

# JOURNAL

*OF THE PENNSYLVANIA ACADEMY OF SCIENCE*



Founded on April 18, 1924

ISSN: 1044-6753

May 2015  
Volume 89(1)

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*PAS Home Page: <http://pennsci.org>*

*91<sup>st</sup> Annual Meeting*  
*of the*  
**Pennsylvania Academy of Science**

April 10-11, 2015  
*Lebanon Valley College*  
*Annville, PA*

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## JOURNAL OF THE PENNSYLVANIA ACADEMY OF SCIENCE

PENNSYLVANIA ACADEMY OF SCIENCE  
JOURNAL INFORMATION FOR AUTHORS

## EDITORIAL POLICY AND FORMAT

The *Journal* of the Pennsylvania Academy of Science publishes original papers, research notes, commentary, editorials, view points, and review articles in the natural, physical, engineering, and social sciences. All papers must discuss the relevance of the data presented and a clear interpretation of its meaning in view of current knowledge of the discipline concerned. Helpful references for the author are: (1) Day, R.A. 1983. How to write a scientific paper. 2<sup>nd</sup> ed. ISI Press, Philadelphia, xv + 181 pp.; (2) O'Connor, M. and F.P. Woodford. 1976. Writing scientific papers in English, Elsevier, Amsterdam, vii + 108 pp.; (3) MacGregor, A.J. 1979. Graphics simplified; and (4) How to plan and prepare effective charts, graphs, illustrations, and other visual aids, University of Toronto Press, Toronto, 1-64 pp.

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**Submit names, email addresses, as well as the professional area of expertise of 4 possible reviewers who have agreed to review your manuscript.** The reviewers must be outside the author's institution, possess knowledge of current research in the area of study, and generally be professionally qualified to referee the paper. The peer reviewing process is the Editor's responsibility, and the reviewers are selected at the discretion of the Editor.

All authors are requested to conform to the following:

**1. General Format.** All manuscripts should be typed, and double spaced, with 3 cm margins all around. *Do not use single spacing anywhere* (including Literature Cited). Images should be submitted as jpegs or tif and in the English language. Manuscripts should be organized as follows: (1) an unnumbered cover sheet with Title, Authors, their institutions and addresses, and name, address, and telephone number of the author to receive proof, (2) an unnumbered sheet with an Abstract, (3) Introduction, (4) Materials and Methods, (5) Results, (6) Discussion, (7) Acknowledgements, and (8) Literature Cited. All pages of the text, Introduction through Literature Cited, are to be numbered, and the names of authors should appear in the upper right-hand corner of each page. The text should begin in the middle of the first numbered page. Manuscripts need to be submitted in English.

**2. Headings.** All headings are in CAPITAL letters and centered. **3. Title.** Brief and to the point. It should inform the reader of the subject of the paper.

**4. Byline.** Include author's name, name of institution, department, address and zip code.

**5. Abstract.** A clear and concise paragraph which summarizes the research.

**6. Introduction.** The introduction should be concise and offer only that information necessary to orient the reader to the purpose and scope of the paper. It should state the reasons for the work and cite only published literature relevant to the subject.

**7. Materials and Methods.** Describe materials, methods, and equipment. Avoid repeating previously published details, unless modifications are extensive. The necessity of conciseness should not lead to omission of important experimental details necessary for others to repeat the work. When applicable, describe the experimental design and justify its use.

**8. Results and Discussion.** The Results section is a clear and concise account of the findings. Data should be presented in the most efficient manner, either in text, tables, or illustrations. All tables and illustrations must be referenced in the text. The Discussion section should extend or contradict current published information on the subject. Limit the discussion to the relevant subject and avoid speculation.

**9. Acknowledgements.** The source of any financial support received for the work being published must be indicated in the Acknowledgments section. The usual format is as follows: "This work was supported by Public Health Service grant CA-01234 from the National Cancer Institute."

Recognition of personal assistance should be given as a separate paragraph, as should any statements disclaiming endorsement or approval of the views reflected in the paper or of a product mentioned therein.

**10. Appendixes.** Appendixes that contain additional material to aid the reader are permitted. Titles, authors, and reference sections that are distinct from those of the primary article are not allowed. If it is not feasible to list the author(s) of the appendix in the byline or the Acknowledgments section of the primary article, rewrite the appendix so that it can be considered for publication as an independent article, either full-length paper or Note style. Equations, tables, and figures should be labeled with the letter "A" preceding the numeral to distinguish them from those cited in the main body of the text.

**11. Literature Cited and Footnotes.** Except for the title and author reference at the beginning of the paper, and superscript notation in tables, do not use footnotes. Create separate Appendixes or an Endnotes section if additional supplementary text material is required. Place Endnotes section just before the Literature Cited section. Number each endnote within the Endnote section using Arabic numbers in the order in which they are referred to in the

other sections of the manuscript. In other sections of the manuscript, place endnotes reference numbers in parentheses, and use the text style of type and not superscript. Place appendices after the Literature Cited section. Include a Literature Cited section: list references in alphabetical order by first author. Include only published references cited in the manuscript; unpublished work normally will be cited as personal communication (pers. comm.) in other sections of the manuscript, e.g., J.R. Halma (pers. comm.) or (J.R. Halma, pers. comm.). List all authors and full citation in the Literature Cited section. Use the most recent issue of the recognized abstracting authority to determine the correct abbreviations of periodical names (e.g., for biology use BIOSIS, Bioscience Information Service, Philadelphia, PA). If in doubt, do not abbreviate serial names. Use the following format and style for the Literature Cited section:

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*Book* (Select pages)-Snedecor, G. W. and W. G. Cochran. 1976. Statistical Methods. The Iowa State Univeristy Press. Ames, IA, 237-238.

*Book* (Complete work)-Snedecor, G. W. and W. G. Cochran. 1976. Statistical Methods. The Iowa State Univeristy Press. Ames, IA, xix + 593 pp.

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In all but the Literature Cited section, cite all works by author and year. For works with one or two authors, include names in each citation, e.g., (Smith and Reif 1984), or, if authors' names are used in the text- Smith and Reif (1984); for works by three or more authors, use et al. after the first author, e.g., (Gur et al. 1983), or, if the authors' names are used in the text- Gur et al. (1983). Research Notes with fewer than five references should be cited within the other sections of the manuscript thereby eliminating the need for a Literature Cited section. When references are cited within the text of other sections, include authors by last name only, and do not use et al. in the citation, e.g., for a journal article- (Genys, Harman and Fuller 1984, Proc. Pa. Acad. Sci. 58:67-69), or if authors are used in the text- Genys, Harman and Fuller (1984, Proc. Pa. Acad. Sci. 58:67-69); for a book-(Snedecor and Cochran, 1976, Statistical Methods, The Iowa State University Press, Ames, IA, 237-238), or, if authors are used in the text-Snedecor and Cochran (1976, The Iowa State University Press, Ames, IA, 237-238).

12. *Research Notes*. Papers submitted as short communications with an abstract are classified as Research Notes. Research Notes must contain the same basic quality of content and order of presentation as more substantial papers having content separated by section. Citations must follow the same format as articles.

13. *Case Reports*. While a full-length article or a Note may contain a case report section when the report is incidental to the rest of the paper, a specific Case Report format must be used when the report constitutes the entire article.

A Case Report must include an abstract of no more than 50 words. The text starts with presentation of the case under the section heading "Case Report"; there is no introductory text before the Case Report heading. After the case is presented, the rest of the text follows in a separate section after a ruled line to separate the sections. No separate head is used

for this short discussion section, but paragraph lead-ins are permitted. The total number of tables and figures (combined) must not exceed 3.

14. *Editorials*. These are commissioned only articles. Original papers should not be submitted under this article type.

15. *Commentaries*. These are commissioned-only articles. Original papers should not be submitted under this article type. They are generally not peer-reviewed.

16. *View point*. These articles are academic papers which address an issue of current public or professional debate and/or approach an issue from a more personal perspective than standard academic writing.

17. *Tables and Illustrations*. Tables must have a title, be numbered, and typed on a separate page. Tables must be created using the tables tool in Microsoft Word or as text with tabs separating columns and paragraph returns separating rows. Computer generated images or scans should be saved as Tiff, EPS, or JPEG files. Resolution (at the dimensions to be published) should be at an absolute minimum of 300 dpi. Provide the legends for all illustrations in consecutive order on a separate page.

18. If animals are used in the research, the author(s) must state in the material and method section that the study was conducted in accordance with the guidelines laid down by the U.S. Office of Laboratory Animal Welfare (or individual country of origin) and that the research was approved by the Institutional Animal Care and Use Committee. All human subject research, and all other activities, which in part involve human subject research, must be reviewed and approved by the institutions IRB committee.

19. There are no page charges for publication in the journal, however one of the authors must be a member of the Pennsylvania Academy of Science. Galley proofs will be sent to the authors for checking; they must be returned to the Editor within a week after receipt.

20. *Editorial Policy*. Every paper is reviewed by the Editor and selected professional referees. Manuscripts will be returned or rejected if considered unsuitable for publication.

21. *Manuscripts and Correspondence*. Address all inquiries relating to publication in the *Journal* to the Editor: Dr. Carl Pratt, Immaculata University, Department of Biology, 1145 King Road, 210B Loyola Hall, Immaculata, PA 19345, [CPratt@immaculata.edu](mailto:CPratt@immaculata.edu)

**Schedule of Activities**  
**91<sup>st</sup> Annual Meeting**  
**of the Pennsylvania Academy of Science**  
**April 10 - April 12, 2015**  
**Lebanon Valley College**  
**Annville, PA**

**Friday, April 10**

<b>Time</b>	<b>Activity</b>	<b>Location</b>
4:00-6:00 PM	PAS Board Meeting	AACA Museum
6:00-7:00 PM	PAS Board Dinner	AACA Museum
6:30-7:30 PM	Meeting Check-In	AACA Museum
7:00-9:00 PM	Reception	AACA Museum

**Saturday, April 11**

7:30-10:30 AM	Meeting Check-In	Lobby, Mund
8:45-9:10 AM	Introduction and Welcome	Leedy Theater, Mund
9:15-10:30 AM	Oral Presentations	
9:30-10:30 AM	I Plants, Agriculture, and Biotechnology	Room 203, Neidig-Garber
9:15-10:30 AM	II Animal Ecology	Leedy Theater, Mund
10:15-10:45 AM	Coffee Break	Intermezzo, Lynch
10:00-12:00 PM	Poster Session I: Biology and Ecology of Bacteria, Plants, and Fungi; Animal Behavior, Ecology, and Neuroscience (Poster set-up 8:00-10:00 AM)	Syndoninos Commons, Lynch
10:45-12:15 PM	Oral Presentations	
	III Animal Models of Human Disease	Leedy Theater, Mund
12:00-1:00 PM	Lunch	Lehr Dining Room, Mund
12:00-1:00 PM	PAS Business Meeting (Open to all members)	Lehr Dining Room, Mund
1:00 PM	Regal Fritillary butterfly field trip departure	Lobby, Mund
1:00-2:00 PM	Oral Presentations	
	IV Gene Expression and Genomics	Leedy Theater, Mund
2:00-2:30 PM	Coffee Break	Intermezzo, Lynch
2:15-4:00 PM	Oral Presentations	
	V Animal Pathogens	Leedy Theater, Mund
	VI Microbial Ecology followed by Science Education	Room 203, Neidig-Garber

1:00–3:00 PM	Poster Session II: Aquatic Ecology and Water Quality; Education (Poster set-up 12:00-1:00 PM)	Syndoninos Commons, Lynch
6:00-9:00 PM	Dinner and Keynote Address: Caught in the SNOWstorm – Scott Weidensaul	Lehr Dining Room, Mund

## Sunday, April 12

7:30–8:30 AM	Meeting Check-In	Lobby, Mund
8:00-9:00 AM	PAS Board Meeting	Tweedy Board Room, Mund
9:30–10:00 AM	Coffee Break	Intermezzo, Lynch
9:45–11:00 AM	Oral Presentations	
	VI Aquatic Ecology	Leedy Theater, Mund
9:45-11:45 AM	Poster Session III: Health and Disease (Poster set-up 8:00-9:30 AM)	Syndoninos Commons, Lynch
11:45–12:30 PM	Lunch	Lehr Dining Room, Mund
12:30-1:00 PM	Awards Ceremony	Leedy Theater, Mund

## Abstracts of Oral & Poster Presentations

### 91<sup>st</sup> Annual Meeting of the Pennsylvania Academy of Science April 10-11, 2015 Lebanon Valley College Annville, PA

(Arranged in alphabetical order of first authors or presenters)

**Albagli, Kevin\*, Brenna Hynes\*, Ashley St. John\*, and Robert Kurt.** Lafayette College, Easton, PA 18042. *Evaluating the Presence of Inflammasomes after LPS Treatment in 4T1 Cells as Compared to Dendritic Cells*—Inflammasomes are large multiprotein complexes consisting of Nod-like receptors (NLR), caspase-1 and an adapter protein (ASC). Inflammasomes have been shown to cause contrasting effects in cancer depending upon what stage they appear. Early expression of inflammasomes in tumor cells has been shown to be beneficial since early inflammation can help the body reject a tumor, whereas later expression of inflammasomes in tumor cells has been shown to be detrimental. 4T1 is a tumor found in mice that is similar in nature to human breast cancer. Both 4T1 and human breast cancer cells metastasize spontaneously and grow at a similar rate. In this project we evaluated the presence of inflammasomes in 4T1 tumor cells compared to dendritic cells. Dendritic cells served as the control because they are capable of eliciting a strong inflammatory response. Previous studies showed that 4T1 cells had low levels of NLRP3, ASC and caspase-1 suggesting that they were incapable of producing inflammasomes. The purpose of this study was to see if lipopolysaccharide (LPS) treatment could increase NLRP3, caspase-1 and ASC gene and protein expression levels using quantitative PCR (qPCR) and western blots respectively. The qPCR data suggested that ASC and caspase-1 gene expression levels were decreased by LPS treatment, while NLRP3 gene expression levels were increased. However, we did not detect an increase in protein production. The results showed that even when treated with LPS, ASC and NLRP3 were not detectable in the tumor cells suggesting that the tumor cells cannot create functional inflammasomes. The caspase-1 data showed a potential decrease in expression of this protein in the tumor cells following LPS treatment. Overall, these data suggest that LPS does not assist 4T1 cells in creating an inflammasome dependent inflammatory response. (106)

**Alghithi, Nada\*, Gary Stavish, Lyndsie Johndrow, and Robin P. Ertl.** Marywood University, Scranton, PA 18509. *Cytochromes P450 Sequence Identification in the Purple Sea Urchin Genome*—In Sea Urchins, approximately 128 unique cytochrome P450 (P450) genes have been identified. P450s are mono-oxygenases involved in detoxification and steroid biosynthesis, although the reason for the number of P450s is not clear. This raises the question of whether P450s are involved in specifying cell type during stem cell differentiation. Sea urchin embryos are an ideal research organism for these studies, as they are model organisms in developmental biology. The fact that the sea urchin genome has been fully sequenced and partially annotated provides the ability to employ many molecular tools. The ease of rearing embryos in culture and their transparency allows the use of fluorescent probes in combination with confocal microscopy to investigate the pattern of P450 expression. This would help determine their role in development. The current annotation of the genome indicates genes predicted to be P450 based on a sequence algorithm. The studies presented here examine sequence alignment with known P450s from other organisms in order to confirm their identity and generate suitable P450 probes. Ultimately, understanding the regulation of cell differentiation is important to regenerative medicine in directing stem cells to the needed cell type. (96)

**Altates, Erin E.\* and Diane Bridge.** Elizabethtown College, Elizabethtown, PA 17022. *Expression of small heat shock proteins in Hydra*—Research into the diseases of aging has identified genes that act in diverse organisms to prevent damage associated with aging. One important set of such genes are those that code for heat shock proteins. Heat shock proteins help maintain correct folding of proteins within cells. Some heat shock proteins are present in cells under normal conditions, but levels increase in response to stresses, such as high temperatures, which can increase protein misfolding. With increased age, the ability of cells to produce heat shock proteins in response to stress is reduced. We are examining expression of specific heat shock proteins in members of the invertebrate genus *Hydra*. Studies suggest that members of one species, *Hydra vulgaris*, may be able to survive indefinitely without a decline in health or an increase



quality-conductivity, turbidity, alkalinity, and pH. During fall 2014, BMI collections were made both actively, using D-frame nets by directly disturbing the river bottom and passively using Hester-Dendy samplers and rock baskets immersed for six weeks. Overall, Family Richness values for these sites was moderately low: active sampling collected twelve BMI families while passive sampling found five. In samples taken by active means, Chironomidae dominated at Site 1 ( $x=36.7\%$ ), while those at Site 2 were dominated by Heptageniidae ( $x=26.7\%$ ). Chironomids dominated in passive collections at Site 1 with Hester-Dendy samplers ( $x=46.4\%$ ). These values were reflected in %EPT for samples taken at Sites 1 and 2 by active sampling (24% and 39%, respectively) but only 8% at Site 1 taken by passive means. A small difference occurs in the Shannon Diversity Index (SDI) values, where active samples taken at Sites 1 and 2 were 1.59 and 1.86, respectively. SDI for passive samples at Site 1 was 1.29. Unlike %EPT, the Hilsenhoff Biotic Index (HBI) at Sites 1 and 2 for active sampling was 4.71 and 5.14, respectively while passive samples from Site 1 had a HBI of 6.52. Between methods of collection within a single site there is variability in common metrics. Though river branches are distinctive physically and chemically, biotic metrics do not distinguish between them using BMI family-level identification. (81)

**Beaver, Mariah\* and Cassie Leggour\*.** Delaware Valley University, Doylestown, PA 18901. *Degradation of Glyphosate Utilizing Plant Growth Promoting Bacteria*—It is suggested that glyphosate, the main chemical used in Round Up, inhibits cell proliferation in mammals causing fertility issues and birth defects. If soil bacteria were able to degrade the glyphosate into a non-harmful metabolite, the human health risks related to Round Up would decrease. This study used previously isolated plant growth promoting bacteria from an undergraduate microbiology lab to test degradation of glyphosate. A MSM media with glyphosate as the sole carbon source was used to determine if plant growth promoting bacteria were able to utilize glyphosate. Five of the twelve PGPB were demonstrated growth in the MSM media suggesting that glyphosate was utilized. The bacteria are being identified using 16S rDNA sequencing. Studies are in progress to determine if the selected bacteria are able to degrade glyphosate in soil where other carbon sources are available. Soil samples will be collected over a period of time. The soil will be treated to release the glyphosate. A UV Spectrometer will be used to measure the concentration of glyphosate in the soil samples. (55)

**Bergado, Zefanne, Pam Myers\* and Kelly Orlando.** Immaculata University, Immaculata, PA 19345. *Neofunctionalization of Candida glabrata Pmu3 as a thiamine phosphatase*—*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* (PMU1, PMU2, and PMU3) 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 PMU3 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 PMU3 activity. We are testing the phosphatase activity of various fusions of PMU2 (which does not share this neofunctionalized activity) and PMU3 to narrow down the region(s) that confer thiamine phosphatase activity. Once a smaller region is identified we can create point mutations in PMU2 or in the fusions to determine the individual amino acids that confer thiamine phosphatase activity. Our goal is to determine the vital regions of the *C. glabrata* PMU3 gene necessary for its neofunctionalized enzymatic activity. (58)

**Bessonett, Shannon M.\* and Dr. Jodi L. Yorty.** Elizabethtown College, Elizabethtown, PA 17022. *Prevention of Corticosterone Induced Loss of Dendritic Cell Subsets When Exposed to Anti-CD40*—Dendritic cells (DCs) are important immune cells linking the innate and adaptive immune responses. DCs phagocytose antigen to present to and activate T cells. Subsets of DCs vary based on protein expression, which allows for differentiation. The different subsets observed were the plasmacytoid DCs, myeloid DCs, and cross-prime DCs. Corticosterone (CORT), a glucocorticoid hormone released in response to stress, has been observed to alter DC function. In the current study, C57BL/6 mice were exposed to exogenous corticosterone in the drinking water for 24 hours. The splenic DC populations were then quantified by flow cytometry. CORT exposure significantly decreased all subsets. Mice were then provided varying recovery times (3, 5, or 10 days) post CORT exposure. DCs quickly returned to normal levels, and exceeded percentages in control mice. Previous studies have shown that injection of mice with anti-CD40 antibody triggers DC maturation. When C57BL/6 mice were injected with anti-CD40 the total spleen size and DC subset populations increased. It was hypothesized that injection of anti-CD40 may prevent the CORT induced loss of DCs. Thus, C57BL/6 mice received two injections of anti-CD40 antibody over two days. Mice were then supplied with CORT immediately following the second injection. When provided anti-CD40 prior to CORT exposure the loss of DCs was prevented. Mice receiving only a single injection

can satisfactorily yield DNA. However, the concentrations are quite low  $<12$  ng/ $\mu$ L. This protocol has been applied to several *C. fragrans* specimens, and yielded concentrations  $< 5$  ng/ $\mu$ L. Following additional trouble shooting, including the use of a bead beater to further agitate the dried material, higher yields of DNA from the remaining samples of *C. fragrans* will be used for microsatellite primer development. Determining levels of genetic variation within and among populations will be important factors to include in current State and Federal Recovery Plans for *Clitoria fragrans*, as part of ongoing conservation efforts. (51)

