musculus* (laboratory mouse). Constant concentrations of cells (500,000 cells/well) containing CXCR4 receptors were induced with varying levels of CXCL12 (0, 50, 200ng/ml). After both twenty-four and forty-eight hours of treatment, RNA was isolated from the cells, converted to cDNA, and PCR was conducted in order to determine the level of perforin produced in response to CXCR4 signaling. The data demonstrated that a relationship exists between CXCL12 levels and perforin production. While the data showed increasing CXCL12 levels from 0 to 50ng/ml led to an increase in perforin production, a further increase to 200ng/ml of CXCL12 generally led to a decrease in the level of perforin produced by the cells. In addition to completing these experiments, the CXCR4-CXCL12 signaling cascade was modeled using NetLogo. Unfortunately, the model did not produce the same results as the experimental data, therefore the model will need to be altered in the future to accurately model the CXCR4-CXCL12 signaling cascade. (24)

Stevens, Shawna*, Noelle Mondulick, and Angela Asirvatham Misericordia University, Dallas, PA 18612. *A-Kinase Anchoring Proteins, Phosphodiesterase 4A: Players in Schwann Cell Proliferation*. — Proliferation of Schwann cells in the peripheral nervous system is dependent upon the heregulin/neuregulin family of growth factors secreted by neurons. The stimulation of Schwann cell division by heregulin occurs in a synergistic fashion only if pathways involving cAMP are also triggered.

The molecular mechanisms involved in the synergistic modulation of Schwann cell proliferation by heregulin and cAMP pathways are unknown. Previous studies have shown that A-Kinase anchoring proteins (AKAPs) of the cAMP/PKA signaling pathway play a key role in Schwann cell division. Treatment of neonatal Schwann cell cultures with SiRNA oligos synthesized against AKAP150 and AKAP95 exhibited a significant reduction in cell growth, expression of AKAPs and the cell survival signal, AKt/Protein kinase B. PDE4A hydrolyzes the second messenger cAMP, which controls intracellular signal transduction and activation of PKA, but not much is known about their effect when subject to heregulin, forskolin, and heregulin + forskolin. Based on these studies it was hypothesized that the expression of AKAP95 and AKAP150 along with the expression of the cAMP-terminating enzyme, PDE4A would increase when Schwann cells were treated with growth factors. Immunoblot analysis revealed that forskolin treatment of Schwann cell lines caused an upregulation in the levels of PDE4A, AKAP95 and AKAP150. Immunofluorescence staining examination indicates that AKAP95 is nuclear while PDE4A and AKAP150 are perinuclear. Staining also revealed that PDE4A is more prominent in heregulin treated cells compared to forskolin and heregulin + forskolin treated cells. These preliminary observations suggest that a relationship between expressions of AKAP proteins along with PDE4A may be necessary to mediate mitogen-stimulated Schwann cell growth. (64)

Sutton, Lindsey*, Deborah Austin, and Rebecca Smith Wilson College, Chambersburg, PA 17201. *Temperature Dependence of Viscosity and Polarity of Phosphonium Based Ionic Liquids*. — Ionic liquids are considered “green” substances mainly due to their low volatility, low combustibility, and recyclability. These ideal chemical properties make ionic liquids useful for a wide range of applications; such as, catalysts and solvents in organic reactions. Ionic liquids are defined as substances composed solely of ions, which are in the liquid state at temperatures below 100 °C. They are typically composed of an inorganic anion and an organic cation; however, they can be composed of inorganic cations and anions. Investigation of physical properties is required for the less characterized phosphonium based ionic liquids. This study focused on the temperature dependence of the viscosity and polarity of tributyltetradecylphosphonium chloride and tributylmethylphosphonium bis(trifluoromethylsulfonyl)imide. In addition, the effects of acetonitrile and ethanol on viscosity were observed. Viscosity was measured as a function of temperature using a capillary viscometer. Viscosity decreased with increasing temperature as expected. The viscosity of tributyltetradecylphosphonium chloride ranged from 729 mPa*s at 42.7 °C to 400 mPa*s at 51.8 °C. Tributylmethylphosphonium bis(trifluoromethylsulfonyl)imide has a viscosity that ranges from 52.27 mPa*s at 42.7 °C to 30.62 mPa*s at 55.7 °C. Furthermore, two solvents were added to each ionic liquid at mole fractions ranging from 0.025 – 0.1 and the viscosity was measured at a constant temperature. The method of solvatochromism was used to determine polarity. Three betaine dyes, 4-nitroaniline, N,N'-diethyl-4-nitroaniline, and Reichardt's Dye, were utilized and the absorbance spectra were recorded at three temperatures for each dye. Analysis of the solvent effect on viscosity and polarity data is ongoing. The measured physical properties can be added to the database of knowledge about ionic liquids and may contribute to further development of applications. (50)

Tafesh, Ghada*, Brad Engle, and Rebecca Smith Wilson College, Chambersburg, PA 17201. *The Relationship Between Oral Anticoagulant Apixaban and Fish Oil Supplementation in a Stroke-Prone Animal Model*. — For decades, warfarin has been the cornerstone for anticoagulation and stroke therapy, with few alternatives and no other oral options. However, warfarin tops the list of drugs with extensive drug and dietary interactions, requiring extensive patient and provider education, as well as frequent monitoring and dose adjustment due to its narrow therapeutic window. Therefore, researchers have been intrigued by the concept of developing oral anticoagulants with few drug and dietary interactions, such as apixaban, a newly approved oral anti-factor Xa inhibitor. Factor Xa catalyzes the conversion of prothrombin to thrombin in order to form a bloodclot. While to date few drug and dietary interactions have been reported for apixaban, it is still early in its development and clinical use cycle. This study investigated the interaction of apixaban with the commonly used dietary supplement fish oil (omega-3 polyunsaturated fatty acid) to determine the likelihood of a potential drug interaction. The study involved the spontaneously hypertensive stroke prone (SHRSP) rat model to determine the effect

of apixaban (n=5), fish oil (n=5), apixaban and fish oil (n=7) in comparison to a control group (n=5). Prothrombin and factor Xa activity tests, along with blood pressure and weight measurements, were taken over a six-week period to determine drug-supplement interaction and any potential changes in progression toward stroke. Statistical significance between and within groups will be determined by ANOVA. Preliminary results show no difference in the rate of weight gain or rate of increase in blood pressure between control and treatment groups. However, the three treatment groups show increased clotting times (apixaban and fish oil > apixaban > fish oil) using the prothrombin test. The enhanced anticoagulation effect, in combination, may be beneficial if it slows the progression towards stroke or detrimental if it increases the chances for uncontrolled bleeding. (42)

Thomas, Sneha A.*, and Eric P, Ingersoll Penn State University-Abington, Abington, PA 19001. *Expression of Matrix Metalloproteinase mRNAs in Breast Epithelial Cells.* — Breast cancer is the second most common type of cancer in women affecting over 200,000 women each year. In order to learn more about the progression of this disease, we are investigating the role of a group of proteins called matrix metalloproteinases. These are enzymes that degrade the extracellular matrix and allow cancer cells to spread from the original tumor enabling them to eventually form metastases. We are examining the expression of these enzymes in four different breast epithelial cell lines, ranging in phenotype from transformed to invasive and tumorigenic, using RT-PCR. We will present data on the expression of several MMP genes to determine the role that these enzymes may play in tumor formation and metastatic behavior. (14)