**Catherine, Andrew T., Stephanie N. Shishido, Gregg A. Robbins-Welty, and Amy Diegelman-Parente\*.** Mercyhurst University, Erie, PA 16546. *Rational Design of a Structure-Switching DNA Aptamer for Potassium Ions*—Structure-switching molecules provide a unique means for analyte detection, generating a response to analyte concentration through a binding-specific conformational change between non-binding and binding-competent states. While most ligand-binding molecules are not structure-switching by default, many can be engineered to be so through the introduction of an alternative non-binding (and thus non-signaling) conformation. This population-shift mechanism is particularly effective with oligonucleotides and has led to the creation of structure-switching aptamers for many target ligands. Here, we report the rational design of structure-switching DNA aptamers based on the thrombin binding aptamer (TBA) that binds potassium with affinities that bridge the gap between previously reported weak-binding and strong-binding aptamers. We also demonstrate a correlation between the free energy of the experimentally determined binding affinity for potassium and the computationally estimated free energy of the alternative (non-binding) structure. (4)

**Cavalcanti, Lisana Furtado and Cynthia A. Walter\*.** Saint Vincent College, Latrobe, PA 15650. *Microalgae biofuel production and nutrient reduction in municipal waste water*—Two critical environmental issues, clean energy and clean water, can be simultaneously addressed if biofuels can be efficiently produced from algae that remove excess nutrients from waste water. The goal of this study was to use municipal waste water as a sustainable means of algal growth for biofuels. Waste water was collected from a facility in Westmoreland County, PA that releases residential sewage water into streams after secondary treatment. Discharge water was free of fecal coliform bacteria, but contained elevated phosphorus and nitrogen that contribute to eutrophication in streams and lakes. *Chlorella vulgaris* was grown in sterilized batch cultures with aeration using fluorescent lighting at 11 watts/sq. meter, a common light intensity inside buildings, but a fraction of the average sunlight on earth. Algae were harvested every 2-3 weeks and given replacement waste water. Optical density at 335 nm,

the optimal wavelength for active cultures, indicated exponential algal growth after each harvest. At the end of most 2-3 week growth periods, dissolved forms of nitrogen and phosphorous in waste water with algae were reduced by at least 75% compared to waste water without algae. Algae collected via centrifugation were air-dried at 24°C. and measured for energy content in a bomb calorimeter, yielding 3647 J/g dry weight. Although the energy content was lower than values reported for microalgae under more favorable conditions, the rapid algal growth under low light conditions and waste water improvement indicate practical benefits from microalgal culture. This study shows the potential of *Chlorella vulgaris* as a biofuel and a tool to reduce nutrient pollution from sewage plants into streams. (78)

**Chudoff, Dylan\*.** Immaculata University, Immaculata, PA 19345. *Isolation of novel Arthrobacter sp. phages with a robust new method*—As *Arthrobacter* sp. bacteriophages are being discovered and investigated for their genomic diversity, host range specificities, and possible applications in bioremediation, increasing attention is placed on finding new phage isolates. Previous isolation procedures resulted in little success and required long incubations. Here, we present the discovery and initial characterization of multiple *Arthrobacter* phages found in southeastern Pennsylvania to be added to the current collection of 101 discovered and 23 sequenced *Arthrobacter* phages. Soils were gathered from several locations and phages were extracted from soil and filtered into enrichment culture with host strain *Arthrobacter* sp. KY3901, previously not attempted in *Arthrobacter* phage isolation. Initial attempts with this new method yielded several phage isolates showing varying plaque morphologies indicative of several putatively different phages. Calcium chloride dependency has also been shown to be a relevant parameter in isolating *Arthrobacter* phages. Results showed that three putative phages were highly dependent on high concentrations to form plaques whereas others grew independent of calcium. New phages were analyzed by restriction digest showing possible methylation of the genome. This enrichment procedure has shown to be effective in isolating various types of phages with *Arthrobacter* and other types of bacteria, also. (30)

**Cliaff, Kendall A.\* and Diane Bridge.** Elizabethtown College, Elizabethtown, PA 17022. *Investigating the Function of the Amyloid Precursor Protein in Hydra*—Amyloid precursor protein (APP) can be cleaved to produce different products. One of these is amyloid- $\beta$ , the main component of the amyloid plaques found in patients suffering from Alzheimer's disease. Duplication of the APP gene causes early-onset Alzheimer's disease. However, the normal functions of APP are still not well understood. To gain insight into the roles normally played by APP, we are studying it in the morphologically simple invertebrate Hydra. Using RNA in situ hybridization, we determined that



APP mRNA is present at high levels throughout the bodies of adult Hydra. We are in the process of using the CRISPR/Cas9 system to produce Hydra with a non-functional APP gene. (10)

**Conahan, Megan\* and Wendy Boehmler.** York College of Pennsylvania, York, PA 17403. *The Effect of Theophylline on Anxiety in Zebrafish (Danio rerio)*—Methylxanthines, including caffeine and theophylline, are nonselective antagonists of the A1 and A2A adenosine receptors. Blockade of these receptors has been associated with reduced risk of Alzheimer's disease and Parkinson's disease. Both, theophylline and caffeine have been found to be neuroprotective in mouse models of Parkinson's disease. One of the drawbacks to the use of caffeine is the unwanted side effect of increased anxiety. The purpose of this study was to determine whether theophylline had similar anxiogenic side effects in zebrafish. Anxiety-like behavior can be measured using the novel tank diving test in which zebrafish will instinctually swim to the bottom of the tank during times of heightened anxiety. Adult zebrafish were divided into four treatment groups (n=10): plain tank water, 0.5 mM caffeine, 0.5 mM theophylline and 5 mM theophylline and treated acutely for 10 minutes. We found that both the low dose and high dose of theophylline had significantly lower anxiety than the caffeine group with no significant difference from the negative control (tank water). This suggests that theophylline should continue to be investigated as an alternative neuroprotective agent to caffeine. (49)

**Cook, Shannon\*, Morgan Sperratore, and Sheryl Fuller-Espie.** Cabrini College, Radnor, PA 19087. Pathogen-induced nitric oxide production in earthworm coelomocytes detected by flow cytometry: An innate immune response impeded by the nitric oxide synthase inhibitor aminoguanidine—In this in vitro investigation, nitric oxide (NO) production was induced within coelomocytes of the earthworm *Eisenia hortensis* following microbial challenge. Coelomocytes were pre-loaded with the fluorescent indicator 4-amino-5-methylamino-2', 7'-difluorofluorescein diacetate (DAF-FM DA) in order to detect the presence of intracellular nitric oxide subsequent to a 16 hour incubation with chemically-fixed soil bacteria of *Bacillus megaterium*, *Arthrobacter globiformis*, *Pseudomonas stutzeri*, or *Azotobacter chroococcum* at a range of multiplicities of infection (MOIs). Flow cytometric analysis measuring increases in relative fluorescence intensity (RFI), which is directly proportional to the amount of intracellular NO produced, permitted determination of statistical significance ( $p < 0.05$ ) of exposed coelomocytes compared to baseline controls. Significant increases in NO were detected reproducibly in coelomocytes treated with all bacterial species used. The most prominent results were observed after exposure to Gram positive *B. megaterium* and *A. globiformis* where

100% of earthworms tested exhibited statistically significant increases of RFI at MOIs of 100:1 and 500:1, respectively. Furthermore, significant decreases in NO production in bacteria-stimulated earthworm coelomocytes incubated with the NOS inhibitor aminoguanidine hydrochloride were observed. These studies demonstrate microbial induction of NO synthesis in earthworms and provide evidence of an antimicrobial role of NO in the innate immune system. (14)

**Corbin, Kenzie\*, Isabella Walko, Brianna Dacy and Elaine R. Reynolds.** Lafayette College, Easton, PA 18042. *The effect of diet on a fly model of Parkinson's disease*—Parkinson's disease (PD) is the second most common neurodegenerative disorder. The degeneration of dopaminergic neurons in the substantia nigra pars compacta in Parkinson's has been found to be associated with increased oxidative stress caused by mitochondrial dysfunction. Previous research has shown that the reduction of environmentally triggered reactive oxygen species (ROS) levels through antioxidant supplemented or calorically restricted diets can reduce parkinsonian symptoms in several animal models. In our lab we work on a group of fly mutants that serve as a seizure model known as bang-sensitive (bs). These mutants have seizure in responses to stimulation but also have classic phenotypes associated with aging and neurological disease including neurodegeneration, motor defects and a shortened lifespan. Many of the bang-sensitive mutants encode genes associated with mitochondrial function, suggesting that these genes might also serve as models for Parkinson's disease. We investigated the role of two different diets, YS and MYC, on four different *Drosophila* lines: CS wildtype, bangsenseless (which encodes a Na channel), and two mitochondrial genes easily shocked and technical knockout. The YS diet had been shown to reduce seizure behavior but did not rescue lifespan. We used immunohistochemistry methods to look for dopaminergic degeneration in all fly strains and for each diet. We found that there was increased degradation for some mutants compared to CS flies on the MYC food, but there were no clear trends suggesting a benefit of using the YS food. We also tested for mitochondrial function with the fly strains raised on the two foods using a cytochrome oxidase assay. While there are some differences in activity levels between strains, there was no impact of diet on mitochondrial function. Further analysis of the complex relationships between gene function and dietary impact on the multiple phenotypes of these mutants needs to be performed. (70)

**Corpus, Larry D.\*, David Dorbad, Garrett Drumheller, Nick Essington, Alex Romeo, and Nick vonEgypt.** Misericordia University, Dallas, PA 18612. *Aquatic Macroinvertebrates from a Freshwater Seep in Luzerne County, Pennsylvania*—Freshwater seeps emanating from vertical rock surfaces often exhibit short hydroperiods, yet represent habitats that support substantial numbers of aquatic

macroinvertebrates. Depending upon their permanence and quantity of water flow, seeps may represent important refugia, early breeding sites, and/or distribution sites for downstream aquatic macroinvertebrate populations. Despite their potential importance to aquatic ecosystems, seeps have not received much attention and remain poorly understood as to their distribution, hydrology, physiochemistry and biotic components. The purpose of the initial research reported here was to photographically document and collect physiochemical data and aquatic organisms from a temporary vertical seep located along the Back Mountain Trail (BMT) in Luzerne County, Pennsylvania. The seep in question ultimately comprises part of the Toby Creek drainage basin flowing from the Back Mountain region into the Susquehanna River. The BMT seep flows down 13m at an approximate 45° angle, then collects and flows 100m south in a shallow drainage furrow alongside the trail bed. Seep flow lasted 10 days. Maple and oak leaves comprised most of the allochthonous input in the shallow furrow and 660 aquatic macroinvertebrates were collected, with arthropods predominating in both abundance and species diversity. Three arthropod families collectively represented 82% of the sample organisms; the Diptera: Chironomidae (n=229) and Simuliidae (n=199), and Copepoda: Cyclopidae (n=111). At a regional scale, the seep site displayed significant differences in the number of taxa, aquatic macroinvertebrate abundance, and diversity when compared to a 1st order-stream in the local area. Differences were attributed to: 1) water flow impermanence; 2) reduced water quantity; 3) substrate differences; and 4) reduced habitat availability. It is further suggested that reduced hydroperiod and fewer habitats prevents predators from becoming established at the seep site, thus allowing shredders, scrapers, filterers, and grazers to predominate. (84)

**Costenbader, Drew\* and James C. Hunt.** East Stroudsburg University, East Stroudsburg, PA 18301. *Settlement recruitment as observed at a field site in Lynnhaven Inlet, Virginia*—Populations of the American Oyster, *Crassostrea virginica*, in the Chesapeake Estuary have substantially declined in the last century due to over harvesting, degraded water quality and disease. Oysters play a vital role in ecosystem ecology by filtering the water and improving water quality. Therefore, efforts are underway to restore their populations. This experiment sought to analyze the frequency, distribution, and abundance of the oyster spat in the Lynnhaven Inlet in Virginia Beach, Virginia. This was done with the use of Hester-Dendy plates, which oysters will readily settle on. Six plate-sets with seven 10cm by 10cm plates on each were deployed in the Lynnhaven Inlet on July 13<sup>th</sup> and left in the water for 5 weeks. A single square plate from each set was removed once a week and analyzed under a dissecting microscope. Species observed were recorded, described and counted. No oysters were observed to settle on the plates in this experiment. Settlement, instead, was

dominated by barnacles and algae. Results of this study will be used to improve settlement survey techniques in an ongoing oyster restoration project in Greenbackville, Maryland. (82)

**Daly, Jennifer H.\*, Shannon R. Cook, and Sheryl L. Fuller-Espie.** Cabrini College, Radnor, PA 19087. *Using flow cytometry to measure xenoreactive responses in annelids: An in vitro study using *Lumbricus terrestris* versus *Eisenia fetida**—Earlier studies by pioneers in the field of innate immune responses in invertebrates have investigated the capacity of earthworms (oligochaetes) to discriminate between self and non-self and mount an immune response in both allogeneic and xenogeneic pairings. Those studies used in vivo orthotopic allografts or xenografts of the body wall as well as in vitro cytotoxicity assays employing trypan blue uptake, lactate dehydrogenase release and radioactive sodium chromate release protocols using isolated leukocytes (coelomocytes). Using two different genera of earthworms, our goal was to develop an in vitro flow cytometric assay to measure the natural killer-like immune response of *Lumbricus terrestris* when challenged by fluorescently-labeled coelomocytes of *Eisenia fetida*. Data is shown that demonstrates significant cytotoxicity at effector:target ratios of 5:1 and 1:1 following a two-hour incubation period compared to spontaneous cytotoxicity of control samples, however, this result was not reproducible in other assays. We conclude that the mechanism by which graft rejection was operating in early studies investigating graft rejection in earthworms is likely not due to natural killer-like cell killing, but instead caused by an alternative necrotizing process. (122)

**De Salle, Samantha\*, Thomas Kelly, and Sara Turner.** Mercyhurst University, Erie, PA, 16546. *The Prevalence of *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 and have been found 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, the *I. scapularis* population is crucial to monitor because 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 Erlichiosis which has a fatality rate reaching 5%. Subsequent studies will also be conducted to determine the effect of Dammix® on other pathogens carried by *I. scapularis*. In an attempt to limit the vector carriers, Dammix®, a product claiming to control the population Lyme disease carrying ticks, was put down

in mortality rates. In contrast, the related species *Hydra oligactis* begins to show increased mortality rates after sexual reproduction. Transcriptome analyses have identified heat shock proteins which are expressed at much higher levels in response to stress in *Hydra vulgaris* compared to *Hydra oligactis*. We determined which cell types within the animals express three of these genes, in order to address the question of whether they contribute to the longer lifespan of *Hydra vulgaris*. These small heat shock protein genes are expressed in high levels in the stem cells of *Hydra vulgaris*, suggesting a role in maintaining stem cells in good condition over time. (17)

**Angely, Samantha\*, Lindsay Richardson\*, Brandon Snyder\*, and Cynthia Walter, Ph.D.** Saint Vincent College, Latrobe, PA 15650. *Bacteriological and Chemical Assays of Upper Ohio Basin Municipal Water and Well Water*—Contamination of drinking water from municipal sources or private wells can serve as serious health risks to humans and animals. Recent research in Pittsburgh water supplies indicated elevated bromides in the Allegheny River that contribute to elevated brominated Trihalomethanes (THM) in municipal water. Also in Pennsylvania, private wells had undesirable frequencies of bacteriological and chemical problems. Two studies focused on water chemistry (pH, conductivity and the ions, Nitrate, Nitrite, Fluoride, Bromide, Chloride, Phosphate, and Sulfate) and fecal bacteria (i.e., fecal coliform and sulfide producing organisms). The purpose of the municipal water study was to test for water contamination along the Allegheny River and drinking water (DW) distributed from a small municipal treatment facility. Samples were collected near the water intake on the Allegheny River along with collections upstream at multiple sites and from a home with municipal water. Levels of contamination were expected to be elevated during late summer compared to fall based on assumptions that the river volume was normally lower in late summer than in fall. All bacterial counts were well below the limit for recreational and DW use and ranged from 3 to 91 colonies per 100ml sample and drinking water at 0/100ml. The bacterial contamination, however, was higher in September compared to November, as predicted. The bromide results for the Allegheny River and tributaries ranged from 0.45 to 2.2 mg/l and the drinking water range from 0.12 to 1.5mg/l, consistent with earlier studies. Sampling in 20 private wells showed fecal bacteria in 40% of samples before filters and 25% of water after filtration or treatment. The important results from these studies highlight elevated bromide levels in source water for municipal water treatment facilities and indications of bacteria present in private well water systems. (77)

**Antal, Julian\* and Thomas McGuire.** Penn State Abington, Abington, PA 19001. *Ascorbate Decreases Proliferation of MCF-10F and C5 Breast Epithelial Cells*—Ascorbate has been shown to produce anti-proliferative effects on the growth of cancer cells. MCF-10F and C5 breast epithelial cell lines were exposed to three different dosages of ascorbate (0 mM, 5 mM, and 10 mM) to determine the effect on proliferation of these cells. Cell number was quantified using spectrophotometry. In a dose-dependent manner, ascorbate reduces proliferation of MCF-10F and C5 breast epithelial cells in vitro. Decreased proliferation of these cell lines suggests that ascorbate can be used therapeutically as an adjuvant to traditional chemotherapy. In the future we will examine two additional cell lines (E2 and T4) to establish the consistency of ascorbate's anti-proliferative effect. (108)

**Barker, Zachary\*, Dr. Tanya Matlaga, Dr. Carlos Iudica, and David Muñoz.** Susquehanna University, Selinsgrove, PA 17870. *Temporal Variation in Leaf Litter Invertebrates Available to Plethodon cinereus*—One of the most abundant predators present in Eastern deciduous mixed forests is the Red Backed salamander (*Plethodon cinereus*). However, the impact of this predator on leaf litter invertebrate communities is not well understood. We examined *P. cinereus* activity in spring and fall seasons by quantifying individuals found under cover boards in 9 plots (10 m x 5 m; 50 boards in each) at Camp Karoondinha in central PA. Simultaneously we collected leaf litter samples in each plot and extracted invertebrates using Berlese funnels. We quantified the richness and abundance of invertebrates in each sample to gain understanding of phenological changes in the food supply available to *P. cinereus*. We calculated Shannon-Wiener diversity indices and correlation coefficients to show the strength of the relationship between invertebrate diversity and *P. cinereus* activity. Lastly, using analysis of variance we examined how invertebrate diversity varies by plot and sampling date. Preliminary data indicate that leaf litter samples are dominated by members of the orders Collembola and Acari, with taxon richness varying from five to eight orders. In addition, variation by sample date and location indicates that food sources available to *P. cinereus* are impacted by phenology and site characteristics. (8)

**Beachel, Breeyon\*, Michael D. Bilger, and Jack R. Holt.** Susquehanna University, Selinsgrove, PA 17870. *Using Benthic Macroinvertebrate Families for Monitoring in the Upper Main Stem of the Susquehanna River: Is Family-Level Identification Adequate?*—Benthic macroinvertebrate (BMI) families were collected as part of a long-term monitoring program, each summer and fall, from 2009 to present, on the Susquehanna River between Selinsgrove and Sunbury, PA, near Shady Nook, and below the confluence of the North and West Branches of the river. Mixing weakly, both branches are identified by distinct water



of anti-CD40 and simultaneously exposed to CORT had an intermediate loss of DCs. Mechanistically anti-CD40 is suspected to be preventing this loss by up regulation of pro-survival proteins. (119)

**Campbell, John M.\* and John O. Campbell.** Mercyhurst University, Erie, PA 16546. *Winter roosting behavior of American crow (Corvus brachyrhynchus) in Erie Pennsylvania*—Social, flight and roosting site utilization behaviors of American crows were monitored from January through March 2015 along an urban-rural gradient in Erie, Pennsylvania. Two distinct populations of crows (resident and non-resident) were detected. A flock of 300-400 non-resident crows were tracked between their nocturnal roost in a large urban cemetery and a daytime foraging site at a rural landfill. These sites were located at opposite ends of a migratory flight path utilized daily throughout the winter. Small groups resident crows in suburban territories along the flight path of the non-resident crows appeared to forage and roost independently of the non-resident crows. Foraging and roosting behaviors of non-resident crows during the day varied with time of day and day-of-the-week. The commencement of return flights to the urban nocturnal roost was not as precisely coordinated as the landfill arrival flight in the morning. Utilization of specific daytime and nighttime roosting areas within the cemetery and near the landfill varied according to weather conditions, likely as a strategy to conserve energy. (9)

**Cannon, Stefani\* and Thomas C. LaDuke.** East Stroudsburg University, East Stroudsburg, PA 18301. *Niche partitioning by shelter site selection in lowland tropical treefrogs of northeastern Costa Rica*—Many factors have been postulated as contributors to the high levels of organismal diversity in the Neotropics. Most of these have to do with organisms actively interacting with their environment, but few have considered the need of animals to find safe ways to avoid predators while sleeping. In this study, we examine the ways that treefrogs in the lowlands of Costa Rica specialize in particular types of sleeping microhabitats, thus partitioning the environment. A number of frog species have been found seeking shelter in unfurling leaves of large-leafed tropical plants such as those of the genus *Heliconia*. Many frog species can be observed sleeping on the top of or underside of leaves of large-leafed plants and also in immature, rolled leaves. Sample and random plots are used in this study to assess the density of sleeping treefrogs as well as microhabitat preference. Data was also collected on individuals found outside the plots. Plots were surveyed for sleeping frogs and vegetation surveys were also conducted. In this study, we quantify the use of different types of shelters by frog species. We will evaluate differences in shelter site selection by shelter type (leaf axil, rolled leaf, mature leaf, etc.), plant taxon (to species if known), height of frog above the ground, position of frog on leaf, etc. So far, nine species

have been discovered using large-leafed plants as daytime shelter sites. This study will be continued with a second field season this summer to provide more data and support for our results. (5)

**Cartisano, Emma\* and Jennifer Thomson.** Messiah College, Grantham, PA 17055. *Opioid Growth Factor Affects Presentation of Conditioned Fear Response in Rats*—Post-traumatic stress disorder (PTSD) is a disorder of the stress response that may develop in some individuals following exposure to certain traumatic events including combat, crime, or natural disaster. Clinical studies have found a negative correlation between morphine administration and PTSD expression. The present study investigated the use of opioid growth factor (OGF) as a treatment to prevent the expression of conditioned fear in an animal model of PTSD. OGF, like morphine, acts on the opioid system within the central nervous system but with no potential for addiction. A traditional fear-conditioning model was used, in which rats were exposed to a series of three foot shocks in a conditioning chamber distinct from the home environment. Forty eight hours later animals received an injection of either OGF (10 mg/kg) or saline. Fear expression was quantified on days 1, 2, 7 and 14 after administration of OGF. Rats that received a single dose of OGF showed a decreased conditioned fear response across test days as compared to animals receiving saline control injections. This study is the first to show a potential effect of OGF on learned fear responses in an animal model of PTSD. Future studies will investigate the use of OGF in other animal models of PTSD. (46)

**Casey, I. Abigail\* and Amy E. Faivre.** Cedar Crest College, Allentown, PA 18104. *Establishing a Protocol for DNA Extraction of Dried Plant Material of Clitoria fragrans (Fabaceae), a Federally Threatened Plant Endemic to the Lake Wales Ridge in Florida*—*Clitoria fragrans* (pigeon wings) is found only on the Lake Wales Ridge, a narrow region of peninsular Florida that has remained exposed during the most recent rises in sea level and an area of high endemism with a number of rare plant and animal species. A comparison of genetic variation among the few remaining populations of *C. fragrans* will allow us to determine patterns throughout its range, including the extent of gene flow among populations. However, we must first determine the most effective protocol for DNA extraction from the dried leaves of *C. fragrans* which have been collected from approximately 15 individuals representing 8 populations. Given the limited accessibility of *C. fragrans*, techniques for maximizing the concentration of DNA extracted were first tested on herbarium specimens of two other Fabaceae, also in the subfamily Papilionoideae, *Cercis canadensis* (red bud) and *Trifolium pratense* (red clover). Using a modified Qiagen kit protocol, we have determined that five separate extractions of 20 mg each, agitated with a mortar and pestle and eluted with the same 100 µL of storage buffer

on the State Park lands. DNA analysis of ticks collected by flagging to determine if they were vectors for *B. burgdoferi* was then conducted through the use of a Polymerase Chain Reaction and gel electrophoresis. (26)

**Del Gaudio, Marisa\* and Anya Goldina.** Elizabethtown College, Elizabethtown, PA 17022. *Past social experience influences the effect of pheromones on crayfish aggression*—Animals rely on multiple sensory modalities during social interactions. Olfactory signals can provide important information about individual social experience. Crayfish communicate chemically by producing pheromones, which they use to communicate social status to opponents. Dominant individuals secrete more pheromones than subordinates. While it has been shown that chemical signals can influence individual aggression, it is not clear how chemical signals interact with individual social experience to modulate individual behavior. Furthermore, the role of individual social experience in perception of chemical signals has not been examined. In this study we examined how winning experience affects the way in which crayfish respond to pheromones produced by conspecifics of different status. Two naïve crayfish *Orconectes rusticus* were paired to establish hierarchy. The dominant individual was then placed into an isolation tank containing water with pheromones from 1) dominant, 2) subordinate, or 3) naïve individuals for one week. At the end of the week, the dominant individual was paired with a naïve opponent to examine how differential pheromone exposure affected the way in which the individual behaved during subsequent agonistic interactions. Water that contained pheromones from dominant individuals increased aggression intensity of the focal individual, while exposure to pheromones of naïve and subordinate individuals increased threat behaviors, but decreased overall aggression. Our results suggest that crayfish can distinguish between pheromones produced by animals of different social status and that exposure to these pheromones affects their subsequent interactions with conspecifics. (42)

**Dise, Kevin I.\* and Anya Goldina.** Elizabethtown College, Elizabethtown, PA 17022. *Social Instability Stimulates Molting in the crayfish *Orconectes obscurus**—Agonistic interactions in most animals reflect individual social experience and nutritional status, which affect resource acquisition. Crustaceans establish social hierarchies in which dominant individuals tend to be largest, most aggressive, and have the greatest access to resources such as mates, shelter, and food. Subordinates, on the other hand, are smaller and lack access to resources. However, to become dominant, individuals must grow, a process that requires nutrients. Crustacean growth requires molting, where animals shed their external skeleton and rebuild a larger carapace. During molt, animals are very vulnerable to predators and potential competitors. Thus, an animal must balance the potential

benefit of growth with the risk of injury resulting from agonistic interactions during molting. In this study we asked how does being in a social group influence molting behavior? The crayfish *Orconectes obscurus* were isolated for 7 days prior to being placed into either an individual tank or into a tank with 2 same-sex crayfish. Social interactions in group tanks were recorded and analyzed to determine social status of each individual. All animals were observed daily for 30 days to note movement patterns and molts. Subordinates molted quicker than isolated individuals, and quicker than dominant individuals with social groups. Interestingly, this effect was only evident during the summer months, suggesting that seasonality and social behavior interact to mediate molting. (40)

**Doran, Taylor P.\*, Courtney B. Godbolt\*, and Amy E. Faivre.** Cedar Crest College, Allentown, PA 18104. *Assessing Pollen Viability in Christmas cactus (*Schlumbergera xbuckleyi* var. Magenta) Flowers Following Time Since Anthesis Using Aniline Blue Stain*—The assessment of pollen viability is important for gauging the potential success of fertilization in angiosperms. Though there are a number of steps determining the success of fertilization from the release of pollen grains starting at flower anthesis and culminating in sperm delivery to the ovule and the production of a viable seed, pollen viability is one of the first steps in the process and can be a quick way to measure male success. This study compared differences in pollen viability in one variety of Christmas cactus (*Schlumbergera xbuckleyi* var. Magenta) in relation to flower age. 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 for use in the field and provides a fairly quick way to assess pollen viability. The presence of stained cytoplasm is used as a proxy for pollen viability. Initial results show higher levels of pollen viability than have been seen when using in vitro methods to assess pollen viability in previous years. A conservative interpretation of the staining indicates no difference in pollen viability among all three days following anthesis, with a mean pollen viability of 83.5% + 2.3% for first day flowers and a mean pollen viability of 81.5% + 4.5% for third day flowers. A less conservative interpretation of the staining suggests differences between first day flowers (mean pollen viability of 95.2% + 1.4%) and third day flowers (mean pollen viability of 84.7% + 4.3%). These data are important for providing insight into the potential for fertilization success in this variety of Christmas cactus. (52)

**Engberg, Katherine\* and Megan Rothenberger.** Lafayette College, Easton, PA 18042. *Effect of Road Proximity on Abundance and Movement Patterns of Vernal Pool-Dependent Wood Frogs*—Nearly a third of amphibian species are currently under threat of extinction. A common amphibian habitat, the vernal pool, is often left unmonitored



and unprotected, putting this amphibian habitat at risk. A primary threat to both amphibians and vernal pools is habitat destruction and fragmentation. So far, few studies have investigated the impact of road proximity on nearby vernal pools and their obligate amphibian populations. The wood frog (*Lithobates sylvaticus*) was the focus of this study because it is considered the most common vernal pool indicator in Pennsylvania. The objectives of this study were to 1) collect weekly data on water quality and physical pool characteristics at three isolated vernal pools (>1000 m from a road) and two pools near roads ( $\leq 100$  m from a road) in Jacobsburg State Park in Eastern Pennsylvania from March – October 2014 and 2) use drift fences and pitfall traps to monitor adult wood frog movement from one isolated pool and the two pools near roads from September – November 2014. This study indicates that although road proximity does not seem to have a significant effect on vernal pool conditions, habitat fragmentation does have a significant effect on wood frog movement patterns. Statistical analyses indicate that wood frogs moved relatively evenly around isolated pools, but frog movement around pools near roads was clearly directional and away from roads. These data can be used in the future to inform construction projects around the upland habitat surrounding vernal pools. (37)

**Erdmann, Cassie\*, Matthew Kimock\* and Barbara Fenner.** King's College, Wilkes-Barre, PA 18711. *The effects of A $\beta$ 25-35-induced toxicity on SH-SY5Y cells*—Alzheimer's disease (AD) is a progressive neurodegenerative disorder that is the most common cause of dementia. The classic hallmarks of AD are amyloid beta (A $\beta$ ) peptide and neurofibrillary tangle accumulation in the brain. A $\beta$  accumulation causes oxidative stress, leading to the neuronal death and dementia associated with AD. The purpose of this study is to investigate the effects of A $\beta$ 25-35 toxicity on oxidative stress in SH-SY5Y cells. In our preliminary studies, we observed that 200  $\mu$ M A $\beta$ 25-35 induced cell death, while 1  $\mu$ M, 25  $\mu$ M, and 100  $\mu$ M A $\beta$ 25-35 did not induce cell death. Therefore, we hypothesize that concentrations of A $\beta$ 25-35 between 100  $\mu$ M and 200  $\mu$ M would induce oxidative stress without cell death. Our current study investigates the effects of 50  $\mu$ M, 100  $\mu$ M, and 150  $\mu$ M A $\beta$ 25-35 on oxidative stress in SH-SY5Y cells. Cell survival is first determined with the AlamarBlue survival assay. Then, we utilize the H2DCFDA oxidative stress assay to calculate the formation of reactive oxidative species. Furthermore, future studies will quantify oxidative stress using fluorescence microscopy. (112)

**Erney, Tiffany\*, Jeremy Osko, Frank Yopez Castillo and Angela L. Asirvatham.** Misericordia University, Dallas, PA 18612. *The Effect of Nicotine on the Expression of A-Kinase Anchoring Proteins in Rat Pheochromocytoma Cells*—Nicotine, a major component of tobacco smoke is known to stimulate dopamine release via the cAMP-protein Kinase A (PKA)-mediated signaling pathway. Spatial

regulation of PKA in the cell requires the association of A-kinase anchoring proteins (AKAPs) with the regulatory subunit of PKA. In order to examine the effects of nicotine on the expression of A-Kinase anchoring proteins, PC12 cells were incubated with medium only (control) or medium with increasing concentrations of nicotine at  $3.115 \times 10^{-5}$  M,  $4.361 \times 10^{-5}$  M and  $5.607 \times 10^{-5}$  M for 24 hours. Immunoblot analysis of control vs nicotine treated cells reveal an increase in protein expression of AKAP95 specifically at a concentration of  $4.361 \times 10^{-5}$  M. This preliminary finding suggests that nicotine treatment of PC12 cells may have an influence on differential expression of AKAPs. (38)

**Ferguson, Briana N.\* and Amy E. Faivre.** Cedar Crest College, Allentown, PA 18104. *Exploring Self-Incompatibility Systems in 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 there are one or two studies in which a particular 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. Preliminary 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. This study will enable us to determine the compatibility system of this variety of *S. xbuckleyi* and examine the possibility of its being sterile. If this variety is not sterile, additional hand-pollinations will be done to produce seeds. If this variety is determined to be sterile, this knowledge is beneficial to the horticultural field as well as for the preservation of this variety in general, because plants can then only be produced from cuttings, resulting in genetically identical plants, which are often more susceptible to disease. (53)

**Forney, Stephen<sup>1\*</sup>, Rebecca Wicker<sup>1</sup>, Aliya Frankel<sup>1</sup>, Mia Sallavanti<sup>1</sup>, Fiana Fach<sup>1</sup>, Brian Brune<sup>1</sup>, Robert Burns<sup>2</sup>, Jan A. Pechenik<sup>2</sup>, and William J. Biggers<sup>1</sup>.** <sup>1</sup>Wilkes University, Wilkes-Barre, PA 18766; <sup>2</sup>Tufts University, Medford, MA 02155. *Effects of Photosensitizers and Quinones on Settlement and Metamorphosis of Larvae of the Polychaete Annelid Capitella teleta*—Trochophore larvae of the marine polychaete annelid *Capitella teleta* settle and metamorphose in response to currently unknown chemical “cues” in marine sediments. We have explored the

effects of different biochemicals from marine sediments, separated by thin layer chromatography, on the settlement and metamorphosis of *C. teleta* to assess their activity as chemical cues. Thin layer chromatography analysis of the sediment extracts showed the presence of three broad classes of biochemicals, these being chlorophylls and their decomposition products being pheophytins and pheophorbides (which are known photosensitizers that produce singlet oxygen upon light exposure), along with quinones (phyloquinone from algae, ubiquinones, and menaquinones from bacteria), and also carotenoids. In testing some of these chemicals singly or in combination in bioassays, we have found that chlorophyll A, pheophytin A, pheophorbide A, phyloquinone and menaquinones can all induce settlement and metamorphosis of the larvae after a period of 24 hours compared with controls. The settlement and metamorphosis process is however rapidly enhanced by adding to the assay dishes chlorophyll, pheophorbide, or pheophytin in combination with either phyloquinone or menaquinones. These results indicate that the *Capitella* larvae may recognize algal and bacterial food sources present in the marine environment by the presence of these chemicals, which aids in their habitat selection. (138)

**Gensel, Sarah\*.** Widener University, Chester, PA 19013. *Using Select Remote Sensing Techniques to Quantify the Occurrence and Spatial Distribution of Shade Trees in the Urban Environment of Chester, Pennsylvania*—This project will develop and initiate a conceptual model for the design, construction, and maintenance of a shade-tree inventory for the city of Chester in Pennsylvania. The project will include updating an existing shade-tree database developed by previous environmental science students in the environmental science departments Geographic Information Systems Laboratory. The database includes the industrial highway section, Sun Hill District, Chester Park, and Deshong Park. The update will include field verification of the location, species, and condition of previously mapped shade trees. The Diameter at Breast Height (DBH) will be recorded as a new environmental attribute for these trees to facilitate the quantification of the ecosystem services provided by these trees. The database was then extended to include the shade trees within the proposed cultural corridor from Widener University to downtown Chester along the Avenue of the States. Locations were recorded using geo-location (GPS field work) and geo-referencing (GIS image referencing) to compare accuracy. This allowed for the calculation of the ecosystem services provided by trees in the city along with their spatial distribution across the city. Temperature sensors were deployed to quantify the temperature reduction to the ground provided by shade trees in the urban environment. The data collection methodology and all existing data and maps were submitted to the GIS scientist at the city to be used for future urban forestry grants and funding initiatives. (54)

**Gerrity, Skyler\*.** Misericordia University, Dallas, PA 18612. *Abundance and distribution of native and non-native crayfish taxa in the Ten-Mile Creek watershed of the Huyck Preserve*—Crayfish serve as an important organism in a stream ecosystem due to their ability to exert an effect on multiple trophic levels. However, invasive crayfish, such as *Orconectes rusticus* in the northeastern U.S., have been shown to cause ecological damage and to disrupt whole ecosystems. The purpose of this study was to assess the distribution and population levels of crayfish in the Ten-Mile Creek watershed within the boundaries of the Huyck Preserve. Four taxa of native and invasive crayfish, *O. rusticus*, *Cambarus robustus*, *Orconectes propinquus*, and a hybrid of *O. rusticus* and *O. propinquus* were collected. Comparisons with previous studies showed that the *Cambarus bartonii* and *Orconectes immunis* have been extirpated from the preserve. A north-south gradient was determined, with the colder northern waters being inhabited by a larger native population and the southern warmer waters containing a larger invasive population. The *O. rusticus* and *O. propinquus* hybrid was found at six of eight sites, all of which were inhabited by the parent species. In conclusion, the invasion of *O. rusticus* and its hybridization with a native crayfish species has reduced the biodiversity of crayfish in the Huyck Preserve. (74)

**Girsch, Emily A\*, McDevitt, Dillon and Dr. Jane F. Cavender.** Elizabethtown College, Elizabethtown, PA 17022. *SV40 T antigen's role in the activation of the cyclin A promoter via TBP and p53 binding*—Simian virus 40 (SV40) is a small DNA tumor virus, capable of transforming cells in culture and causing tumor growth in animal models. The SV40 large T-antigen binds host cell proteins in order to induce cellular proliferation and transformation. Specifically, the tumor suppressor proteins p53 and the retinoblastoma gene product (pRb) are sequestered allowing for prevention of G1 arrest, and progression into S-phase, respectively. In addition, T-antigen has been shown to transactivate the cyclin-A promoter, allowing for movement through S and G2/M phases. It has been shown previously that cyclin-A transactivation is independent of T-antigen's ability to sequester pRb, yet dependent upon the J-domain hsp70-binding function. This observation led us to investigate the mechanism of cyclin-A promoter activation by T-antigen. T-antigen has been reported to interact with TBP, thus we assessed if promoter activation was reliant on this activity. In addition, since our lab has not been able to demonstrate TBP:T binding we investigated whether a trimeric complex of T:p53:TBP may functionally exist. By using a reporter assay, CV1 cells were cotransfected with cyclin-A driving luciferase and either wild type or mutant T-antigen expressing plasmids. Our data show that the K173A/K174A TBP-defective-binding mutant transactivated the cyclin-A promoter. T-antigen mutants with no affinity for p53 are able to transactivate the cyclin-A promoter at wild type

levels. Moreover, these data suggests that the activation of cyclin-A may not be a promoter level interaction, which occurs through a direct interaction with TBP or in a trimeric complex containing large T-antigen, TBP, and p53. (104)

**Gnocchi, Peter\*, Samuel Wanner, and Mel Zimmerman.**

Lycoming College, Williamsport, PA 17701. *Limnological Evaluation of Indian Park Pond*—From August to November 2014, students from the Lycoming College Clean Water Institute conducted a limnological evaluation to better understand the water quality of Indian Park Pond in Montoursville, Pennsylvania. This was prompted by a proposed renovation of the pond and surrounding area by the Borough of Montoursville. The pond is home to a large flock of ducks and geese that contribute to a very high organic pollution. A Carlson's Trophic State Index was applied to determine the trophic state using phosphorous, Secchi disk and Chl- $\alpha$ . The nitrogen and phosphorus levels were consistent with the characteristics of a eutrophic pond (N=1.5 ppm, P=0.54 ppm). The pond had high aquatic flora density, also constant with eutrophic nutrient levels. Species diversity in fish and macroinvertebrates was low and consisted of pollution tolerant species. A full topographic profile of the pond was created to better understand its nature and to visualize where sedimentation from eutrophication was most pronounced. Data will be presented that place the pond between the eutrophic and hypereutrophic states (TSI= 71). (88)

**Godbolt, Courtney B.\*, Abigail I. Casey, Taylor P. Doran, Briana N. Ferguson, Mehveen R. Qureshi, and Amy E. Faivre.** Cedar Crest College, Allentown, PA 18104. *A Comparative Study of Three Protocols Used to Analyze Pollen Viability in Christmas Cactus (*Schlumbergera xbuckleyi* var. *Magenta*)*—Several factors influence the success of fertilization in plants which in turn impacts fruit and seed set such as: attracting pollinators, incompatibility systems, pollen viability and pollen tube growth. Pollen viability (pollen tube germination and growth) can be affected by temperature, humidity, and the passage of time pollen is exposed to the environment following anthesis. Using one variety of Christmas cactus (*Schlumbergera xbuckleyi* var. *Magenta*), three different methods were compared for measuring pollen viability. The objective of this study was to identify a method that is best suited for pollen viability analysis in *Schlumbergera xbuckleyi* var. *Magenta*, as well as, determine the pros and cons of each method. In this comparative study all samples of pollen grains were collected from flowers one, two and three days following anthesis. There were two in vitro methods that involved germinating pollen tubes either in a sucrose solution or on a nutrient agar plate, the third method involved staining the cytoplasm of pollen grains. When data for pollen viability was pooled by age and analyzed, pollen viability for Method 1 (sucrose solution) was found to be not significantly

different among the three days, Method 2 (nutrient agar) was significantly different for each day following anthesis ( $p < 0.00001$ ) and preliminary results of Method 3 (staining) suggest some difference between first and third day flowers. Of the three methods, staining was the easiest to conduct and assess and would be most convenient for use in the field. The sucrose solution method was challenging to implement, whereas the nutrient agar may have been the most reliable in terms of results. These results will be added to the growing data set on *Schlumbergera*, a genus of great interest in the horticultural trade. (2)

**Grady, Rebecca B.\*, Jessica Kline, and Dr. André P. Walther.** Cedar Crest College, Allentown, PA 18104.

*Quantification of Homologous Recombination in *Saccharomyces cerevisiae* Using qPCR*—There are many underlying causes of cancer, one of which is unrepaired DNA damage, which leads to mutation. Human cells experience DNA damage every day, but it is normally repaired by cellular repair processes. However, incorrect repair or lack of repair can lead to mutations in key genes that in turn may lead to cancer. The repair mechanism homologous recombination (HR) repairs double stranded breaks by using a homologous donor sequence elsewhere in the genome. This process is facilitated by many proteins, including Replication Protein A (RPA). Mutations in many human HR repair proteins have been linked to cancer. The high degree of similarity in the mechanism of homologous recombination between humans and the yeast, makes *Saccharomyces cerevisiae* a strong model organism for use in this study. Haploid yeast cells can exist as either MATa or MAT $\alpha$  mating types, and the haploids can switch from MATa to MAT $\alpha$  through a site directed homologous recombination event to repair a single double strand break caused by the enzyme HO endonuclease that is under the control of an inducible promoter. We are developing a qPCR-based assay to quantify the efficiency of HR in repairing a single double stranded break at the Mating Type Locus located on Chromosome III. We hope to use this assay to examine the effect of various RPA mutations on the efficiency of HR. (100)

**Gray, Monique A.\* and Meda Higa, Ph.D.** York College of Pennsylvania, York, PA 17403. *Investigating potential interactions between N-acetylgalactosamine- and Mannose-Specific Lectins on Hantavirus Glycoproteins GN and GC*—Hantavirus is a single, negative stranded RNA virus. This virus causes two known diseases, Hemorrhagic Fever with Renal Syndrome (HFRS) and Hantavirus Pulmonary Syndrome. These diseases are transmitted to the human population by rodent urine and fecal matter. Hantaviruses contain three RNA segments, S, M, and L that encode the nucleocapsid protein, the glycoprotein precursor protein, and RNA polymerase respectively. During expression the viral glycoprotein precursor protein is cleaved into two glycoproteins GN and GC forming a heterodimer complex.