Thomas, Xaviera*, Chun Wai Liew, and Robert Kurt Lafayette College, Easton, PA 18042. *The Concentration of CXCL10 (IP-10) Impacts Whether CD8+ T Cells Proliferate or Go Through Apoptosis.* — CXCL10 (IP-10) is known for its role in infectious diseases, inflammatory processes, and tumor development. In addition to the diverse roles that this chemokine has been associated with, CXCL10 can have different effects depending upon its concentration. Here we studied whether the concentration of CXCL10 can impact whether CD8⁺ T cells proliferate or go through apoptosis. The idea is based on the fact that CXCR3, which is a receptor for CXCL10, turns on the JAK/STAT signaling pathway which can lead to cellular proliferation or apoptosis. In order to test this idea we isolated CD8⁺ T cells from mice using magnetic cell separation. After confirming the T cells expressed CXCR3 using polymerase chain reaction, we treated the T cells with different doses of the CXCL10 and assessed whether the cells proliferated or died using trypan blue exclusion. Two trials were conducted and for each trial we evaluated different concentrations of CXCL10 (0, 333, and 1000ng/ml). Cell counts were performed in 24-hour increments, and although control cells proliferated to some extent, we found more cells undergoing cell death than proliferation in the cells treated with 1000ng/ml CXCL10. The JAK/STAT signaling cascade was also modeled using Netlogo in order to identify the most important signaling proteins that contributed to the cell's response. The model showed that production of both STAT and cyclin (which represented cellular proliferation in the model), were dependent upon the amount of CXCL10. In the model the more CXCL10 the cells were treated with, the more STAT and cyclin were produced. These data give us a better understanding of the conditions under which CXCL10 can contribute to cell death or proliferation and have implications for understanding the role of CXCL10 in infectious diseases, inflammatory processes, and tumor formation. (17)

Thompson, Cody*, and Ron Kaltreider York College of Pennsylvania, York, PA 17405. *Telomere Length and Telomerase Expression Prior to and Following Regeneration in Lumbriculus variegatus.* — Cellular senescence is a peculiar phenomenon present in several important biological processes, including aging, cancer, and aging related disease. Telomeres and telomerase are two molecular mechanisms that contribute to cellular senescence, ultimately leading to degeneration at the organismal level. Several tissue types experience cellular senescence, although there are several organisms capable of regenerating lost tissue; which poses the question of how cellular senescence may work in these organisms. *Lumbriculus variegatus*, the organism observed in this study is an aquatic oligochaete commonly present in neurological and toxicology studies; but possesses a great ability to regenerate lost body segments. Using this organism, we examined the effect of tissue regeneration on telomeric

length and telomerase function. *Lumbriculus* individuals (n=10) were fragmented and allowed to regenerate. DNA and RNA was isolated prior to and 4 weeks after fragmentation. Telomerase expression was determined by RT-PCR of telomerase's RT-delta-2 isoform, standardized to actin expression. Telomere length was determined using quantitative PCR, with specialized telomeric primers meant to produce a single-length PCR product. Our data showed telomerase expression significantly decreased in fragmented worms, compared to their uncut controls. Telomere length was found to be less amplified in fragmented worms than in our uncut controls. These data were contrary to what was expected of *Lumbriculus*' regeneration process, as telomere length and telomerase expression have been observed to increase following a large amount of cellular divisions. It is interesting how *Lumbriculus* can continually reproduce in laboratory conditions, despite these changes in telomere biology. Therefore, *Lumbriculus* may be a very useful model in further elucidating telomere biology during advanced tissue regeneration processes, and future studies could characterize these molecular interactions. (18)

Titchen, Breanna*, Steven James, Andrew Mahoney, and Alecia Achimovich Gettysburg College, Gettysburg, PA 17325. *Mutations in the Nsr1/Nucleolin RNA-Binding Protein Suppress Defects in the Snxahrb1 RNA-Binding Protein in *Aspergillus nidulans*.* — Here we report the identification and characterization of suppressor mutations that bypass defects in the *snxA*^{Hrb1} mRNA shuttling binding protein in the filamentous fungus *Aspergillus nidulans*. *snxA*^{Hrb1} is a member of the SR/RRM (RNA Recognition Motif) family of proteins that govern mRNA processing and transport. In the budding yeast *Saccharomyces cerevisiae*, *Hrb1* acts as a gatekeeper to prohibit export of defective mRNAs, and escorts mature mRNAs to the cytoplasm. In *Aspergillus*, *snxA1* and *snxA2* mutations confer a novel cold-sensitive G1 cell cycle arrest at 20° and they exhibit strong transcriptional repression at the permissive temperature of 33°. In order to better understand *snxA* function, we undertook a screen for extragenic suppressors of *snxA2* cold-sensitivity. Two classes of suppressors were identified, one that restores transcriptional proficiency to wild-type levels in *snxA1* and *snxA2* mutants, and a second group that rescues *snxA1/A2* cold-sensitivity but does not increase mRNA levels. Furthermore, the second group is able to suppress the cold-sensitivity of a *snxA* deletion. Therefore, these suppressors appear to bypass *snxA* function in restoring viability at 20°. In this project, we sought to identify the gene responsible for bypass suppression. Whole-genome sequencing of three bypass suppressors, R22, R39, and R49, revealed a candidate mutation in each of three genes. Deletion of these three candidate genes identified only one, *nsr1/nucleolin*, which could rescue *snxA2* cold-sensitivity. Subsequently, complementation analysis in diploids demonstrated that all three bypass suppressors are allelic with one another, and thus are predicted to harbor mutations in *nsr1*. Currently, we are sequencing *nsr1* in each of these mutants in order to identify the causative mutations. In addition, the wild-type *nsr1* gene will be transformed into the deletion in order to prove correct identification of this bypass suppressor. (28)