Little is known about pathway for hantavirus viral infection and how this virus interacts with cell surface proteins during infection. Also, little is known about how hantavirus glycoproteins are glycosylated (sugar residue attachments), and if this plays a role in infection. Lectins, are proteins produced in plant biochemical processes to carry out specific functions for plants such as protection against foreign substances and cell-to-cell communication. Lectins have high specificities for one or more sugar moieties and can have a specificity for particular sugar linkages or bonding. Thus, lectins can be applied to hantaviruses as a way to help prevent hantavirus infection and it can help identify the type(s) of glycosylation of hantavirus glycoproteins GN and GC. To study the effect of plant lectins on hantaviruses, a pseudovirion system was utilized, where different hantavirus glycoproteins (ANDV, HTNV, and PUUV) were expressed on a vesicular stomatitis virus (VSV) core bearing a specific reporter gene known as Renilla luciferase. The reporter gene allowed the product of infectivity (light) to be quantified. Lectins specific for mannose and N-acetylgalactosamine sugars were chosen for lectin-virus competition assays. Initial experiments showed no significant effect of these lectins on the infectivity of hantaviruses and gave no conclusive information about the glycosylation of hantavirus glycoproteins GN and GC. (133)

**Greis, W. Hunter\*, Tasnia Hassan\*, and Daniel Stroembom.** Lafayette College, Easton, PA 18042. *Exploring the effects of asynchrony in models of collective motion*—Traveling animal groups frequently move in a highly organized manner, as represented by flocks of birds and schools of fish. Despite being an everyday occurrence, we do not yet fully understand how this works. What type of interactions between neighboring animals gives rise to the overall flock structure and behavior we observe? Typically this question is investigated using self-propelled particle (SPP) models that contain computer representations of animals (particles). These models differ in the individual interaction rule used and how the particles update their headings, synchronously or asynchronously. Here we investigate the effects of synchronous versus asynchronous heading update in a specific model. We find that the choice of updating scheme has a significant effect on the behavior. In particular, certain flock structures do not form when using synchronous update, but are present when using the asynchronous updating scheme. Combining this with the fact that many models exclusively use synchronous update, we speculate that some models may contain the ‘right’ interaction rules, but that other technical details (e.g. choice of updating scheme) is preventing us from observing the full range of flock structures and behaviors that these interaction rules are capable of producing. We believe that investigating

this matter further by implementing commonly used models with different, more realistic, heading update schemes, may take us one step closer to understanding what is going on in real moving animal groups. (45)

**Gundlach, Victoria\*, Sreejata Munsi, Meg M. Laakso.** Eastern University, St. Davids PA 19087. *Modification of TYLCV to make transgenic plants and express virus in the whitefly insect vector*—The spread of tomato yellow leaf curl virus (TYLCV), a plant virus found in the genus *Begomovirus*, to countries spreading across five continents, has resulted in millions of dollars of loss in the food crop industry. TYLCV is transmitted by a whitefly insect vector that acquires virus while feeding on infected plants and transmits the virus to non-infected plants. To better understand the interactions between the virus, the plant host, and the insect vector, the viral coat protein and movement protein (CP and MP) were subcloned into a shuttle plasmid for *Agrobacterium*-mediated delivery into tomato seedlings. This method was used to make transgenic plants. As a control, transgenic plants were successfully made which expressed the full tomato yellow leaf curl virus and showed the classic symptoms of leaf curling and yellowing. Three gene delivery methods were tested: injection or infiltration of seedling leaves, and soaking seedling explants. Plants modified by injection or infiltration were grown in sterile soil under 16h light/ 8h dark cycles, in a transgenic plant room. Seedlings explants were maintained on Murashige and Skoog agar under the same conditions, but failed to develop into infected plants. In order to track the movement of virus in infected plants or within the body of the white fly vector, genetically modified virus and viral proteins that express green fluorescent protein are under construction. Future directions include testing modified virus or proteins in plants and whiteflies, and genetically modifying additional viruses in the *Begomovirus* genus. (64)

**Hauer, Christopher\*, Elizabeth McGovern, and Howard P. Whidden.** East Stroudsburg University, East Stroudsburg, PA 18301. *Changes in the Community Composition and Distribution of Bats in the Delaware Water Gap National Recreation Area Following the Emergence of White-nose Syndrome*—Since the emergence of white-nose syndrome (WNS) in February 2006, populations of hibernating bats have experienced severe declines throughout eastern North America. We used mist netting surveys to assess the potential impacts of WNS on the distribution and community composition of bats in the Delaware Water Gap National Recreation Area (DWGNRA) by comparing capture data from 2013-14 with capture data from the park’s last comprehensive bat survey in 1997-98. A negative binomial regression model found a significant decline ( $p < 0.001$ ) in capture rates of *Myotis lucifugus* (Little Brown Myotis) and *M. septentrionalis* (Northern Long-eared Myotis) from 1997-98 to 2013-14, whereas capture rates of

*Eptesicus fuscus* (Big Brown Bats) increased significantly ( $p < 0.001$ ) over this time period. We also conducted emergence counts at active summer maternity roosts to assess current reproductive rates and possible declines as a result of WNS. A maximum of 295 Little Brown Myotis were observed during emergence counts at one roost, representing a 90% decline from the 2,500-3,000 individuals that were present at this roost in 1997-98. In addition, Big Brown Bats have partially displaced a former colony of 400 Little Brown Myotis at another roost. Finally, we used an AR125 acoustic detector to record bat echolocation calls along a 109 km driven transect route in the DWGNRA. We identified echolocation calls to species using the SonoBat 3 autoclassifier and plotted the locations of bats in the park using TransectPro. The majority of recorded bat passes were Big Brown Bats and *Lasiurus borealis* (Eastern Red Bats), and these species now 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 today. (23)

**Hayden, Leah\* and Megan Rothenberger.** Lafayette College, Easton, PA 18042. *Effects of nutrient enrichment and acidification on phytoplankton species composition in Raritan Bay, a eutrophic estuary*—Coastal ecosystems are subjected to numerous environmental stressors due to anthropogenic activities. Stressors such as eutrophication and ocean acidification can have a direct impact on plankton abundance and species composition. Raritan Bay, an urban estuary located between New York and New Jersey, has a long history of cultural eutrophication and associated harmful algal blooms (HABs). In order to better understand the relationship between water quality and plankton assemblages, a monitoring study began in 2010. The six sampling sites match those from a comparable study in Raritan Bay in 1962. The objectives of this study are to 1) continue water quality monitoring at these six sites and 2) analyze relationships between water quality and plankton abundance and species composition. Five years of data indicate that high nitrate and low Si:N ratios have a significant impact on plankton community composition with a shift towards dinoflagellates and an increase in observed HAB species. Other studies have shown that ocean acidification can also alter plankton assemblages. Since multiple stressors interact, the combined effect of nutrient enrichment and ocean acidification can significantly alter natural plankton assemblages. Controlled microcosm experiments will be used to investigate the effects of these stressors on plankton abundance and species composition. (85)

**Hernandez, Millie\* and Meda Higa, Ph.D.** York College of Pennsylvania, York, PA 17403. *Expression and purification of Hantaan and Puumala virus GN glycoproteins in *E. coli**—Hantaviruses are enveloped negative-strand RNA rodent-borne viruses within the *Bunyaviridae* family.

The genome consists of three segments in which one is the M segment. This segment encodes glycoproteins GN and GC that are expressed on the surface of the viral envelope. Both GN and GC hantavirus glycoproteins are critical in the role of cell attachment and entry of host cells. Previous research suggests GC is responsible for membrane fusion in cell entry. However, no information regarding the function of GN, or its contribution towards host-cell interactions has been identified. To develop a tool that can better aid researchers in investigating the interactions between viral and host cells, we aimed to produce and purify soluble GN glycoproteins of two viruses, HTNV and PUUV. We attempted to express constructs with deleted transmembrane domains in *Escherichia coli*. Initial results suggested little to no protein production of either HTNV or PUUV soluble GN glycoprotein. Interestingly, however, sequencing results were not inconclusive as they were indicative of the presence of GN glycoprotein in the vector for HTNV. Further research in the optimal conditions for the IPTG induction and the solubilization of GN glycoproteins for Hantaviruses are being pursued. Soluble GN glycoproteins can be introduced to a chicken for antibody production to use to identify receptors, mechanisms and interactions between viral and host cells during cell entry. (134)

**Hile, Jessica\*, Kelcy McIntyre, and Amy Reese, PhD.** Cedar Crest College, Allentown, PA 18104. *Canis lupus familiaris as fungal reservoirs for Rhodotorula species*—As the number of individuals living in an immune-deficient state increases, some are at risk for secondary diseases caused by opportunistic fungi, such as *Cryptococcus* and *Rhodotorula* species. Unlike other disease-causing yeast, they are coated with polysaccharide capsule, which protects them from the immune system or environmental conditions. We know these fungi are found throughout the environment, but we do not fully understand their reservoirs or how they are transferred from place to place. We wanted to determine the prevalence of *Rhodotorula* species on domesticated dog coats, since dogs spend time outdoors and then are in close contact with their owners. Members of the Cedar Crest College community were invited to participate over fall break 2014 by picking up an information and collection kit. Participants were to then answer a general survey to provide a brief medical history and outdoor time use information, as well as swab samples obtained by rubbing their dog's coat several times with a provided sterile cotton swab and collection vessel. Samples were transferred to Sabouraud agar plates and incubated for several days at 34 °C. Many plates contained an abundance of mold, yeast, or bacterial growth. Putative *Rhodotorula* colonies were identified by their pink color and restreaked to ensure purity. Samples were then viewed microscopically, tested for urease production, and analyzed with a *Rhodotorula*-specific anti-capsule antibody. Of the seventy-three dog samples collected, twelve likely *Rhodotorula* samples were obtained from this study from



twelve different dogs. We are now in the process of extracting genomic DNA from which the internal transcribed spacer region will be amplified, sequenced, and compared with a fungal database to determine which *Rhodotorula* species were isolated and detected from this canine population. This work demonstrates that dogs can carry *Rhodotorula* among the other fungal spores and bacterial cells present on their coats. (20)

**Hillman, Michelle\*, Coleen McDonald\*, Robert Kurt.** Lafayette College, Easton, PA 18042. *Using the EMT6 Murine Mammary Carcinoma to Study Concomitant Tumor Immunity*—Concomitant tumor immunity has been a well-documented model to study the immune response to cancer since the early 1900's. The concept of this model is that if a mouse is injected with a primary tumor the immune system will successfully fight off a secondary tumor challenge delivered in another location even though it was not able to do so with the primary tumor. The goal of this study was to determine if the white blood cells involved in the early tumor rejection response could be captured after mice were injected in the mammary fat pad with the EMT6 murine mammary carcinoma. For this purpose mice were injected in their fourth right mammary fat pad with EMT6 tumor cells and the fat pads were removed one, two and three days post injection. Following enzymatic digestion of the tissues, differential cell counts were done to determine the type of white blood cells infiltrating the primary tumor. To study the tumor rejection response, mice bearing a ten-day primary tumor were injected with a secondary tumor challenge in their fourth left mammary fat pad. These mammary fat pads were removed one, two and three days post injection and differential cell counts were performed to determine the type of white blood cells infiltrating the secondary tumor challenge. We found that lymphocytes were present in some of the primary tumors one and two days after tumor delivery and in the secondary tumors one, two and three days after tumor delivery. These data suggest that we may be able to use the mammary fat pad as a way to isolate white blood cells involved in the early immune response to growing tumors as well as the immune response to tumors undergoing rejection. (107)

**Hoffman, Kyle\*, Nelia Ruano, and Abdalla Aldras.** East Stroudsburg University, East Stroudsburg, PA 18301. *The Effect of Alternative Sugars on the Intestinal Flora of Mouse Model*—The intake of alternative sugars, through various studies, has been revealed to demonstrate negative health impacts upon consumption. In this study, we are conducting an in vitro study measuring the effect of "sucralose" in Splenda®, "saccharin" in Sweet'N Low®, and "aspartame" on the natural intestinal gut flora. Four anaerobic isolated species have been taken from mouse fecal material and are currently being grown on TSA plates supplemented with one of these three alternative sugars in

succession for a period of two months. The CFU's/ml of bacterial growth is being measured bi-weekly in comparison to that of the normal control TSA plates. A carbohydrate fermentation test occurred before the samples were plated on TSA supplemented plates and another carbohydrate fermentation test will occur at the end of two-month period. Identification of these four species is occurring via various biochemical tests including: TSI, MVRP, urea, dextrose, lactose, sucrose, and other selective tests for comparison against known values for the purpose of bacterial species identification. (27)

**Holt, Jack R.\*, Austin Iovoli, Amir Alwali, and Ian Murray.** Susquehanna University, Selinsgrove, PA 17870. *Diatom communities in the upper main stem of the Susquehanna River reflect the habitat and the means of collection*—From 2009 to the present, diatom periphyton communities have been collected as part of a long-term monitoring program summer and fall between Sunbury and Selinsgrove near Shady Nook, Byers Island on the Susquehanna River. The Byers Island transect lies below the confluence of the West Branch and North Branch of the Susquehanna River, each of which shows signature values of turbidity, pH, conductivity, and alkalinity. The overall purpose of the monitoring program was to establish a baseline together with benthic invertebrate communities to help understand changes in the Susquehanna River. Throughout the study, diatom communities were collected passively by periphytometers, artificial substrates using glass microscope slides which were immersed in the river for 3-4 week intervals. In 2012, we began to supplement the passive samples with diatom communities collected actively from stones, sediment, and plants (when present). Overall, Species Richness for the sites was relatively low and rarely exceeded 15 species when collections were made passively, but more than doubled (26-56) when collections were made by active means. Furthermore, from 2012 to the present *Cocconeis placentula* dominated the passive collections ( $\bar{x}$  = 81.7%), but were much less common in diatom communities on stone ( $\bar{x}$  = 7.8%) and sediment ( $\bar{x}$  = 6.0%). This difference was seen in common metrics like Shannon Diversity Index (SDI) in which SDI for diatom communities on glass slides was 0.5 to 0.8 while SDI values for communities on stone and sediment ranged from 2.5 to 3.0. Because of the dominance of *C. placentula* on the periphytometer slides, diatom communities on them showed high similarity between the two plumes. Communities collected by active means, however, did show differences. For example, of the 146 species collected between samples taken actively from the North Branch Plume and West Branch Plume in summer 2014, only 20 species were shared between them. (33)

**Jordan, Sheagley\* and Christopher W. Brey.** Marywood University, Scranton, PA 18509. *Overexpression of Krüppel-like transcription factor, KLF-2 maybe toxic to Caenorhabditis elegans*—This study is part of a multi-institutional collaboration in which the goal is to understand the consequences of abnormal fat deposition and its importance in the treatment of human obesity, diabetes, and cardiovascular disease. To investigate this fat storage problem we use *Caenorhabditis elegans* as our model system. We are interested in the klf-2 gene, a member of the Krüppel-like Transcription Factor family. The other two members of the KLF family, Ce-klf-1 and Ce-klf-3, have been shown to be integral factors in *C. elegans* ability to regulate fat. Our aim is to examine Ce-klf-2 and determine its connection to lipid metabolism in *C. elegans*. Herein we report that over expression of klf-2 gene through microinjection of construct pHZ336 [5' flanking genomic sequences (~ 2 kb) from klf-2 ATG and the full coding sequences covering all its 4 exons fused to GFP] maybe be toxic to *C. elegans*. Single-worm PCR analysis indicates that the gfp gene is present in the microinjected worm's F3 generation transformed progeny, but the GFP protein itself is not being expressed. Additional tests are underway to determine the mechanism of klf-2 gene toxicity in *C. elegans*. (12)

**Kelly, Julia\*, Megan Morrison, and Amy J. Reese.** Cedar Crest College, Allentown, PA 18104. *Toward overexpression of alpha-1,3-glucanase in Cryptococcus neoformans using two inducible plasmid constructs*—*Cryptococcus neoformans* is a disease-causing fungus, and one of the most prevalent causes of death in HIV/AIDS patients worldwide. *C. neoformans* causes a pulmonary infection, but if left untreated, cells can migrate to the central nervous system and cause meningioencephalitis, which is often fatal. The virulence of *C. neoformans* stems from the polysaccharide capsule, which allows for the cells to evade phagocytosis by the immune system. Alpha-1,3-glucan, which is produced by alpha-1,3-synthase, anchors the capsule to the cell wall, and may be regulated by other enzymes within the cell. In *Schizosaccharomyces pombe*, overexpression of the enzyme alpha-1,3-glucanase (AGN) causes cell lysis, suggesting that AGN plays a role in controlling cell wall structure, specifically the alpha-1,3-glucan within the cell wall. *C. neoformans* contains four AGN genes on four chromosomes, but the roles of these genes and their products in *C. neoformans* are not understood. We hypothesize that one or more of the gene products plays a role in altering alpha-1,3-glucan levels during cell growth to allow for budding. To test this hypothesis, we are expressing the full-length gDNA of each AGN gene in *C. neoformans* to evaluate the impact of an abundance of these gene products on the cells. Two inducible promoters are being investigated as overexpression systems for AGN. CTR4 is a *C. neoformans* CUF1-dependent copper promoter, which is regulated by the amount of copper in the surrounding media. GAL7 is a

well-known galactose-induced promoter for *C. neoformans* expression. Both plasmids containing the promoters have similar restriction sites flanking the gene insert, so primers were designed to amplify AGN genes from *C. neoformans* gDNA with matching restriction sites. When the inserts are cloned into each of the CTR4 and GAL7-containing plasmids, the role of each AGN gene in *C. neoformans* may be elucidated. Progress in cloning will be reported. (126)

**Kendig, David J.\* and Jeffrey P. Thompson.** York College of Pennsylvania, York, PA 17405. *Down Regulation of Telomerase Enzyme in Mouse (Mus musculus) Melanoma Cancer Cells using a Novel Anti-Telomerase siRNA Plasmid*—This research presents evidence that siRNA is a suitable mechanism for down regulating telomerase activity in mammalian melanoma cells, resulting in altered growth patterns. Small interfering RNA (siRNA) is a 15-22 bp stretch of double stranded-RNA capable of specific down-regulation of mRNA by forming structures recognized as foreign genetic material and by activating the RNA-induced silencing complex, or RISC in the host cell. This project focuses on down-regulating telomerase activity with the ultimate goal of terminating cellular growth and metastasis of melanoma cancer cells in a mouse (*Mus musculus*) cell line. B16-F10 melanoma cells were transfected with an anti-telomerase psiRNA-75sk plasmid that causes the cell to create an RNA hairpin structure containing 22 nucleotide base pairs specific to mouse telomerase or a negative control plasmid that creates a scrambled RNA hairpin and tested in vitro for qualitative characteristics of cell death and quantitatively for diminished telomerase mRNA levels using real time PCR. Inhibiting telomerase activity with siRNA resulted in a significant reduction in live cells. In addition, the ability of cells to produce melanin was also inhibited in the cells transfected with the silenced telomerase siRNA compared to cells transfected with the negative control siRNA sequence. Real Time PCR indicated a 52% decrease in maximum relative level of telomerase gene expression (RQ Max) between experimental and control samples only 10 days after transfection. Gene transfection showed to be highly effective in delivering telomerase-interrupting gene sequences and the melanoma cells' health was compromised. The use of novel siRNA plasmids should be considered as a potential molecular strategy capable of exhibiting gene silencing capabilities and impairing the viability of certain cancer cells. (105)

**Kennedy, Timothy A.\*, Michael Pheasant, and Barbara McCraith.** Misericordia University, Dallas, PA 18612. *Comparison of Benthic Macroinvertebrate Diversity in Trout Brook and Leonard's Creek, Pennsylvania*—Benthic macroinvertebrates are responsible for controlling the populations of lower trophic levels and accelerating detrital decomposition in stream ecosystems. Assessing their diversity is important in order to examine the overall health of the

stream ecosystem. This study was undertaken to gather data to assess the diversity of benthic macroinvertebrates in Trout Brook and Leonard's Creek, Luzerne County, Pennsylvania. We collected macroinvertebrates in the summer, fall, and winter of 2014. Both streams had similar species evenness; however, Leonard's Creek had higher species richness. Although the dominant family found in Trout Brook was Elmidae (Coleoptera), and the dominant family found in Leonard's Creek was Baetidae (Ephemeroptera), analysis of similarities indicated that both streams have similar benthic macroinvertebrate diversity. (75)

**Klemow, Kenneth\*, Abdullatif Alghusn, Tekalign Berhe, Marc Davis, Darrell Dech, Christopher Kropiewnicki, Carley Smith.** Wilkes University, Wilkes-Barre, PA 18766. *Vegetation Assessment of the Transco Natural Gas Pipeline in Northeastern Pennsylvania*—The expansion of the shale gas industry in Pennsylvania is leading to the installation of more than 16,000 miles of new gas pipeline statewide. Vegetation within pipeline corridors are maintained as herbs, grasses, and low shrubs to facilitate access and prevent tree roots from damaging the buried lines. Such vegetation prevents downstream erosion, and can provide habitat to grassland animals. However, corridors fragment forests and serve as potential avenues for invasive species. To better understand vegetation composition within an established pipeline ROW, vascular plants were assessed within a 1700' long segment of the Transco interstate pipeline in eastern Luzerne County in fall 2014. The identities and percent cover of all species were examined within seventeen 1 m x 1 m plots forming a transect along the segment. The corridor was about 100' wide, bordered on both sides by mixed hardwood/conifer forest. In all, 30 vascular plant species were identified. The three most abundant included wrinkleleaf goldenrod (*Solidago rugosa*), dewberry (*Rubus hispidus*), and Pennsylvania sedge (*Carex pensylvanica*) – with average cover being 47.0%, 27.9%, and 16.6%, respectively. Each of the other species averaged < 4% cover. With one exception, all of the species were natives, and none was invasive. Seedlings of three tree species: red maple (*Acer rubrum*), eastern hemlock (*Tsuga Canadensis*), and red oak (*Quercus rubra*) were observed. Succession to forest is apparently inhibited by mowing during the fall. These findings represent the baseline conditions, against which impacts of future pipeline expansion and construction can be compared. (59)

**Kloiber, Stephen\*, Blaine Rothausen, and Matthew S. Wallace.** East Stroudsburg University, East Stroudsburg, PA 18301. *A Survey of Moths (Insecta: Lepidoptera) of the Delaware Water Gap National Recreation Area*—The Delaware Water Gap National Recreation Area (DEWA) consists of ~70,000 acres of diverse habitat along the Delaware River in eastern Pennsylvania and western New Jersey. There have been a few invertebrate studies

done in the park but no comprehensive moth list has been developed. For this study, we conducted surveys at various points in the Delaware Water Gap to develop an evidence-based moth list for the park from April-November 2014. Surveys were conducted using a combination of 1000 Watt and 400 Watt metal halide lights, a UV blacklight, and baiting. Approximately 89 hours were spent conducting 28 surveys at 9 locations within the park, yielding 617 species of moths from 37 families, and over 2,277 specimens. Of the 37 families observed, Noctuidae were the most species rich family followed by Erebidae, Geometridae, Tortricidae, and Crambidae. The Speckled Green Fruitworm, *Petrophila fulicalis*, the Painted Lichen Moth, the Elegant Grass-veneer, and the Hickory Tussock Moth were the five most abundant species found in our surveys respectively. Of the 617 species identified, 289 were only documented on one of the 28 surveys and 235 species were represented by only one individual. (7)

**Knoll, Lesley B.\*** Lacawac Sanctuary Field Station, Lake Ariel, PA 18436. *Approaching fifty years of ecological research and education at Lacawac Sanctuary Field Station*—Lacawac Sanctuary Field Station is an independent, non-profit biological field station and nature preserve founded in 1966. Lacawac is located in the Pocono Mountains of Northeastern Pennsylvania and is used by many institutions of higher education without a field station of their own. Lacawac Sanctuary is 550 acres in area, including a 53 acre pristine natural lake (Lake Lacawac) and nearly all of its watershed, wetlands, 2 small ponds, and stands of mixed hardwoods and hemlock. Visiting classes and researchers have access to long-term databases of physical, chemical and biological lake data, and weather and solar data. Highlighted in this presentation are long-term trends in Pocono lakes. Terrestrial dissolved organic matter (DOM) is increasing in many streams and lakes in northeastern USA and parts of Europe, but the ecological consequences of this phenomenon are only beginning to be explored. Long-term data from two Pocono lakes, Lake Lacawac and Lake Giles, show some of the ecological consequence of increasing concentrations of terrestrial DOM including changes in water clarity and dissolved oxygen. (97)

**Kolbeck, Matthew\* and Tammy Tintjer.** King's College, Wilkes-Barre, PA 18711. *Use of a brine shrimp (*Artemia salina*) assay to evaluate endophyte-infected *Agrostis hyemalis* toxicity*—The relationship between grasses and fungal endophytes is often one of mutualism as plants provide their cohabiting fungus with nutrients and protection while the fungal endophyte confers an additional defense mechanism to its host by means of bioprotective alkaloid production. The primary goal of this research was to evaluate the production of endophyte toxins in the relationship between the grass, *Agrostis hyemalis*, and its naturally occurring fungal endophyte, *Epichloë amarillans*.



A second goal was to evaluate the potential utility of the brine shrimp (*Artemia salina*) lethality assay in detecting the presence of fungal toxins. The results suggest that 2-day old brine shrimp have significantly reduced survival in assays with endophyte-infected (E+) *A. hyemalis* compared to a salt water and endophyte-free plant control. To obtain endophyte-free plant material, we heat-treated grass seeds for 4 days at 60 °C prior to planting. Brine shrimp also survived in an assay containing the isolated fungal endophyte mycelium grown in liquid culture and with alkaloids isolated from E+ grass. While the alkaloids did not cause brine shrimp mortality in three concentrations used, the brine shrimp showed reduced activity, suggestive of sub-lethal dosing. We performed thin-layer chromatography on extracts from the plant and fungus in an attempt to characterize their chemical composition, although we have not obtained clear results thus far. The utility of the brine shrimp assay was supported as a method for preliminary endophyte toxicity screening, as the results are similar to those using typical grass herbivores, such as fall armyworm (*Spodoptera frugiperda*). We are continuing assays to evaluate the toxicity of liquid culture media following endophyte growth in said media and to evaluate increased doses of alkaloid extract. (69)

**Kolmer, Taylor\* and Alyssa Cantalini.** Susquehanna University, Selinsgrove, PA 17870. *Sand Dollar Embryos as a Potential Model System for Studying Thalidomide Teratogenesis*—The drug thalidomide causes very serious teratogenic malformations when ingested early in pregnancy. At this point there is not complete understanding of the drug's mechanism(s) of action and its effects on development. Sea urchin embryos showed thalidomide induced developmental abnormalities in previous studies. As deuterostomes, both vertebrates and echinoderms show similar embryonic developmental processes and signaling pathways. Like sea urchins, sand dollars also belong to the class Ichinoidea. We explored the use of sand dollar embryos as an additional model system to test and study the effects of thalidomide on development. Sand dollar embryos were obtained using standard spawning and fertilization techniques. We added thalidomide dissolved in DMSO to embryo cultures at the time of fertilization. Finally, we observed samples of the embryos and evaluated them during specific time points corresponding to certain developmental stages (blastula, early gastrula, developed gastrula, and pluteus larvae). Preliminary data suggests that embryos cultured in 800 µM thalidomide solution demonstrate a variety of malformations in the pluteus larvae stage. Most frequently observed malformations include abnormal embryo morphology and delayed development. Work will continue to optimize experimental conditions and develop a concentration curve. (109)

**Kosak, Zachary J.\*, Erin E. McClelland, and Jeramia J. Ory.** King's College, Wilkes-Barre, PA, 18711, and Middle Tennessee State University, Murfreesboro, TN 37130. *A Potential Role for Biotin in Cryptococcal Meningitis Severity*—*Cryptococcus neoformans* is an opportunistic human pathogen, primarily inducing cryptococcal meningitis in those with compromised immune systems. Further, it is known that cryptococcal meningitis more severely affects male patients when compared with female patients. To determine what characteristics of *C. neoformans* result in more severe human infections, we have utilized microarray technology to examine innate gene expression profiles of *C. neoformans* and compare those gene expression profiles with many clinical characteristics of the patients the strains were isolated from. When comparing microarray results based on host gender, the biotin metabolism pathway was the only pathway found by the software KEGG Pathway to be upregulated in solely one host gender, the male gender. The biotin metabolism pathway has recently been suggested as a rescue factor for *C. neoformans*, although no biochemical work to date has verified that hypothesis. Regardless, upregulation of these genes in isolates from male patients may provide a new clue into cryptococcal meningitis severity, lend new support to the hypothesis of biotin as a rescue factor, and provide a novel pathway for pharmacological targeting in treatments for cryptococcal meningitis. (16)

**Kosarek, Noelle N.\* and Eric S. Ho.** Lafayette College, Easton, PA 18042. *Activity of the Metabotropic Glutamate Receptor -1 (GRM1) Gene as a Potential Marker for Aggressive Breast Cancer Subtypes*—Metabotropic glutamate receptor-1 (mGluR1), a G-protein coupled receptor responsible for receiving the excitatory neurotransmitter, glutamate, has been previously shown to increase the metastatic potential of melanoma. A recent report has shown that mGluR1 is inactive in normal breast cells and active in triple negative breast cancer cells (TNBC). There exists the possibility then that the activity of mGluR1 in TNBC is contributing to rapid and uncontrolled cancer cell growth. Interestingly, the gene that codes for mGluR1, GRM1, is located 5,368,479 bps downstream of the estrogen receptor gene, ESR1, and is almost immediately adjacent to RAB32, a gene that codes for a Ras protein that, when mutated leads to unchecked proliferation. There is a possibility that these three genes exhibit a high linkage disequilibrium and are often times inherited together. Further, two of these genes can possess significant mutations. GRM1 contains a large and detrimental deletion and ESR1 contains a large insertion. If the two genes are inherited together with these mutations the result can produce a particularly aggressive breast cancer subtype. This study will explore GRM1 as a potential marker for a new breast cancer subtype by using Hapmap, Galaxy,

and the UCSC Genome Browser to determine the relationship of GRM1 to the genes that code for known breast cancer makers; namely, progesterone receptors, estrogen receptors, and human epidermal growth factor-1 receptors. (102)

**Koshar, Jenna\* and Cynthia Walter.** Saint Vincent College, Latrobe, PA 15650. *The Effect of Enrichment Intervention on the Behavior of Shelter Dogs*—Animal shelters are able to care for stray dogs awaiting permanent homes at a low expense. The environment at these facilities, however, can possibly have negative effects as seen in undesirable animal behaviors reported in literature. Integrating enrichments into a regular regime of shelter dogs has the potential to improve their temperament and behaviors. This is important because dogs are usually adopted on a first-impression basis. It is important to determine ways to predict behaviors in shelter dogs. This study was designed to measure if enrichment – a ten-minute walking session – affected the frequency of various behaviors of thirty shelter dogs in two different shelters. Thirty dog behaviors, such as barking, lying down, and standing, were tallied in frequency during a ten-minute observation before and after walking. It was hypothesized the walk would be associated with an increase in some behaviors, such as standing and walking behaviors, and a decrease in other behaviors, such as barking. In most cases, the hypothesis was supported in both shelters. For example, lying down increased on average from pre-enrichment ( $x=3.6$ ,  $s.d.=3.2$ ) to post-enrichment ( $x=5.0$ ,  $s.d.=3.9$ ) after the walk. In addition, the walking behavior also increased before ( $x=1.5$ ,  $s.d.=1.8$ ) to after enrichment ( $x=2.15$ ,  $s.d.=3.8$ ) and supported the hypothesis with 95% confidence. Barking, however, was dependent on the shelter in which the dogs were housed, showing a statistically significant interaction of shelter and walking (Two Factor ANOVA  $P=0.004$ ). For example, barking increased at Shelter A (from  $x=0.2$  to  $x=1.4$ ,  $s.d.=4.8$ ) but decreased at Shelter B (from  $x=3.3$  to  $x=1.9$ ,  $s.d.=2.6$ ) in pre versus post-walk sessions. Overall, underlying conditions in the shelter can impact dog responses to a walk. In sum, the use of a ten-minute walk could encourage the balance of active and resting behaviors in shelter dogs. (44)

**Lappas, Courtney M., Rebecca R. Wise\*, Cody, J. Lloyd, and Emily N. Pipkin.** Lebanon Valley College, Annville, PA 17003. *The plant hormone zeatin riboside inhibits T lymphocyte activity via adenosine A2A receptor activation*—Cytokinins are plant hormones that play an integral role in multiple aspects of plant growth and development. The biological functions of cytokinins in mammalian systems are, however, largely uncharacterized. The naturally occurring cytokinin zeatin riboside has recently been demonstrated to activate the mammalian adenosine A2A receptor, which is broadly expressed by various cell types including immune system cells, with the activation of the A2AR playing a role in the regulation of cells involved in

both innate and adaptive immunity. We show for the first time that zeatin riboside modulates mammalian immune system activity via an A2AR-dependent mechanism. Specifically, zeatin riboside inhibits the production by CD3+CD4+ T cells of IFN-gamma, IL-2, TNF-alpha, IL-4 and IL-13, and the production by CD3+CD8+ T cells of IFN-gamma, IL-2, and TNF-alpha. Additionally, the upregulation of CD25, CD69 and CD40L by activated T lymphocytes is modulated by zeatin riboside. The immunomodulatory activities of zeatin riboside are blocked by co-treatment with the selective A2AR antagonist ZM241385. These data suggest that zeatin riboside possesses therapeutic potential as a mammalian immunomodulatory agent. (118)

**Lazarski, Kathleen, Nicole Nicholson, Spero Skarlatos\*, Caitlin Hutton\*, and Robert L. Hale.** Shippensburg University, Shippensburg, PA 17257. *Frontal lobe EEG and BIS/BAS activity in relation to symptoms of NPD, ASPD, and binge drinking behavior*—This study looked at alpha wave activity in the frontal lobes and the motivation “BIS/BAS” brain system as they relate to antisocial personality disorder, narcissistic personality disorder, and drug and alcohol disorders. Undergraduate students from Shippensburg University volunteered and completed an EEG scan. An Electrocap® with recording surface electrodes at F3 (positive), F4 (negative), F7 (positive), F8 (negative), and A1 (right ear lobe; common) was used. After a baseline period to stabilize recordings, participants engaged in randomly-ordered “eyes open” and “eyes closed” sessions, with only data from the “eyes closed” sessions analyzed. An ML132 bioamplifier amplified the resulting signal, which was then sent to a single channel of the ADInstruments 4/25T Powerlab®. Off-line data analysis was conducted using ADInstruments LabChart v7® Spectrum® software. After EEG recordings were completed, participants then completed an online (SurveyMonkey®) survey which included a generic drug survey, the Wechsler-94, NPI-13, the Subtypes of Antisocial Behavior questionnaire (STAB), and the BIS/BAS scales. Major grouping variables were created using median splits on the STAB subscales (antisocial personality disorder), the NPI-13 (narcissistic personality disorder) and the Wechsler-94 drinking scale (binge v. non-binge drinkers). Dependent measures were the BIS/BAS subscale scores and EEG alpha power. Group differences on these measures were analyzed using Multivariate Analysis of Variance as the primary statistic, with alpha controlled at .05. (48)

**Leger, Alena\*.** King's College, Wilkes-Barre, PA 18711. *Success Rate and Effects on Growth of Artificial Combinations of Cool Season Grasses and Strains of Fungal Endophytes*—Cool season grasses and fungal endophytes often form a mutualistic symbiosis, where the presence of the endophyte has positive effects on plant growth. Previous studies suggest that fungal endophytes exhibit host specificity



as well as local adaptation, where they provide greater benefits to hosts in which they are typically found than to other hosts. In this study we created artificial combinations of grasses and their endophytes, using two grasses within the same genus and one outside that genus. We expected that endophytes would be less successful at colonizing grasses outside the genus they are normally found compared to grasses within their host's genus. We also expected local adaptation, such that natural associations, those in which the isolates are reintroduced to the host species from which they were isolated, were more beneficial to the host compared to when introduced into a different species. Using endophytes isolated from seeds and stems of *Elymus riparius*. *Elymus villosus* and *Schedonorus arundinaceous* we inoculated seedlings of each of the species, using a hypodermic needle to create a small slit at the base of the seedling and inserting fungal hyphae. To ensure that seedlings were initially endophyte free, samples of the seeds were examined microscopically for fungal endophytes using aniline blue-lactic acid stain and were found to lack characteristic endophytic hyphae. The seeds were also heat treated, 60 °C for one week, to further reduce the chance that the resulting seedlings were initially infected. The inoculated grasses were grown for eleven weeks. We assessed the benefit to the grass as survival rate and number of tillers produced. To determine colonization success rate we used the fluorescent stain Calcafluor to microscopically analyze the inoculated grass seedlings for endophytic hyphae. (68)

**Lukow, Devon\*, Megan Santiago, and Abdalla Aldras.** East Stroudsburg University, East Stroudsburg, PA 18301. *Seroprevalence of Toxoplasma gondii in Coyotes (Canis latrans) From Eastern United States*—*Toxoplasma gondii* is a protozoan parasite responsible for Toxoplasmosis, one of the most common human infections in the world. *T. gondii* can infect any warm-blooded animal, but it is known to rely on feline as definitive hosts to complete its life cycle. The typical mode of transmission of *T. gondii* is either through ingestion of the parasite's oocysts present in feline feces, or through ingestion of infected tissues. Carnivorous animals, such as the coyote, are susceptible to infection and consequently serve as a good indicators of the prevalence of the parasite in a particular location. Eighty-one coyote serum samples collected from various locations across the eastern United States were tested for the presence of IgG antibodies to *T. gondii* via an Indirect Enzyme-linked Immunosorbent Assay (ELISA) protocol. 60 (74%) of the coyotes tested positive for IgG antibodies to *T. gondii* and correlations with age, gender, and geographic distribution were explored. (24)

**Mangkalaphiban, Kotchaphorn\*, Rebecca M. Smith, and Laura F. Altfeld.** Wilson College, Chambersburg PA 17201. *The Efficacy of Zingerone and Curcumin in Inhibiting the NF- $\kappa$ B Inflammatory Pathway in Mouse Macrophage Cells: A Comparative Study*—Inflammation is a protective

response to infection by the immune system, but when inflammation becomes chronic, it can lead to destruction of tissues, resulting in autoimmune disorders, neurodegenerative and cardiovascular diseases. Recently, natural products have become a popular area of research because they have been used to treat medical conditions for thousands of years with minimal side effects. Among them, ginger (zingerone) and turmeric (curcumin) have been tested for their anti-inflammatory properties, specifically the NF- $\kappa$ B pathway. Studies suggest that both compounds reduce the activity of NF- $\kappa$ B, a transcription factor responsible for turning on inflammatory genes, by preventing the phosphorylation and degradation of its inhibitor, I $\kappa$ B. In this comparative study, mouse macrophage cells (A3.1A7) were treated with three different concentrations of either compound one hour before (pre-treatment) or after (post-treatment) being stimulated for inflammation by bacterial lipopolysaccharide (LPS). The maximum concentration for each compound, determined by cell viability test using trypan-blue exclusion assay, was 150  $\mu$ M for zingerone and 15  $\mu$ M for curcumin. The activity of NF- $\kappa$ B p65 subunit, determined using enzyme-linked immunosorbent assay (ELISA), is expected to be lower in the treated groups than that of the untreated group. The levels of I $\kappa$ B and phosphorylated I $\kappa$ B, measured by Western blotting, are expected to be inversely related, with the level of phosphorylated I $\kappa$ B corresponding to the activity of NF- $\kappa$ B. Due to the lower maximum concentration and the molecular structure, curcumin is expected to reduce inflammation more efficiently than zingerone. Additionally, the pre-treatment groups are expected to show greater significant results than the post-treatment groups due to earlier compound availability. The findings of this study can lead to an understanding of the molecular structure most effective for the inhibitory action, which can be used to improve the efficacy and minimize the side effects of anti-inflammatory drugs. (15)

**Matthews, Margaret\*, Matthew Vendeville, Sara Turner, and Thomas Cook.** Mercyhurst University, Erie, PA 16546. *Looking for Toxoplasma gondii in the Erie, PA environment*—The purpose of this study is to detect *Toxoplasma gondii* oocysts in the Erie, Pennsylvania environment. *Toxoplasma gondii* is a unicellular parasite that causes the disease toxoplasmosis. This parasite is present worldwide and over 60 million Americans may be infected with toxoplasmosis. *Toxoplasma* sits dormant in healthy individuals but causes severe health problems for those who have a compromised immune system or women that are pregnant. In order to find out if this parasite is present in Erie, soil samples were collected from areas around animal shelters, as well as, in urban and rural parks within the city limits of Erie, Pennsylvania. We chose to collect soil samples in these areas because one of the two major ways to contract Toxoplasmosis is coming in contact with cat feces. Since we are more likely to find remnants of

cat feces around animal shelters, samples of soil were taken from these areas. We then chose to collect samples from parks because children play in the dirt leading these parks to be points of infection if they do contain *Toxoplasma* oocysts. These soil samples undergo DNA extraction, PCR in order to amplify the amount of DNA present, and are run through gel electrophoresis with a positive *Toxoplasma* sample as a control. This is done in order to see if *Toxoplasma gondii* oocysts are present within the soil. (25)