Vadaketh, Krista*, Brendan Dougherty, Aaron Pinninti, Elizabeth Walton, Archana Ganta, Edward Winter, and Aikaterini Skokotas Rosemont College, Rosemont, PA 19010. *Developing a Switchable System to Induce Synchronous Meiosis in the Yeast, *Saccharomyces cerevisiae*.* — In *Saccharomyces cerevisiae*, meiosis is regulated by a tightly controlled induction of early, middle, and late sporulation genes. The induction of middle gene expression is the key step that controls exit from prophase and meiotic commitment. Sum1 is a DNA-binding protein that inhibits middle promoter expression during vegetative growth. Sum1 repression is lifted during prophase I. Sum1 is down-regulated during meiosis by cyclin-dependent kinase (Cdk1) and a meiosis-specific CDK-like kinase, Ime2. In this study, we are developing a strategy to induce synchronous meiosis by using a Cdk1 kinase inhibitor to trap yeast cells in prophase I of meiosis. Subsequent removal of the inhibitor would allow cells to synchronously enter meiosis. (149)

Villaverde, Leslie*, Tasnia Hassan*, Carli Jones, Chun Wai Liew, and Robert Kurt Lafayette College, Easton, PA 18042. *Studying Transcriptional Regulation of CCL2 in Murine Mammary*

Carcinoma. — In our research, we investigated the role of CCL2 in breast cancer by studying the CCL2 gene in murine mammary carcinoma cells at the level of transcriptional regulation. Previous research demonstrated that CCL2, an inflammatory chemokine, could enhance tumor growth by contributing to tumor-associated inflammation. Here we set out to study the transcriptional factors that bind to CCL2's proximal and distal promoters to determine why breast cancer cells constitutively produce this chemokine. For this purpose we designed primers flanking the proximal and distal CCL2 promoters and used polymerase chain reaction to amplify the promoters from genomic DNA of the tumor cells. After ensuring that we amplified the correct size products, we cloned the DNA into the pCR2.1-TOPO vector and transformed competent *E. coli*. After having the DNA sequenced to confirm we successfully cloned the promoters, we set out to delete transcriptional factor binding sites in the promoters through site-directed mutagenesis. The transcriptional factor binding sites that were deleted included AP-1 and STAT-1 in the proximal promoter, and NFkB and STAT-3 in the distal promoter region. We were successful in mutating the NFkB site in the distal promoter. The normal and mutated distal and proximal promoters will be used in electrophoretic mobility shifts assays to determine whether the nucleus of the tumor cells contain proteins capable of binding the promoters. These assays will help determine whether the presence or absence of a particular transcriptional factor impacts CCL2 gene expression. This study may lead to a better understanding of tumor-associated inflammation and may ultimately lead to the production of new mechanisms for controlling tumor-associated inflammation. (16)

Wadja, Julie*, Chun Wai Liew, and Robert Kurt Lafayette College, Easton, PA 18042. *The Effect of pH on the Expression of the TDAG8 GPCR, Which Produces cAMP*. — This project was performed to investigate the optimal pH to grow murine CD4⁺ T cells using experimental and computational modeling approaches. TDAG8 is a proton sensor and previous research reported that when TDAG8 expressing cells are exposed to an environment with a pH of less than 7.8 the signaling cascade results in an increase in cAMP production. There are several possible outcomes of this signaling cascade, one of which is cell proliferation. Thus, the project aimed to find the optimal pH for TDAG8 signaling, which would contribute to greatest production of cAMP and thus proliferation of the T cells. After purifying CD4⁺ T cells from the spleens of naïve mice using magnetic cell separation, polymerase chain reaction was used to determine whether the cells expressed mRNA for TDAG8. As expected the cells expressed this proton sensor. Next, to test the effect of pH on cAMP levels, the CD4⁺ T cells were incubated in serum free DMEM media and after 24 hours the cells were treated with media that differed in pH; 6.8 , 7.0, 7.2, 7.4, and 7.6 and cAMP levels were measured by ELISA. Two trials were completed and depicted a weak trend showing an optimal pH at 7 for cAMP production. However, with so few trials and a weak trend the data was not conclusive. Although we were able to model the TDAG8 signaling cascade the results from the model did not match the experimental results indicating that more work is needed to develop a suitable computational model of the TDAG8 signaling cascade. In conclusion, although more experiments are needed to validate the findings, the data suggest it is worthwhile to pursue TDAG8 signaling as a possible mechanism to expand T cells for immunotherapeutic uses such as cancer immunotherapy. (23)

Walker, Patrick *, and Bridgette Hagerty York College of Pennsylvania, York, PA 17405. *Kin Recognition in the Leopard Gecko (*Eublepharis macularius*)*. — Many lizard species can identify kin based on pheromone markers. However, mother-offspring recognition has not been studied thoroughly in territorial species like *Eublepharis macularius*. One method to truly evaluate kin recognition is variability of the number of tongue flicks during exposure to pheromone samples. Our hypotheses were 1) female *E. macularis* and their offspring can identify kin through pheromones, and 2) both females and neonates will tongue flick more toward non-related individuals than related individuals. We isolated female *E. macularis* and their offspring through separate housing prior to egg hatching. In a series of trials, we measured tongue-flicking behavior when we exposed each individual to pheromone samples from the cloaca of related and unrelated individuals in random order. Neonates flicked their tongues significantly more when exposed to related females' pheromones than to non-related females' pheromones. Females also flicked their tongues more toward related neonates' pheromones. These

results support other pheromone recognition studies in which male *E. macularis* flicked their tongues at a higher rate to previously encountered females pheromones. Many lizards, including skinks, have also shown recognition between mother and offspring, even without prior introduction, with specifically high rates of recognition in neonates. Therefore, *E. macularis* likely does have the ability to discriminate kin from non-kin based on pheromone cues. Kin recognition may help decrease inbreeding in captive populations. Additionally, females may be able to isolate non-kin neonates during cannibalistic behavior. (126)

Wamser, Nicole*, Aubrey Jones, and Anastasia Thevenin Lafayette College, Easton, PA 18042. *Expression and Purification of Zona Occludens (ZO-1) from E. coli for Binding Experiments with Gap Junction Protein, Connexin 43 (Cx43)*. — Direct cell-cell communication plays a pivotal role in many aspects of cellular life, and is achieved through Gap Junctions (GJs). Connexins (Cxs) are membrane proteins that make up GJs, with six connexin molecules forming a half-channel (connexon) in the plasma membrane of one cell and six connexins in the plasma membrane of the neighboring cell. Two connexons then dock, forming a complete channel or a gap junction. Many GJ channels (100s-1,000s) congregate into areas termed GJ plaques. Gap Junction function is regulated through post-translational modifications. Connexin 43 (Cx43) phosphorylation on over 15 serines and tyrosines by several kinases is known to affect all stages of Cx “life-cycle,” including forward trafficking, connexon accumulation into gap junction (GJ) plaques, channel closure and GJ internalization. One binding partner of Cx43 is the scaffolding protein, Zona Occludens-1 (ZO-1). Previous studies on Cx43 and ZO-1 interactions indicate that ZO-1 regulates plaque size and speed of formation of GJs by interacting with Cx43 in connexons, as well as edges of GJ plaques. This interaction – dictated by Cx43 phosphorylation – also determines whether GJs are open or closed. To gain a better understanding of how Cx43 phosphorylation regulates its interaction with ZO-1, and thus GJ function, we aim to conduct *in vitro* binding studies between recombinant Cx43 and ZO-1. We successfully expressed and purified milligram amounts of a PDZ-2 domain of ZO-1 from BL21 *E. coli* cells to over 95% purity. Quantitative binding studies are currently underway to test the interaction between ZO-1 and a series of phosphomimetic mutants of Cx43 *in vitro*. (26)