**May\*, Dionne and Megan Rothenberger.** Lafayette College, Easton, PA 18042. *The effect of toxic legacy sediments on macroinvertebrate populations in the Bushkill Creek as an indicator of post-dam removal impacts*—Interest in dam removal as a means of river restoration has been gaining momentum nationwide, particularly in Pennsylvania, the state that leads the nation in the number of dam removals. However, just like dam construction, dam removal can have significant impacts on the surrounding ecosystem. The problem is that very few dam removals (i.e., < 5%) have been accompanied by pre-removal monitoring of water quality and species composition, toxicity studies, extensive follow-up studies, and peer-reviewed publications. 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 was the catalyst for a multi-disciplinary study at Lafayette College that involved the collection of pre-removal data on water quality and macroinvertebrate assemblages and on concentrations of heavy metals (i.e., lead, copper, cadmium, and arsenic) in sediment cores extracted from above the dams. Analysis of sediment cores showed that these metals are present in concentrations that could lead to death or adverse physiological effects for stream biota if they are re-suspended following dam removal. Therefore, this study was designed to explore this possibility, and the objectives were to 1) continue collecting pre-removal data on water quality and macroinvertebrate assemblages at established study sites, 2) use a sediment assay with cores extracted from above the dams to obtain baseline metal concentrations for toxicity bioassays, and 3) run controlled bioassays to determine the effect of ecologically relevant concentrations of lead, copper, and cadmium on an abundant macroinvertebrate species in the Bushkill, *Hyaella azteca*. Preliminary bioassays indicate that these metals significantly impact the behavior and increase mortality of *H. azteca*. Data from this study will help to inform dam removal and expectations of biotic response to sediment re-suspension. (86)

**Maylor, Alexis, Samantha Rosencranz and Christopher W. Brey\*.** Marywood University, Scranton, PA 18509. *A mutation in the Krüppel-like transcription factor (klf) 2 decreases the life-span of *Caenorhabditis elegans**—In vertebrates, adipose tissue stores energy in the form

of fat. Fat storage and utilization is essential for energy homeostasis, and its disruption is associated with metabolic syndromes such as type-2 diabetes and cardiovascular disease in humans (42% of the human disease genes have ortholog counterparts in *C. elegans*). The process by which fat storage is coordinated through positive and negative feedback signals is still poorly understood. The Krüppel-like transcription factor, klf-2 is part of family of transcription factors important in fat metabolism. Here we show for the first time that homozygous mutant klf-2 (ok1043) worms placed in M9 buffer devoid of food have a decrease in life-span by approximately 30% when compared to wild-type and klf-3 mutant (ok1975) worms. Our study demonstrates that Ce-klf2, among its many other biological roles, may play a critical part in the development and maintenance of the normal life-span of *C. elegans*. (115)

**McDonald, Connor M.\*, Rebecca A. Urban, and Robert E. Carey.** Lebanon Valley College, Annville, PA 17003. *Using DNA Barcoding to Enhance Identification of Benthic Macroinvertebrates for use in Waterway Biomonitoring: An Interdisciplinary Lab in Ecology and Genetics at Lebanon Valley College*—Benthic macroinvertebrates play a critical role in freshwater food webs. Ecologists and conservation officials realize that the health of the benthic macroinvertebrate community reflects the stability and diversity of the overall system. For this interdisciplinary project, Dr. Urban's ecology lab class (BIO312L) sampled invertebrates within the local Quittapahilla Creek. The students identified their specimens with dissecting microscopes and dichotomous keys down to the family level. DNA barcoding is a method that uses a genetic marker to assign an unknown sample organism to a taxonomic group. The gene typically used for this purpose in animals is mitochondrial cytochrome c oxidase (cox1 or COI). This method is useful when traditional identification procedures are not available or are difficult to use. In the case of stream macroinvertebrates, traditional identification methods are somewhat problematic due to the morphological similarity found within invertebrate families. DNA barcoding using cox1 may alleviate this problem by providing a fast, reliable method to obtain a more specific identification. Students in BIO201L (Genetics) lab isolated DNA from the stream macroinvertebrates collected by ecology students. Students then used these DNA samples as the template for a polymerase chain reaction (PCR) using primers designed to conserved regions of the invertebrate cox1 gene. Amplified gene sequences were then sequenced. Students analyzed these sequences using the “DNA subway” suite of applications that are part of the iPlant Collaborative (<http://dnasubway.iplantcollaborative.org/>). These data were then be passed to BIO 312L students who will use these more precise identifications to recalculate measures of biodiversity. This activity will also include discussion of why and how these molecularly derived identifications might affect biodiversity calculations. Students will be assessed

both on their understanding of the ecological or genetics techniques they learned, and also on their understanding of the applications of molecular techniques to questions raised in field biology studies. (95)

**McGovern, Elizabeth\*, Christopher Hauer, and Howard P. Whidden.** East Stroudsburg University, East Stroudsburg, PA 18301. *Assessment of Eastern North American Tree Bat Activity Along Two Potential Migration Corridors*—The tree bats of northeastern North America [*Lasiurus borealis* (Eastern Red Bat), *Lasiurus cinereus* (Hoary Bat), and *Lasionycteris noctivagans* (Silver-haired Bat)] exhibit long-distance latitudinal migration and roost in trees year-round. As a result, studying the seasonal habits and movements of these species is a challenge. To better understand the seasonal activity of tree bats in northeastern Pennsylvania, and to assess the importance of linear landscape features as migration corridors, we used AR125 acoustic detectors to monitor bat activity at 3 paired sites along the Delaware River and an adjacent ridge. We identified echolocation calls to species using the SonoBat 3 autoclassifier, assessed seasonal activity patterns for each species, and used the Wilcoxon signed-rank test to compare ridge and river activity. Eastern Red Bat activity was elevated from late June to late August, coinciding with the summer resident period, and activity was higher at the ridge than the river ( $p < 0.001$ ). This is consistent with the use of forested uplands as summer habitat for this species. Hoary Bat activity was elevated from mid-April to late May and mid-July to early August, coinciding with spring and fall migration periods for this species, and activity was higher at the river than the ridge ( $p < 0.001$ ). Silver-haired Bat activity was elevated from mid-April to mid-May at both the ridge and river, and from mid-August to early October at the ridge, coinciding with spring and fall migration periods for this species. These patterns of bat activity indicate differences between species in the timing of migratory activity and suggest that different species may migrate along different landscape features. The tree bats of northeastern North America are threatened by fatalities at commercial wind-energy facilities and are most susceptible to fatality during fall migration. Identification of migration corridors may therefore assist in the conservation of these species. (22)

**McIntyre, Kelcy\*, Catherine Bradshaw, and Amy J. Reese, Ph.D.** Cedar Crest College, Allentown, PA 18104. *Investigation into the capsule binding mechanism of the fungus *Rhodotorula*—*Cryptococcus* and *Rhodotorula** are fungi that can cause disease in immunocompromised humans. What makes them different from other pathogenic fungi is that they are encapsulated with a sugar coating, which protects them in the environment outside of the body or from the immune system inside the body. In *Cryptococcus neoformans* cells, the capsule is attached via cell wall alpha-1,3-glucan. This research project is focused on *Rhodotorula*

species; we hypothesize that *Rhodotorula* species bind capsule material in a similar fashion to *Cryptococcus*. To study the capsule interaction of *Rhodotorula* samples, we use a polyclonal rabbit antibody specific to *Rhodotorula* capsule material, which is detected with a fluorescently-tagged secondary antibody. We are using both the *Rhodotorula* anti-capsular antibody and a *Cryptococcus* anti-capsular antibody to study the ability of the different fungal cells to acquire exogenous capsule from the other fungus. In order to remove capsule from the encapsulated cells, we have treated the cells with either dimethyl sulfoxide and concentrated potassium hydroxide. In each case, *Cryptococcus* cells appear to more easily bind *Rhodotorula* capsule material than *Rhodotorula* cells could bind *Cryptococcus* capsule material. Current findings suggest that the two fungi may utilize similar capsule binding methods to some extent, but that their binding interactions are not exactly the same. (124)

**McNett, Alison\* and Mel Zimmerman.** Lycoming College, Williamsport, PA 17701. *Comparison of Water Quality, Fish, and Macroinvertebrate Characteristics of Two Class A Trout Waters with Other Impaired Streams*—Two class A trout streams, both named Hagerman's Run (one a tributary of Lycoming Creek; the other a tributary of West Branch Susquehanna River) in Lycoming County were sampled for the last 5 years and will be compared to seven other streams from impaired sites. The Hagerman streams show high macroinvertebrate species diversity but low diversity of fish. In addition, one of these creeks also shows some impairment due to erosion from gravel roads, which may threaten its classification. The seven other streams are tributaries to or part of the Sugar Creek watershed which is a tributary to the North Branch of the Susquehanna River. All 7 of these streams contained no trout, and showed low macroinvertebrate diversity. All of these streams were located near or next to farms, and there is a high possibility that agricultural runoff is occurring. The fish diversity in these tributaries was higher compared to the two Hagerman's Run streams. The water chemistry also showed higher concentrations of Phosphorous and Nitrogen. An attempt will be made to find correlations between the influence of chemistry, habitat and biota on these creeks. (89)

**Meck, Jessica<sup>1\*</sup>, Laura F. Altfeld<sup>2</sup> and Brad E. Engle<sup>1</sup>.** <sup>1</sup>Wilson College, Chambersburg, PA 17201, <sup>2</sup>Saint Leo University, Saint Leo, Florida, 33574. *The Effects of Temperature on the Competitive Interactions between *Pseudogymnoascus destructans* and Native Cave Fungi*—White Nose Syndrome in the United States has resulted in the death of millions of bats. The syndrome is caused by the invasive fungal species *Pseudogymnoascus destructans*. Due to its psychrophilic and opportunistic characteristics, *P. destructans* grows not only around the cave floor and walls, but also on the bat's muzzles and wing membranes. This results in the disturbance of the bat's hibernating cycle, which



causes them to burn their fat reserves leading to starvation and death. While much research is focused on the effects of *P. destructans* on bats, little is known about the ecological impacts *P. destructans* has on the native cave fungi. My research studied the competitive interactions between *P. destructans* and five native cave fungi: *Aspergillus versicolor*, *Aspergillus niger*, *Penicillium chrysogenum*, *Cladosporium cladosporioides*, and *Geomyces pannorum* in order to determine whether, and under what conditions, *P. destructans* is a superior fungal competitor. Competitive trials were conducted in which each of the native cave fungi was paired with *P. destructans* on Sabouraud's dextrose agar plates and grown at four different temperatures: 5 °C, 10 °C, 15 °C, and 25 °C for six weeks. During that time, area of growth was recorded every week to assess the rate of resource utilization, direct competitive interactions, and comparative growth rates. Given the cold tolerance of *P. destructans*, my initial observations have shown that *P. destructans* was an intermediate competitor at 5 °C and 10 °C. Some native species such as *C. cladosporioides* out competed *P. destructans* whereas others simply did not grow. At 15 °C and 25 °C, preliminary data indicates that *P. destructans* has little capability to compete against the natives. In addition to the competitive trials, sediment samples were collected from local bat hibernacula in collaboration with the Pennsylvania Game Commission to determine the native fungal diversity. (21)

**Mehmeti, Lediona\*, Rosalinda DiGironimo, Brendan Dougherty, Archana Ganta, Krista Vadaketh, Edward Winter, and Aikaterini Skokotas.** Rosemont College, Rosemont, PA 19010. *The role of Ndt80 activator protein in the meiotic commitment point of an IME-2 hyperactivated S. cerevisiae strain*—In yeast, glucose starvation is the key signal that causes diploid cells to enter meiosis resulting in spore formation. The Sum1 repressor is displaced in part due to phosphorylation by IME-2 kinase. Subsequently, Ndt80 activator induces exit from prophase I resulting in meiotic development. If nutrients are added prior to the completion of prophase I, cells will exit the meiotic program and return to mitotic growth. This is controlled by Gpa2p, a G-binding protein that binds to the carboxyl terminal end of IME-2 kinase and inhibits sporulation. In this study, we use an IME-2 hyperactivated strain with a truncated C-terminal regulatory domain. In addition, we use an estradiol inducible promoter to regulate Ndt80 expression and trap cells in meiotic prophase. Here, we examine the effect of simultaneous addition of glucose and estradiol at the commitment point. The results indicate that cells return to mitotic growth and that the IME2 hyperactivated strain is unable to override inhibition of meiosis by glucose. (99)

**Meier, Casey\* and Anya Goldina.** Elizabethtown College, Elizabethtown, PA 17022. *Serotonin maintains aggression within social networks of crayfish Orconectes obscurus*—Serotonin (5-HT) is the main modulator of agonistic behavior in decapod crustaceans. However, the exact effect of 5-HT on social behavior has been difficult to determine because 5-HT effects are concentration dependent and reflect individual social history. We used the crayfish *Orconectes obscurus* to examine how 5-HT modulates social behavior in the context of social networks. Since in nature, animals form networks where they can have multiple winning and losing experiences and can thus, be dominant to some individuals and subordinate to others, we created a simplified social network to assess the role of 5-HT in a more naturalistic social environment. Three individuals were placed into a 10-gallon aquarium to establish a dominance hierarchy. Interactions were videotaped and social status of each individual was identified. When the dominance hierarchy stabilized, we examined if animals of different social status exhibit differential sensitivity to 5-HT by treating individuals with different 5-HT concentrations, and then assessing agonistic behaviors within networks and individual postural changes. Serotonin treatment caused a dose-dependent increase in retreat behavior of dominant individuals. In addition, our preliminary results suggest that serotonin maintains overall aggression levels during repeated interactions by causing more status shifts and preventing stabilization of social networks. (35)

**Mellott, Martina R.\*, M. Dana Harriger and Deborah S. Austin.** Wilson College, Chambersburg, PA 17201. *Comparative Analysis of Milk Replacers on Holstein Bovine Serum Protein Concentration and Development*—There are approximately 55,000 dairy cows across the United States, each producing roughly six and a half gallons of milk per day (Thiesse, 2012). The dairy cows also give rise to the next generation of producers. Calves have to be fed the proper quality of colostrum, as well as milk or milk replacer to ensure healthy growth and prevention from disease. This study measured the quality of each mother's colostrum before feeding to the newborn calf, using a Brix refractometer. After the third feeding of colostrum, calves were fed milk replacer through six weeks of age. Calves were assigned to one of five commercial replacers for the study. Serum samples were collected and analyzed for total protein utilizing a field refractometer and IDEXX Catalyst Dx ® chemistry analyzer for comparison. The weight of the calves was recorded weekly to determine the influence the milk replacers had on development. Analysis included comparing levels of protein with the type of milk replacer, the influence each milk replacer had on weight, and comparing the results of the refractometer and IDEXX. It is anticipated that the various protein and fat rations within the milk replacers will impact weight and protein gains between the five different groups of calves; therefore, the most beneficial milk replacer

for the calves can be determined. The results of this study will provide data to dairy farmers for selection of a milk replacer with benefit to their calves' health and potentially their future milk production. (3)

**Messler, Alice\* and Cosima Wiese.** Misericordia University, Dallas, PA 18612. *Antimicrobial Activity as Related to Alkaloid Composition of Root Extracts from Berberine Containing Plants*—Drug resistant bacterial infections in humans are becoming increasingly more common. The overuse of market antibiotics has caused bacterial strains to become more virulent and resistant to pharmaceuticals, and some diseases that were once treatable now have fatal outcomes (Buhner, 2012). Resistance to standard antimicrobial drugs has increased the interest in plant chemicals, particularly alkaloid compounds. This study explores the alkaloid content and antibacterial activity of root extracts of goldenseal (*Hydrastis canadensis*), Oregon grape (*Mahonia aquifolium*), and Japanese barberry (*Berberis thunbergii*), against *Staphylococcus aureus* bacteria. The goal was to determine whether these root extracts were effective as antimicrobials, and to relate their alkaloid profiles, including the types and quantities of different alkaloid compounds, to their antimicrobial efficacy. Our hypothesis states that extracts from berberine containing plants, which contain multiple alkaloid compounds, will have greater antimicrobial efficacy than each of these alkaloids in isolation. To test the hypothesis, the alkaloid profile for each root extract was characterized using High-Performance Liquid Chromatography (HPLC), and the antimicrobial efficacy of the extracts was compared to the antimicrobial efficacy of isolated alkaloids, both individually and in combination. Results of the HPLC analysis showed that the alkaloids palmatine and berberine were present in both the Oregon grape and Japanese barberry extracts, and hydrastine and berberine were present in the goldenseal extract. The antimicrobial assay demonstrated a significant inhibitory effect of the root extracts on the growth of *S. aureus*, while the isolated compounds, both individually and in combination, did not inhibit the growth of *S. aureus*. (28)

**Metcalf, Blake E.\*, Peter J. Pulhac, Benjamin J. Harowitz, John L. Silverio, Joseph T. D'Auria, Sarah A. Benson, Stephen R. Madigosky, Itzick Vatnick, and Robert W. Morris.** Widener University, Chester, PA 19013. *Microclimatic Characteristics of a Lowland Neotropical Rainforest, Amazon Conservatory of Tropical Studies (ACTS) Iquitos, Peru*—Tropical forests are some of the most structurally complex and biologically diverse habitats on our planet. Yet little information is known on how the physical nature of the forest changes with height and horizontal distance. Herein, we examine the vertical profile of a lowland tropical forest outside of Iquitos, Peru. Specifically, the temperature of the forest was examined every 2 minutes over a period of three days in March 2015 at the Amazon

Conservatory of Tropical Studies (ACTS). Data loggers were placed on a series of vertically strung lines at 1.5 m intervals from ground level to some 30 m above the forest floor. Four distinct sites containing varied vegetative cover were monitored to determine if horizontal variation within the forest is thermally distinct. Loggers were programmed to capture highly resolved data so that even the finest of thermal variation within the forest could be ascertained. This data was then correlated with weather events that occurred during the same time period. Parameters such as UV-A, UV-B and PAR were recorded along with rainfall events. Results indicate that the canopy is distinctly stratified although narrowly so. The thermal variation noted throughout the forest is ideal to support a wide array of terrestrial organisms that occupy finely defined ecological niches. (67)

**Million, Andrew\*, Cassandra Powell, Kyle Holiman, Dawna Houser, and James C. Hunt.** East Stroudsburg University, East Stroudsburg, PA 18301. *Examining meiobenthic communities in sediments associated with an oyster restoration project in Greenbackville, Maryland*—During the summer of 2014, meiobenthic samples were collected and processed from 45 sites along a beach in Greenbackville, Maryland. The beach is the site of an active oyster restoration project. During the fall of 2014 and spring of 2015, sediment samples were analyzed for types and relative abundances of organisms between 63  $\mu$  and 500  $\mu$  in size. A subgroup of these organisms was identified for seasonal quantitative analyses that will be conducted in 2015 and 2016. The goal of the project is to identify changes in the meiofaunal and meiofloral community associated with the oyster restoration project, and potentially to use the group of identified types as indicators of environmental changes in local sediments. (83)

**Minnick, Alec\* and Mel Zimmerman.** Lycoming College, Williamsport, PA 17701. *The Lycoming County Farm Project*—In August 2011, a long term project started to monitor the water quality of three sites along an unnamed tributary to White Deer Hole Creek (Lycoming County). This project involved the cooperation of 4 farms (3 Amish), the Lycoming County Conservation District, the Lycoming County Planning Commission, and Lycoming College Clean Water Institute. After one year of preliminary water quality monitoring, the Lycoming County Conservation District worked with farms to implement best management practices (BMPs), consisting of riparian buffer construction, manure management, and no-till farming. Clean Water Institute interns began a pre and post evaluation along three sections of the tributary (upstream, middle, and downstream of project), collecting monthly chemical and physical data. Yearly sampling of macroinvertebrates and fish (electrofishing) was conducted, and density, diversity, and water quality were estimated based on population and identification. Data loggers documenting flow have been



used to calculate nitrogen, phosphorus, and sediment loads. Statistical analysis found no significant improvement to nutrient and sediment loads, though a positive effect on the biota was evident. Specific evidence pointing to this observation includes improvements in macroinvertebrate taxa (from 10-12 genera to 13-17 genera), improved water quality based on fish IBI (from 32-Poor to 44-Fair), and the reappearance of brown trout at two of the sampling sites. (90)

**Mondulick, Noelle\*, Stevens\*, Shawna and Angela L. Asirvatham.** Misericordia University, Dallas, PA 18612. *The Role of Phosphodiesterases in Neonatal Rat 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. Levels of cAMP in the cell are regulated by phosphodiesterases a family of phosphohydrolases. There are 11 different PDE families with various isoforms and splice variants but not much is known about their role in Schwann cells. AKAPs are known to bind both PDE and PKA to regulate cAMP concentration in cardiac myocytes. Based on these studies it was hypothesized that the expression of AKAP95 along with the expression of the cAMP-terminating enzyme, PDE4A and PDE7A would increase when Schwann cells were treated with heregulin, forskolin (a pharmacological agent that activates cAMP), or heregulin + forskolin. Immunoblot analysis reveals that forskolin treatment of Schwann cells increased the expression of PDE4A, PDE7A and AKAP95 in comparison to heregulin and heregulin + forskolin. These preliminary observations suggest that a relationship between AKAP95 and phosphodiesterases may be necessary to mediate mitogen-stimulated Schwann cell growth. (39)