Ward, Erica*, Richard Jackson, and Catherine Santai Harrisburg University of Science and Technology, Harrisburg, PA 17101. *Extraction Method Effects on Antibacterial Properties of Essential Oils*. — With the increasing number of antibiotic-resistant microbes, the search for new antibiotics is paramount for the future of medicine. Research is turning toward plants and their essential oils to find compounds that combat bacteria. Essential oils from *Origanum vulgare* (oregano)^[1] and *Syzygium aromaticum* (clove)^[2] have previously shown to have antibacterial properties. Oil composition can vary depending on extraction method and potential antibacterial function^[3]. In this study, oregano and clove were both extracted using two different methods: organic solvent extraction and Pressurized Hot Water (PHW) extraction. These physical conditions can improve water’s ability to extract a solute by adjusting physical constants, including the dielectric constant. The efficiency of the antibacterial component was assayed using disc diffusion against *Escherichia coli* and *Staphylococcus aureus*. There was no significant difference in antibacterial effectiveness between the two extraction methods for oregano-derived oil against *E. coli*. Therefore subjecting water to both high pressure and temperature increased the solubility for carvacrol, the main antibacterial constituent in oregano, as predicted. Lastly, the diethyl ether solvent-extracted clove oil did not inhibit any bacterial growth for either bacterial species but the PHW extracted clove oil inhibited both bacterial species suggesting that the solvent altered the antibacterial composition of the oil. This new information indicates extraction method and essential oil composition greatly affects antibacterial properties. 1. Pesavento, G. *et al.* (2015). *Food Control*. 54, 188-199. 2. Nzeako, B.C. *et al.* (2006). 6(1), 33-39. 3. Gonzalez-Rivera, J., *et al.* (2015). *Innovative Food Science & Emerging Technologies*. E-published. (104)

Wilkes, David*, Robert Martin*, and Thomas McGuire Penn State University-Abington, Abington, PA 19001. *Ascorbate Decreases Proliferation of Breast Epithelial Cells and Acts Through a Pro-Oxidant*

Mechanism. — Ascorbate has been shown to produce anti-proliferative effects on the growth of cancer cells. Four breast epithelial cell lines (MCF-10F, E2, C5, and T4) were exposed to different dosages of ascorbate to determine its effect on the proliferation of these cells. Cell number was quantified using spectrophotometry. In a dose-dependent manner, ascorbate reduced proliferation of these breast epithelial cells *in vitro*. To determine whether ascorbate's mechanism of action involved oxygen radical formation (including hydrogen peroxide), catalase was added in addition to ascorbate. Cell proliferation in the presence of catalase and ascorbate resulted in normalized cell growth suggesting that ascorbate acts as a pro-oxidant. Decreased proliferation of these cell lines suggests that ascorbate can be used therapeutically as an adjuvant to traditional chemotherapy. (11)

Wilson, Allenna*, Derek Straub, and Dan Ressler Susquehanna University, Selinsgrove, PA 17870. *Wet and Dry Deposition of Inorganic Ions, Organic Acids, and total Organic Carbon.* — In this study, dry and wet deposition samples were collected using an automated sampler equipped with a rain sensor in order to study the removal of trace gases and particles from the atmosphere. In particular, a comparison between the magnitude of dry and wet deposition for individual species in this region was of interest. Samples were taken for approximately four months with 4 or 7 day sampling periods. Wet deposition samples were collected whenever rain occurred during a sample period while dry deposition samples were collected at all other times. After collection the pH of each sample was measured, then analyzed by ion chromatography to measure the concentrations of specific anions (chloride, sulfate, nitrate, and phosphate), cations (sodium, ammonium, potassium, magnesium, and calcium), and organic acids (acetate and formate). In addition, the concentration of total organic carbon (TOC) was determined. These concentrations were converted to total deposited mass for easy comparison between wet and dry deposition. In addition, the flux (mg/cm²/s) of each species was calculated to further evaluate deposition between wet and dry samples. It has been noticed that wet samples have a greater flux than dry samples for all measured ions. In particular there are three samples that have significantly higher flux values than any other samples, which may be due to large rain events. Correlations between the different anions, cations, and organic acids were determined and used for further understanding of the sources of the deposited compounds. (137)

Wilson, Derek*, Hailey Shannon, Tara Barbarich, Brian Mangan, and Matthew Persons Susquehanna University, Selinsgrove, PA 17870. *Age, Sex, Species, and Site Differences in total Mercury Content Among Riparian and Non-Riparian Wolf Spiders.* — Mercury is a persistent environmental contaminant that primarily originates from coal-fired power plants. Methyl mercury biomagnifies as it moves through food chains until it reaches toxic levels in apex predators. Wolf spiders are known to concentrate mercury at levels far higher than what would be predicted for a terrestrial arthropod predator, sometimes exceeding levels found in fish or even piscivorous birds. Since these spiders occupy positions within detrital, terrestrial, and aquatic food chains, the pathway for mercury biomagnification remains unknown. We collected two widespread wolf spiders, *Pardosa milvina* and *P. saxatilis*, at sites along the Susquehanna River near a coal-fired power plant and compared their total mercury levels to spiders from an uncontrolled coal fire burn site (Centralia, PA) and reference sites away from the river or point sources of mercury pollution (agricultural fields). We collected 89 *Pardosa milvina* and *P. saxatilis* across the six sites and measured total mercury among individual spiders. We found significant differences in mercury level between these two syntopic species despite being very similar in size, microhabitat, phenology, and phylogenetic proximity. We also found higher mercury levels among adult male rather than female spiders suggesting either trophic dimorphism or mercury depuration among females during egg production. We also found significant differences in mercury level by site. Spiders from Centralia had total mercury levels about three times higher than those in riparian zones adjacent to the power plant and about nine times higher than spiders collected from agricultural fields. Significant differences in total mercury across different age classes were also found, indicating significant bioaccumulation. Our results suggest that these species may serve as important bioindicators for mercury bioaccumulation, biomagnification and transport across

diverse habitat types. The high levels near Centralia, PA suggest that aquatic environments are not necessary for significant terrestrial mercury bioaccumulation to occur. (143)

Womelsdorf, Alivia*, Steve Johnson, and Larry Corpus Misericordia University, Dallas, PA 18612. *Flamingo tongue Snails Cyhoma gibbosum Preference of Current Or Noncurrent Side of the Common Sea Fan Gorgonia ventalina from Alkumal Bay, South Alkumal Bay and Yal – Ku, Mexico* — Observations of feeding and locality preferences by the flamingo tongue snail, *Cyhoma gibbosum*, were conducted for four days at three sites along the Yucatan Coral Reef, a section of the larger Mesoamerica Barrier Reef that extends from the Yucatan Peninsula to Honduras, Central America. At each site, the numbers of *C. gibbosum* on soft coral were recorded, along with non-current (shoreline) or current (ocean) side locality preferences. It was predicted that there would be more flamingo tongue snails exhibiting a preference for the current side of the soft coral because of increased nutrient inputs due to ocean flow and greater numbers of coral polyps exposed during food acquisition. Data analysis did not support this hypothesis, and a *p*-value of 0.7008 suggested that no significance existed between current and noncurrent side preferences. Site 1 had more flamingo tongues on the current side of the soft corals in the reef, but Sites 2 and 3 had substantial numbers of flamingo tongue snails on the non-current side of the coral reef. During the study, wave action and underlying ocean currents were very strong and created substantial sediment in the water. It was concluded that most snails were found on the noncurrent side more frequently because of the increased wave action and subsequent increased sediments in the water. Increased sediments may have caused coral polyps to draw themselves into their common cavities for protection, and may have induced flamingo tongue snails to relocate to the noncurrent side of the soft coral for more protection as well. (145)