**Morton, Jacob T.\*, Blake H. Shoemaker\*, Cynthia A. Surmacz, and John M. Hranitz.** Bloomsburg University, Bloomsburg, PA 17815. *Effects of Temperature on the Levels of Heat Shock Protein 70 in Blackworms (*Lumbriculus variegatus*)*—The aim of our laboratory is to determine if blackworms (*Lumbriculus variegatus*) can be used as bioindicators to assess the health of aquatic ecosystems. Blackworms are good candidates because they are sensitive to a variety of environmental toxins and display easily measured physiological responses to stress such as changes in pulse rate, motility, and tactile response. Recently, our laboratory has examined the cellular responses of blackworms maintained at room temperature (22 °C) to heat stress. While

cellular levels of heat shock protein 70 (HSP70) peaked at 31 °C, HSP70 was also elevated in worms at room temperature (22 °C). To better understand this unusual response of the worms at room temperature (22 °C), we investigated the physical properties, physiological and behavioral changes, and cellular stress responses in a population of cold-adapted blackworms in order to establish a control for comparison. Worms (Aquatic Foods, Fresno, CA) maintained at 4 °C had a mean length of 2.75 cm and a mean pulse rate of 18.8 bpm, similar to literature values. Worms maintained at 4 °C survived when the temperature was gradually increased to 22 °C (1 °C per minute) or increased directly to (22 °C). The critical thermal maximum determined experimentally by the absence of motility or tactile response was 33 °C. Protein and HSP70 levels were determined after 3 hour incubation at the following temperatures: 4 °C, increased directly to 22 °C, increased gradually (1 °C per min) to 22 °C, 29 °C, 31°C, and 33 °C. Differences in HSP70 levels were not detected between groups. Protein concentration was significantly lower between the worms placed directly in 22 °C water and the 31 °C group (p=0.03). Further research is needed to understand the cellular responses of cold adapted blackworms to stress before their use as a bioindicator or in toxicity experiments. (76)

**Moss, Jessica\*, Dr. Brenda Pavill, Elizabeth Berilla MS, Dr. Jun Ling, and Dr. Frank Dipino.** Misericordia University, Dallas, PA 18612. *Horizontal Transmission of Nosocomial Infections from Healthcare Providers' to their Patients*—The purpose of this survey study is to determine the level of awareness health care professionals have that their hospital attire may be a cause of hospital acquired infections (HAI or nosocomial) via horizontal transmission. A self-report questionnaire will be used to gather categorical data. Descriptive statistics will be used to analyze responses. Participants will be recruited from Nurse Practitioner (NP) students, Physician Assistant (PA) students and Registered Nurse (RN) students attending Misericordia University. A literature review was focused on the investigation of transmission of infectious agents via the use of attire by health care professionals. Minimal amount of information was found on this mode of horizontal transmission. No tools were found to specifically address the level of awareness of health care professionals about their clothing as a source of nosocomial infections. Therefore, a fifteen-question self-reporting survey was developed to assess health care professionals' awareness about the role of hospital attire in spreading infections. Understanding how infectious agents are transmitted, and having an awareness that horizontal transmission of microorganisms can potentially be passed from health care professionals to patients can be helpful in reducing the incidence of nosocomial infections, improving patient health care outcomes, and decreasing the economic burden of paying for preventable illness and complications. (117)

**Mrozek, Christine M.\* and Dr. Jodi L. Yorty.** Elizabethtown College, Elizabethtown, PA 17022. *Effects of Vitamin D3 and Corticosterone in vivo and in vitro on C57BL/6 Dendritic Cells*—Dendritic cells, (DCs), are a small population of immune cells, which upon maturation express specific surface proteins and can trigger the adaptive immune response. However, the presence of stress hormones such as corticosterone, (CORT), lowers the number of DCs in the body. Vitamin D is commonly marketed as an immune booster. However, some studies have shown that vitamin D negatively regulates the maturation of dendritic cells. Are there hidden risks to the use of Vitamin D in both the presence and absence of stress? Vitamin D3 was administered in two daily 250 IU doses in the form of cholecalciferol via intraperitoneal injection and CORT was provided at a concentration of 150 µg/ml in drinking water for 24 hours. Spleens were processed and DC populations were quantified by flow cytometry. In vitro studies were conducted with the primary culture of bone marrow dendritic cells, (BMDCs), which were then exposed to LPS, vitamin D3, and CORT. In both experiments, flow cytometry provided information about the expression of DC maturation factors MHC II, CD40, and CD80. The in vivo studies have shown a trend that Vitamin D negatively affects the expression of DC maturation factors such as CD40 and MHCII. Ongoing in vitro studies are still being conducted to determine if BMDCs treated with vitamin D and CORT show similar changes in expression of maturation factors after being stimulated with LPS. Overall this study is applicable to the hidden side effects of over supplementation. (120)

**Murphy, Zachary\*, Jessica Biegler, Nelli Horvath, Ann Rodgers, and Andras Hajnal.** Misericordia University, Dallas, PA 18612. *Roux-En-Y Gastric Bypass Surgery Alters Oleoylethanolamide (OEA) Mediated Ingestive Behavioral Responses*—Severe obesity may lead to the development of multiple morbidities and consequently increases mortality. Roux-en-Y Gastric Bypass (RYGB) is a very effective and common treatment for morbid obesity and its comorbidities including type-2 diabetes. The combined actions of restriction and malabsorption result in decreased meal size and nutrient absorption via mesenteric circulation, inducing earlier satiation and eventually weight loss. In hope of developing similarly effective non-invasive procedures to treat severe obesity, we tested a biological molecule called oleoylethanolamide (OEA). OEA is an endogenous lipid messenger synthesized and released from the gut in response to feeding, yet inhibited by fasting. The objective of this study is to confirm that the exogenous administration of OEA will induce specific signaling mechanisms that stimulate satiety, as well as changes in taste preference. Rats were administered OEA via intraperitoneal injections and monitored for food, kaolin, and sucrose intake daily. The results showed an overall decrease in food intake in all rat groups within the first two hours after OEA administration.

Kaolin intake decreased significantly up to six hours after OEA administration. In addition, OEA altered gustational preference in sham rats by inducing them to shift from 1.3M sucrose to 0.9M sucrose concentration. OEA administration appeared to decrease all physiological eating patterns regardless of nutrient, energy, and hedonic effects. (114)

**Namous, Fadia, Selena Contreras\*, Jessica Hile, and Amy J. Reese, Ph.D.** Cedar Crest College, Allentown, PA 18104. *Analysis of fungal organisms isolated from domestic dog coats*—Microscopy fungi are all around us in the environment, though we don't tend to notice them. Often, we also don't know the specific reservoirs for particular fungal organisms, nor how these organisms might get transferred from one location to another. We do know that saprophytic fungi feed off dead or decaying organic material, so they may prefer leaf debris, decaying wood, or even dead skin cells. In this study, we wanted to determine the types of fungi that could be isolated from domesticated dog coats, since dogs spend time outdoors and then are in close contact with their owners. Members of the Cedar Crest College community were invited to participate over fall break 2014 by picking up an information and collection kit. Participants were to then answer a general survey to provide a brief medical history and outdoor time use information, as well as swab samples obtained by rubbing their dog's coat several times with a provided sterile cotton swab and collection vessel. Samples were transferred to Sabouraud agar plates and incubated for several days at 34 °C. Many plates contained an abundance of mold, yeast, or bacterial growth. The plates were photographed and the types of samples cataloged. First, putative pink *Rhodotorula* colonies were identified and restreaked to ensure purity. Next, samples of representative mold were removed for further genomic processing. Finally, remaining potential bacterial or yeast samples were streaked onto yeast peptone dextrose agar plates with chloramphenicol to select only potential yeast colonies. These were further streaked out for purity. We are now in the process of extracting genomic DNA from all yeast and mold samples. The internal transcribed spacer region will be amplified from these gDNA samples, sequenced, and compared with a fungal database to determine which fungal were isolated and detected from this canine population. (125)

**Naugle, Michaela\*, Rachel Ovelman\*, Taylor Unger\* and Margaret T. Peeler.** Susquehanna University, Selinsgrove, PA 17870. *JNK is required for first cell division following fertilization in the sea urchin embryo*—A number of rapid changes occur following fertilization in animal embryos that result in the onset of the cell cycle leading to the first mitotic division of the cleavage stage. Our lab has identified a role for the MAP kinase c-jun N-terminal kinase (JNK), a component of the planar cell polarity pathway, in the first cell division in the sea urchin embryo. Inhibition of JNK with the ATP analogue SP600125 prevents first

division. Since JNK has been shown to be involved in several processes necessary for mitosis in other systems, we are examining the effect of JNK inhibition on events such as spindle formation, cleavage furrow formation, and DNA replication following fertilization in the sea urchin. Initial results show that spindle formation is delayed and abnormal in the majority of JNK inhibited embryos. We have also initiated experiments to examine the requirement for JNK activity during DNA replication. Preliminary data using the mammalian cell line of PtK2 cells indicates that JNK inhibition reduces the number of cells that actively replicate their DNA, as indicated by labeling with Alexa fluor labeled EdU. Similar experiments are underway using fertilized sea urchin eggs, which we hope will provide evidence as to whether JNK is required for DNA replication following fertilization. (111)

**Ngo, Victoria\*, Selena Contreras, Julia Kelly, Samantha Korpics, and Amy J. Reese, Ph.D.** Cedar Crest College, Allentown, PA 18104. *Identifying the prevalence of Rhodotorula species on trees of the William F. Curtis Arboretum of Cedar Crest College*—*Rhodotorula* species are pink to coral yeast-shaped fungi that have been isolated from various environmental locations. They are also considered emerging pathogens, as they are increasingly being linked with disease in immunocompromised patients, particularly associated with central venous catheters infections and meningitis. Little is known about these fungi, including their natural reservoir. During the spring of 2014, sixty-six trees on the Cedar Crest arboretum were each swabbed five times and the samples transferred onto either Sabouraud or yeast peptone dextrose agar plates and incubated at 34 °C. Pink colonies were isolated, restreaked, and phenotypically analyzed with lactophenol cotton blue chitin stain to identify yeast cells. Out of the 66 swabbed trees in the spring, 17 yielded pink colonies that were identified as yeast. These trees were typically oak and beech and concentrated mostly around Blaney and Alumnae Halls. Out of the 66 swabbed trees in the fall, six yielded pink colonies that were identified as yeast. These trees were of varied species with no clear trend, but for the most part, were concentrated around Blaney and Curtis Halls. Both sets of yeast samples bound a *Rhodotorula*-specific antibody generated in our laboratory. For genotypic analysis, genomic DNA is being extracted from the confirmed yeast samples using the Zymo Fungal/Bacterial DNA Extraction Kit. The internal transcribed spacer (ITS) regions of each DNA sample were amplified using ITS1 and ITS4 primers and polymerase chain reaction, and the products confirmed by DNA gel electrophoresis for the spring set and work is in progress for the fall set. These DNA regions will be sequenced and compared with fungal sequence databases to determine their specific species. Our

research was conducted in order to understand if detection of *Rhodotorula* on campus trees could elucidate *Rhodotorula* habitat patterns, as trees are often associated with fungi. (127)

**Ortiz, Michaela A.\*, Chelsea Mahoney, Kayla Hager, and Dr. André Walther.** Cedar Crest College, Allentown, PA 18104. *Identification of Protein-Protein Interactions of Replication Protein A in Saccharomyces cerevisiae*—According to the American Cancer Society, an estimated 1,658,370 cases of cancer will be diagnosed in 2015, and there will be an estimated 589,430 deaths caused by cancer in the United States alone. Our research focuses on trying to understand the underlying causes of cancer by studying Replication Protein A (RPA), which is a single-stranded DNA binding protein required for human genomic DNA integrity pathways including DNA repair, replication, recombination, telomere synthesis, and cell-cycle regulation. The second subunit of RPA is phosphorylated in a cell-cycle dependent manner and in response to DNA damaging agents, and this phosphorylation can affect RPA's ability to interact with other proteins. In this study we are identifying the phosphorylation-dependent and independent protein-protein interactions of RPA by using the model organism *Saccharomyces cerevisiae*, which shares a high level of homology to human cells in the cellular pathways related to maintaining genomic integrity. Identifying the protein's that physically interact with RPA will lead to a better understanding of how RPA functions in the cellular genomic DNA integrity pathways that are often defective in human cancers. A yeast two-hybrid assay was used to identify protein-protein interactions of RPA from a random library of yeast proteins, to identify 380 candidate proteins that interact with a constitutively phosphorylated version of RPA. We have begun the process to determine the identity of the candidate proteins. So far in this study, 83 out of 120 screened candidate proteins experienced a positive protein interaction with RPA, and 6 of these interactions were determined to be phosphorylation-dependent. The identity was determined for 24 of the 83 unknown proteins. Among the identified proteins was a protein known as SIM1, which is of particular interest due to its possible participation in DNA replication. (101)

**Osborn, Elizabeth\* and Megan Rothenberger.** Lafayette College, Easton, PA 18042. *Effects of habitat fragmentation on vernal pool-breeding 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.” Therefore, the objective of this study was to better understand how fragmentation of the life zone habitat impacts the breeding preferences and distribution of salamanders in Jacobsburg State Park in Wind Gap, PA. Salamander egg masses were counted in spring 2014 at three isolated vernal pools (>1000 m from a road) and two pools near roads ( $\leq 100$  m from a road) to determine whether life zone fragmentation and road proximity affects salamander breeding preference. From September to November 2014, cover boards were placed around all five vernal pools to determine and compare spatial distributions of adult salamanders around isolated pools and pools near roads. Abiotic data (i.e., water level, volume, temperature, dissolved oxygen, and pH) were also collected from all the pools on a weekly basis from March to November 2014. Preliminary results indicate that spotted salamanders (*Ambystoma maculatum*) deposited significantly more eggs in pools near roads. The higher volume and longer hydroperiod of these pools could explain this unexpected result. However, all of the adult salamanders found in fall 2014 were at cover board sites in upland habitat surrounding isolated pools, suggesting improved survival and greater population size of salamanders in unfragmented habitat. (87)

**Osborne, Allison\*, Jinalben Patel\*, Tayler White, Angela Snyder, Kristin Konapelsky, Taylor Perkins, Francesca Prendes, Denyell Spingola, Alicia Zook, Audrey J. Ettinger, and K. Joy Karnas.** Cedar Crest College, Allentown, PA 18104. *A Twist on a Classic Developmental Biology Laboratory: Morphological Data and Molecular Analysis of Apoptosis from Chemically Exposed Gallus gallus Embryos*—The data described here was obtained in the context of a faculty partnership that has spanned more than five years. The project was initiated to bridge upper-division courses with the objectives of increasing content knowledge across biology subdisciplines while providing research experiences within teaching laboratories, and has expanded with follow-up studies conducted as independent projects in research labs and summer internships. This endeavor brings together undergraduate biology, neuroscience, and genetic engineering majors to investigate the effects of teratogens, apoptosis-inducing chemicals, and herbal supplements on cell growth, ion channel physiology, and gene expression. While the initial project investigated the gross morphology of treated chicken embryos or isolated chick neurons in combination with a microarray analysis of gene expression across several thousand genes, it has since been expanded to better examine cellular apoptosis by using cell culture models, primarily focused on DT40 chicken lymphoblast cells, and using HeLa cultures for comparisons. In addition, genetic analysis has progressed to the use of pathway-specific PCR arrays and real time PCR analysis. Furthermore, electrophysiology has been incorporated

through the use of an automated patch clamp system that is pedagogically amenable to undergraduate use. The latter portions of this project are supported by an NSF-TUES grant. This presentation focuses on data from the spring 2015 Diseases of the Nervous System and Molecular Genetics cross-course collaboration, in which chicken embryogenesis was examined following exposure to an herbal remedy (Ginkgo biloba extract) and prescription drugs (Excedrin, Methadone, and Diazepam). In addition, control and treated tissue was assayed for differential expression of 84 genes relevant to apoptotic pathways. (110)

**Otarashvili, Teona\* and Eric P. Ingersoll.** Penn State Abington, Abington, PA 19001. *Expression of Matrix Metalloproteinases in Breast Cancer Cells*—Breast cancer is one of the most common cancers affecting women. As with any cancer, they become most dangerous when they become malignant and spread to other locations in the body. One mechanism cells use to invade other tissues is to degrade the extracellular matrix using matrix metalloproteinases (MMPs). MMPs can either be secreted by the cell or be membrane-bound proteins. We have examined the expression of both types of MMPs by both invasive and non-invasive breast cancer cells to determine if these enzymes play a role in invasion by these cells. Our studies indicate that invasive cells seem to express both a wider variety and greater quantity of these enzymes. We will present our data on the expression of mRNAs and proteins of these MMPs in several breast cancer cell lines. (103)

**Parish, Andrea\* and Manuel Ospina-Giraldo.** Lafayette College, Easton, PA 18042. *Bioinformatic and Functional Analysis of Glycoside Hydrolase Family 3 genes in Phytophthora sojae*—Carbohydrate-Active Enzymes (CAZymes) metabolize complex carbohydrates, many of which comprise the structure of plant cell walls. Glycoside hydrolase family 3, in particular, includes enzymes with  $\beta$ -glycosidase, xylan 1,4- $\beta$ -xylosidase, and glucan 1,3- $\beta$ -glycosidase activities. Since xyloglucan and many glucose derivatives are major components of plant cell walls, it is hypothesized that GH family 3 may play a role in the *Phytophthora sojae* infection process. Using bioinformatic approaches, we identified 27 gene sequences belonging to GH family 3 in the *P. sojae* genome. The majority of sequences were located on scaffolds 1, 2 and 8; on average, these sequences were 2200 bp in length and many contained 1 or 2 introns, some of which largely exceeded the average intron length in *Phytophthora* spp. Phylogenetic analysis indicated that most sequences can be classified in three major clades, and bootstrap values support the occurrence of multiple paralogous genes. Four GH family 3 genes were chosen for expression analysis in mycelium grown in vitro and during plant infection. Analysis of real-time reverse-transcription PCR (qPCR) data indicated differences in the level of expression of two of these genes at different



time-points during the infection process when compared to mycelial expression. These results suggest a potential role for GH family 3 enzymes in the infection of soybean plants by *P. sojae*. (62)

**Pates, Hunter\***. Misericordia University, Dallas, PA 18612. *A comparison of macroinvertebrate functional feeding groups in artificial leaf litter packs and natural leaf litter in Trout Brook and Leonard's Creek, PA*—Leaf litter decomposition is an important energy process in stream ecosystems and considered a useful indicator of stream health. Microbial conditioning initiates the breakdown of allochthonous leaf substrate, while benthic macroinvertebrates are responsible for further litter decomposition. Artificial leaf packs are commonly used when examining macroinvertebrate community structure in stream ecosystems. However, studies indicate that leaf packs may not be reliable in accurately depicting macroinvertebrate communities. The main objective of this study is to compare the macroinvertebrate functional feeding group community structure found in artificial leaf packs vs. natural leaf litter community structure in two second order streams in Northeast Pennsylvania. Data on artificial leaf packs suggested that filterer % frequency, although consistently high, declined over time, while gatherer % frequency increased. Shredders were the next most common FFG, while scrapers and predators were relatively less common. Analysis of natural leaf litter data has yet to be completed. If natural litter FFG communities are found to be significantly different than those from artificial leaf packs, these results may suggest the use of both methods concurrently as an alternative to independent sampling techniques. Applying several methods of stream leaf litter sampling to assess benthic macroinvertebrate diversity may provide a more accurate depiction of stream community structure. (72)

**Paul, Jocelyn\* and Meg M. Laakso**. Eastern University, Wayne, PA 19087. *Genetically engineering tomato yellow leaf curl virus to express GFP in transgenic plants*—Tomato yellow leaf curl virus (TYLCV) is an economically important plant pest that infects tomato and other food crops, causing leaf vein yellowing, stunting and fruit loss. The virus is transmitted to susceptible plants by the whitefly *Bemisia tabaci*, but the molecular interactions between the virus, plant and whitefly are poorly understood. The whitefly acquires TYLCV by feeding on virus-infected plants, and it is hypothesized that still-unidentified insect proteins act as attachment factors or receptors, facilitating movement of the virus as it traffics through the body of the whitefly. To visualize virus movement in the whitefly, GFP was fused to a viral structural protein, the coat protein (CP), which is necessary for virus assembly and transmission. This infectious fluorescently labeled TYLCV was constructed by employing PCR primer design and PCR-based mutagenesis. Viral sequences were confirmed by automated sequencing.