Wood, Robert* Mercyhurst University, Erie, PA 16546. *Examining Antimicrobial Efficiency of Antibiotics Coupled with Polyphenol Extracts from Fermented Foodstuffs*. — Phenolic compounds will be extracted from Kimchi, Kombucha tea, and cocoa powder to investigate the synergistic effects of common antibiotic drugs and dietary bioavailable polyphenols. Extracts will be examined using ultraviolet spectroscopy to determine the classes and concentrations of specific polyphenols present. The antimicrobial activity of extract infused antibiotic disks will be examined for efficiency in limiting the growth of *Escheria coli* and compared to that of antibiotics alone. Zones of inhibition for both the control and experimental samples will be compared to determine the percentage change in antimicrobial efficacy when the antibiotics are combined with polyphenol-rich extracts. If the antibiotic-polyphenol extract combinations demonstrate an improved antibacterial capacity there may exist far reaching applications for the pharmaceutical industry in combatting antibiotic resistance (105)

Zamichieli, Ashley*, Chun Wai Liew, and Robert Kurt Lafayette College, Easton, PA 18042. *CXCR3 and CXCL11 Interactions Provide Insight for CD4+ T Cell-Associated Inflammatory Responses*. — Inflammation is an important aspect of the defense system and can have beneficial as well as detrimental consequences. We were interested in studying the role of inflammation in lupus-like kidney disease. A crucial role in inflammation is the migration and expansion of T cells. The interactions between CXCR3 and its ligand CXCL11 are thought to aid the migration and as well as the expansion of these T cells. However, the amount of CXCL11 that CD4+ T cells are exposed to can be a major factor for inflammatory responses and may determine whether the T cells migrate, proliferate or die. To study the role of CXCL11 on CD4+ T cells we collected spleens from naïve mice and enriched the CD4+ T cells using microbead cell separation. After confirming the cells expressed the CXCL11 receptor (CXCR3), the T cells were incubated with 0, 31, 125, or 500 ng/ml of CXCL11. After 24 and 48 hours of treatment, the cells were counted to determine whether the chemokine impacted T cell expansion or death. To complement these experiments we modeled this signaling pathway which included the AKT signaling cascade. For this purpose we used Netlogo to model the signaling cascade and the cellular response triggered when CXCL11 bound to CXCR3 on the cell surface. Both the experiment and model showed that at the 24-hour time interval CXCL11 induced proliferation when 125 ng/ml was used. At the 48-hour time interval, however, there was more cell death at the 125ng/ml concentration compared to the control. These data conclude that when CXCL11 interacts with CXCR3 the effects are both time

and dose dependent. Collectively, these data reveal that CXCL11 is important for more than just inducing CD4+ T cell migration, and deciphering this signaling cascade could lead to a better understanding of inflammatory responses and diseases. (75)

Zimmerman, Mel* Clean Water Institute, Williamsport, PA 17701. *Contribution of Lycoming College Clean Water Institute to PFBC Unassessed Waters Project, 2010-2015*— Pennsylvania's water resource consists of 86,000 miles of flowing water. To date PA Fish and Boat (PFBC) has surveyed over 12,000 miles as wild trout streams leaving significant numbers unassessed. Without documentation it is difficult to protect these waters during the permitting process of urbanization and the recent expansion of Marcellus Shale Gas Extraction. Since 2010 the Lycoming College Clean Water Institute (CWI) has completed 411 stream surveys following PFBC protocols to assess reproducing trout populations in headwater streams in seven major North Central PA watersheds (including streams in Loyalsock, Lycoming, Pine, Genesee and Allegheny creeks). Through population estimates the biomass class can be assigned to a stream, according to PFBC's criteria. Stream classifications range from Class A (biomass of at least 30 kg/ha) and Class B (at least 20 kg/ha), down to class E (no trout). In addition, macro invertebrate diversity (RBA protocols) were done on many of the Class A / B streams. Results show that on average 57% of the streams sampled support reproductive populations of brook and/or brown trout. A total of 4,955 streams have been assessed since 2010 with 64 % by partner institutions like CWI. The success of this program provides not only classification and protection of meeting Cold Water Fishes (CWF) designation in 25PA Code Chapter 93, but also baseline data for continued monitoring of current and future impacts in these watersheds (53)