It is predicted that the fusion protein will allow for viruses and newly synthesized viral proteins to be visualized within the whitefly with a fluorescent microscope, and for virus movement to be tracked in real time. To accomplish this, the genetically engineered virus will be delivered to plants using Agrobacterium-mediated transfer, and whiteflies will then feed on transgenic plants before dissection and analysis by fluorescent microscopy. (65)

**Perkins, Ashley G.\*, Deborah S. Austin, and Rebecca M. Smith**. Wilson College, Chambersburg, PA 17201. *Quantitation of Epigallocatechin (EGC) and Epigallocatechin Gallate (EGCG) in Green Tea Supplements*—Due to the lack of FDA control and consistency of catechin levels in green tea supplements, analysis of various brands of green tea supplements was done via High Performance Liquid Chromatography (HPLC) and compared to the manufacturer's claims. Five different brands of green tea supplements with different quantities of green tea catechins were analyzed. Preparation of the green tea supplement samples consisted of dissolving 1mg from a capsule/tablet in 1mL of a solvent containing 1:1 methanol: 0.5% acetic acid. Samples were sonicated for 20 minutes to ensure a homogenous sample. Samples were filtered using a 25 micron filter, and then 20 microliters was injected into a Zorbax eclipse plus C18 column. Elution was done at a rate of 1mL/mL using a solvent system of 88% deionized water/0.5% acetic acid solution and 12% acetonitrile/0.5% acetic acid. Tryptophan was used as the internal standard and peak area ratios were determined. The Epigallocatechin (EGC) and Epigallocatechin Gallate (EGCG) quantities were consistently low in this study. In addition, an unexpected peak was detected in two of the brands, which was determined to be caffeine, even though the manufacturer made no claim that the supplement contained caffeine. The results of this study support the need for the FDA to regulate supplements and require standardized manufacturing practices and quality control methods, along with requiring complete and reliable labeling information provided by manufactures, in order to ensure the safety of consumers. (116)

**Perrone, Brandon\* and Bridgette E. Hagerty**. York College of Pennsylvania, York, PA 17403. *Prevalence of ranavirus in adult amphibian hosts in a vernal pool in south central Pennsylvania*—Several diseases have been implicated as major factors in the global decline of amphibians. Ranavirus, which is an infectious agent causing the disease in amphibians, as well as other ectotherms, can cause major mortality events during a short period of time. Transmission can occur through multiple avenues including water, soil, and physical contact. There are several hypotheses to explain how ranavirus persists in a location and causes multiple mortality events over time, including interspecific transmission, transmission of the virus through water or soil, and adult amphibians acting as reservoirs, thus spreading

the virus when they return to breed. Our objective was to test the adult host reservoir hypothesis using an amphibian community at a vernal pool near York, Pennsylvania that provides a breeding habitat for several species including spotted salamanders, American toads, and spring peepers. Currently, this pool has the only documented ranavirus-caused mortality event in this region. We hypothesized that ranavirus will be present in adult amphibians, but with lower prevalence than larval amphibians, which were tested in a complementary study. We tested tail and toe clip samples collected in the forested buffer zone around the vernal pool for the presence of the FV-3 strain of ranavirus using qPCR to amplify a portion of the Major Capsid Protein (MCP) gene sequence. Every adult amphibian species present at the site, including terrestrial salamanders, had viral DNA present, which confirmed the adult reservoir hypothesis. In addition, we found that a greater proportion of adult amphibians had the virus than larvae of the same species during a breeding season without a die-off. Overall, a higher percentage of anurans had the virus compared to salamanders. More attention should be paid to the adult community because they are a probable mode of transmission across years. (130)

**Pheasant, Michael S.\*, Timothy A. Kennedy, and Barbara J. McCraith.** Misericordia University, Dallas, PA 18612. *An Analysis of Fish Stomach Contents and Benthic Macroinvertebrates in Trout Brook and Leonard's Creek, Luzerne and Wyoming Counties, PA*—This study was designed to examine and compare the diversity of benthic macroinvertebrates found in Trout Brook and Leonard's Creek (Luzerne County, PA) and the diversity of macroinvertebrates preyed upon by the fish present in each creek. Macroinvertebrates and fish were collected at two sites in Trout Brook and Leonard's Creek in the summer, fall and winter of 2014. After collection the macroinvertebrates from the fish stomachs and the macroinvertebrates from the stream were identified and compared. *Rhinichthys atratulus* and *Semotilus atromaculatus* were found in both Leonard's Creek and Trout Brook while *Salmo trutta* was only found in Trout Brook. There was a significant difference between the diversity of benthic macroinvertebrates present in the creeks compared to the diversity of macroinvertebrates preyed upon by the fish. Overall the benthic macroinvertebrates collected in Leonard's Creek were dominated by Ephemeroptera, while the macroinvertebrates collected in Trout Brook were dominated by Coleoptera. The fish stomach contents were dominated by Trichoptera. Our results suggest that fish feeding preference was not based on the abundance of benthic macroinvertebrates found in the creeks. All 3 fish species were found to selectively sample the benthic macroinvertebrates. (73)

**Potuck, Justin\* and Mel Zimmerman.** Lycoming College, Williamsport, PA 17701. *Community Partnership of the Waterdale Environmental Education Center*—Located in the valley of the Mosquito Creek Watershed and adjacent to the Williamsport Municipal Water Authority Filtration Plant, is the historic Waterdale Lodge. Starting in 2014 a group of partners that includes Lycoming College (Clean Water Institute and Departments of Biology and Education), Williamsport Water Authority and the Lycoming County Conservation District formed the Waterdale Environmental Education Center as a resource for K-12 education outreach as well as a venue for college research projects and community outreach. Educational efforts at Waterdale include development of nature trail walks, aquatic macro invertebrate and fish sampling and identification, water filtration plant tour, water monitoring and testing, and demonstrations of an Enviroscape watershed model. Several full or partial day field trips for local elementary schools have been scheduled, including hands-on indoor and outdoor educational activities. Documentation of efforts to develop programs to educate the public on the importance of source water protection of drinking water supplies will be presented. In addition, water quality data from our monitoring effort will be presented. (98)

**Rahman, Sabih\*, Jeramia Ory, PhD., and Morgan Coslett.** King's College, Wilkes-Barre, PA 18702. *Copper Selective Phenotypes in Cryptococcus neoformans*—*Cryptococcus neoformans* is a fungal pathogen that is prevalent around the world and is a major cause of meningoencephalitis in people with immunocompromised immune systems. Melanin, an insoluble polymer of aromatic compounds, is a major contributor to the virulence of *Cryptococcus neoformans*. Melanin is synthesized by laccase, a copper-requiring enzyme. The level of copper within the cell can directly influence laccase activity, and thereby influence virulence. Under low copper conditions, copper is brought into the cell when the copper sensitive transcription factor *Cuf1p* activates transcription of *CTR4*, a copper importer. In a previous experiment, the effect of a low copper environment was observed on two different strains of *Cryptococcus neoformans*; wild-type (*JEC21*) and a strain lacking the *CUF1* gene (*cuf1-*). The *cuf1-* strain demonstrated highly impaired growth under nanomolar copper conditions compared to *JEC21*. However, a percentage of *cuf1-* challenged on low copper media reverted to a healthy phenotype close to wild-type. The reverted phenotype appears stable when maintained on low copper media. Molecular characterization of the reverted *cuf1-* strain is currently underway. To see if *Cryptococcus neoformans* would respond in a similar way to a higher copper challenge, we have begun testing the limits of growth in millimolar copper conditions. By observing genetic changes at the extremes of copper growth, we hope to identify previously unobserved pathways for copper homeostasis. (131)

**Ressler, Dan\* and Jon Niles.** Susquehanna University, Selinsgrove, PA 17870. *Using landscape characteristics to predict brook trout populations*—Pennsylvania protects water quality in streams based in part on whether there are brook trout or other sensitive species present. But if streams are very small and have never been visited by biologists to determine the presence of these sensitive species, the water is only protected at the level similar to downstream sections that have been assessed. Since there are thousands of small tributaries in Pennsylvania that have not been assessed, we seek to examine landscape characteristics like land use, terrain, and soils data that can be compiled from geographic data sets and find relationships between these variables and known brook trout populations. Using White Deer Creek watershed in central Pennsylvania as a test case, we sampled fish populations and geographic parameters in 23 streams and completed multiple regressions to find the most significant geographic parameters. Carbonate bedrock, watershed size, stream reach slope, and developed land uses were chosen as regression variables. Forty nine streams in Schrader Creek watershed in Northern Pennsylvania were also sampled to determine fish populations to validate the regression equations in a distant watershed. The prediction effectiveness was modest, suggesting more variable need to be evaluated to make a more robust model. Streams that had no fish were generally reliably predicted for that outcome, but for streams with no trout the model predicted about half of them should contain fish. Stresses from human activities like mining and drilling will be developed as the project develops. (79)

**Robin P. Ertl\*.** Marywood University, Scranton, PA 18509. *A SENCER approach to Biochemistry Lab: preparing students for the real world*—A concern raised in a number of undergraduate lab courses is while students can follow the typical step-by-step procedures they often fail to grasp a deeper understanding of what they are doing, and lack the ability to overcome anything but the simplest obstacles. Some students have made the comment that they don't remember anything from labs and could not repeat experiments without the protocol being written out in detail. Part of the problem may be the lack of investment in labs which may seem like a dull series of discrete demonstrations. To break this paradigm, the SENCER (Science Education for New Civic Engagements and Responsibilities) type approach was implemented in a senior level biochemistry lab. This approach links dull material to issues that excite students in order to get them to appreciate the techniques as necessary tools to solve important societal problems. The SENCER approach engages students through complex, contested, capacious, current, and unresolved public issues. The concept is to approach a problem as it is done in the real world, by building off previous work found in research articles.

This presentation examines the failures and successes of a SENCER approach. An important take home lesson is that you do not have to change the tools or techniques employed, just the questions asked. (32)

**Robinson, Joshua, A. Christy, and James Kellam.** Saint Vincent College, Latrobe, PA 15650. *Terrestrial Vertebrate Biodiversity along a Scale of Environmental Disturbance*—As urbanization and other environmental disturbances increase, conservationists need to know how wildlife is impacted in order to preserve the diversity of wildlife species. We hypothesized that as environmental disturbance becomes more prevalent in an area, the health and biodiversity of wildlife would decline. Additionally, the relative abundance of certain wildlife groups such as avian forest species and mammalian carnivores will be negatively impacted. To study the impacts of environmental disturbance, we surveyed three vertebrate taxonomic groups: birds, mammals, and herptiles at three sites of varying environmental disturbance. The study sites included the high quality Powdermill Nature Reserve, a moderate quality private property belonging to the Metsger family, and the low quality Winnie Palmer Nature Reserve, all located in Westmoreland County, Pennsylvania. We performed four types of surveys: bird point counts, herptile visual encounter surveys, trail camera trap counts, and structural measurements of plethodontid salamanders and birds. First, biodiversity (i.e. alpha diversity) among all terrestrial vertebrates progressively declined with Shannon Index values of 3.46, 3.20, and 3.02 at high, moderate, and low quality sites respectively. Avian biodiversity matched this progressive decline while mammal and herptile biodiversity did not. Second, differences in health could only be discerned in tufted titmice through ptilochronology ranging from average growth band sizes of 3.15 (SD 0.3), 2.94 (SD 0.1), and 2.68 (SD 0.1) mm at high, moderate, and low quality sites respectively (One-way ANOVA  $p = 0.00043$ ). Lastly, analysis of animals listed in groups based on land use, trophic levels, synanthropic association, and taxonomic organization showed complex patterns. For instance, plethodontids may have responded more to stream quality rather than other environmental conditions. Nonetheless, environmental disturbance impacted birds most predictably. Overall, we found that avian biodiversity, health, and relative abundance of certain groups strongly correlated with environmental disturbance in western Pennsylvania. (50)

**Rosencranz, Samantha\* and Christopher W. Brey.** Marywood University, Scranton, PA 18509. *Real Time Analysis of Expression Levels of Krüppel-like Transcription Factor (KLF) 2 in *Caenorhabditis elegans**—The nematode, *Caenorhabditis elegans*, is used as a model organism when studying fat storage. Genes for fatty acid synthesis and metabolism have been conserved between humans, other mammals, and *C. elegans*. The ability for mammals to store and regulate fat is directly related to the organism's fitness. In



humans, excess fat storage can lead to obesity, which can cause adverse effects, such as diabetes and heart disease. The basic pathways for these diseases have been conserved between the nematode and humans. *Caenorhabditis elegans* contains homologs of human Krüppel-like Transcription Factors, KLFs. KLFs regulate the accumulation of lipids within the worms' intestines and play a major role in adipogenesis. Our study examined the *Ce-klf-2* gene to determine its expression profile within the worm. The expression data of the *klf-2* gene was obtained through qRT-PCR using the comparative Ct method and employing the house-keeping gene, *ama-1*, as an internal control. Expression of *klf-2* in wild-type worms showed an up-regulation in gene activity in the early larval stages (L1, L2, L3) followed by a decrease in the L4 stage before a re-elevation in the adult stage. *klf-2* expression in later stages of larval development and in the adult indicate *klf-2* importance to the worm's maturation, however further tests need to be performed to explain the abrupt decrease in *klf-2* expression at the L4 stage. (11)

**Ross, Brandon\* and Manuel Ospina-Giraldo.** Lafayette College, Easton, PA 18042. *Expression Analysis of Chitin Synthase in *Phytophthora sojae* R5: RNA extraction, Reverse-Transcription, and qPCR analysis*—The soybean root rot pathogen *P. sojae* causes millions of dollars of damage to soybean crops yearly. This oomycete uses numerous proteins, known as effectors, to inhibit or modulate host defenses, limiting the hypersensitive response and targeted cell death, both of which are characteristic of the plant defense response to pathogen attack. Although oomycetes have broad similarities to fungi, such as morphology and mode of infection, unlike fungi, oomycetes contain cellulose in their cell walls, with only small amounts of chitin (the main component of fungal cell walls) used to give the wall internal support. In this study, expression of chitin synthase, the enzyme responsible for chitin synthesis, was examined at 4 time-points after inoculation of soybean leaves with *P. sojae* and compared to basal expression levels in mycelium. Total RNA extracted from infected leaves was used for reverse-transcription PCR using chitin-synthase specific primers. Obtained cDNAs were employed in qPCR reactions, using the SYBR Green fluorophore. Expression of chitin synthase was found to change at the different time-points, indicating that differential expression of chitin synthase may be important during pathogenesis. (63)

**Runner, Kaitlyn\* and Barbara Fenner.** King's College, Wilkes-Barre, PA 18711. *The effects of *trkB.tl*, independent of *trkB.tk+*, on neurite morphology in the presence of BDNF*—Postmortem studies on Parkinson's disease patients have shown that there are reduced levels of brain derived neurotrophic factor (BDNF) in the substantia nigra. Brain derived neurotrophic factor is a neurotrophin and the effects of BDNF can reduce neuronal injury, promote cell survival, differentiation, and proliferation through the activation of

the TrkB receptor. TrkB is a tyrosine kinase receptor and there are two main TrkB isoforms: full-length receptor (*trkB.tk+*) and the truncated receptor (*trkB.tl*). The *trkB.tk+* homodimer regulates neurite outgrowth through Erk/MAPK and P13k pathways and these mechanisms are well understood. The function of *trkB.tl* homodimer in promoting cell survival is unknown but *trkB.tl* does stimulate neurite outgrowth and sequesters and translocates BDNF. However, the mechanism is not well understood. K252a can inhibit kinase activity of *trkB.tk+* and therefore be used to block *trkB.tk+* activity so that the effects of *trkB.tl* can be examined. The purpose of this experiment was to examine the effects of *trkB.tl*, independent of *trkB.tk+*, on neurite morphology in the presence of BDNF. We hypothesize that the *trkB.tl* receptor increases dendrite extensions and axon branching independently of *trkB.tk+*. SH-SY5Y cells were differentiated, treated with BDNF, K252a, or BDNF + K252a for 5, 15, 20, or 24 hours, and immunofluorescently stained. The images were quantified using MetaMorph and ImageJ software. There may be differences in neurite outgrowth between experimental conditions, but will not be determined until the quantification analysis is complete. If *trkB.tl* induced changes in neurite outgrowth, future studies would examine the intracellular signaling induced by *trkB.tl* and BDNF and how it promotes neurite outgrowth. (113)

**Pedrick, Sarah D.\*, Samuel E. Wanner, and Peter J. Petokas.** Clean Water Institute, Lycoming College, Williamsport, PA 17701. *Habitat Preferences, and Population Structure and Stability, in an Eastern Hellbender Meta-population in the Susquehanna River West Branch Watershed*—We collected habitat and population data over two field seasons (2012 and 2014) for an eastern hellbender (*Cryptobranchus alleganiensis*) population in a tributary of the West Branch of the Susquehanna River. Analyses of population data show that the population has been stable across the sample years, with no significant change in linear density. Analyses of habitat use show that hellbenders take up residency in or near the thalweg, where the majority of cover rocks are located. Peripheral cover rocks are only rarely used by hellbenders. We found a positive relationship between the size (total body length) of hellbenders and the size (length) of the cover rock. Population size/age structure and sex ratios were similar between the two sample years. Sex ratios favored males 2:1 over females. During the second field season (2014), we observed American eels (*Anguilla rostrata*) beneath cover rocks, but in no case did we find eels and hellbenders beneath the same cover rock. We observed no eels in the study area in 2012. Recent eel introductions in the watershed likely explain the sudden appearance of eels in the study reach. The precipitous co-occurrence of eels and hellbenders raises the concern that eels may compete with hellbenders for rock cover and for a limited food resource that consists mainly of Allegheny crayfish (*Orconectes*



*obscurus*). Significant competition for food and cover, and eel predation on hellbender, eggs, larvae and juveniles, could potentially initiate a decline in an otherwise stable hellbender population. (92)

**Schreiber, Matthew\*, Jess Mazzagatti, Emily McCaffery, Emily Rosenblum, Derek Wilson, Orvil Grunmeier, Jake Case, Amanda Abrams, Andrea Mobley, and Matthew Persons.** Susquehanna University, Selinsgrove, PA 17870. *Do sibling cannibals grow up to try to eat their mates? Aggression and cannibalism as a behavioral syndrome in wolf spiders*—Among wolf spiders, there is strong selection to attack and kill large prey (foraging rapacity). Foraging aggression results in spiders that grow faster, survive longer, and mature earlier than individuals that are more tentative in attacking large prey. Such foraging behavior could be part of an aggressive behavioral syndrome since rapacity is correlated with higher frequencies of sibling cannibalism. We tested whether spiders that show sibling cannibalism at the 2<sup>nd</sup> instar are also more likely to attack and cannibalize large juveniles as adults or show sexual cannibalism during courtship and mating interactions. Five-hundred and ten sibling spiderlings of the wolf spider *Tigrosa helluo* were paired, and after 16 days were separated into those that cannibalized their sibling and those that did not. Spiderlings were then fed ad libitum until maturity (ca. 300 days). Upon adulthood, 110 pairs of satiated sibling cannibals or non-cannibals were then paired. Courtship latency, mating frequency, attack latency, attack frequency and cannibalism frequency were then recorded during 30 minute video-recorded trials. Female sibling cannibals showed significantly more aggression toward prospective mates as adults, but were no more likely to cannibalize prospective mates than non-cannibals. Mating frequencies were similar among sibling cannibal and non-cannibal treatments. Our results indicate that aggression toward siblings early in life is significantly related to sexual aggression later, and that both sibling cannibalism and sexual cannibalism likely are part of a larger behavioral aggression syndrome. (136)

**Schreiber, Matthew, Ellie Rosenblum\*, Jess Mazzagatti, Emily McCaffery, Derek Wilson, Orvil Grunmeier, Jake Case, Amanda Abrams, Andrea Mobley, and Matthew Persons.** Susquehanna University, Selinsgrove, PA 17870. *The costs and benefits of sibling cannibalism in the wolf spider Tigrosa helluo: a mother's perspective*—Sibling cannibalism occurs among wolf spiders, but its frequency varies considerably among clutches. Consuming siblings may be costly since it putatively reduces both the direct fitness of the mother as well as the indirect fitness of the cannibalistic spiderling. Consequently this behavior is often modeled as a maladaptive by-product of selection for rapacity (foraging-related aggression) and a form of parent-offspring conflict. However, if cannibalistic spiderlings are feeding primarily on timid or weak siblings and/or have

significantly higher survival than non-cannibalistic siblings, females with more cannibalistic young may not necessarily have reduced fitness. We measured sibling cannibalism frequency among eighteen eggsacs of the wolf spider *Tigrosa helluo*. We also measured differences in survival and growth among separated cannibalistic and non-cannibalistic siblings. After eggsac eclosion, sibling spiderlings were randomly paired for 16 days, noting cannibalism across all pairs (N = 510). Spiderlings were then individually housed, labeled as cannibals or non-cannibals and fed crickets ad libitum every two days over the next 110 days. Spiderling mortality, molt timing, and weight after each molt were recorded. Cannibalism frequency varied from 0 to 37% among eggsacs. Within the first 100 days post-separation, significantly more cannibals survived than non-cannibals (82.4% vs 54.3%). Cannibals were also significantly heavier and molted earlier compared to non-cannibals. After 110 days, the proportion of offspring that survived was unrelated to the number of cannibals in the clutch, suggesting that cannibalistic and non-cannibalistic strategies have similar fitness outcomes for the mother and that the fitness costs of sibling cannibalism may be compensated by higher cannibal survival. (137)

**Seader, Victoria H.\*, Jennifer M. Thornsberry, and Robert E. Carey.** Lebanon Valley College, Annville, PA 17003. *Using the Amborella trichopoda expansin superfamily to elucidate the history of Angiosperm expansins*—Expansins are a superfamily of proteins found in plants that assist in cell wall loosening. The superfamily is divided into four families: EXPA, EXPB, EXLA, and EXLB. Previous work on *Arabidopsis thaliana*, rice, and *Populus trichocarpa* has clarified the evolutionary history of expansins in angiosperms. *Amborella trichopoda* is a very early diverging flowering plant. Thus, it is a sister lineage to all other extant angiosperms.<sup>3</sup> Because of this relationship, comparing the *Amborella* expansin superfamily to those of other flowering plants can suggest which expansin genes were present in the last common ancestor of all angiosperms. The *Amborella* expansin superfamily was assembled from the *Amborella* genome by using BLAST searches with angiosperm expansin queries. The results of these BLAST searches were analyzed and annotated to isolate the complete *Amborella* expansin superfamily. This superfamily is smaller than other angiosperm expansin superfamilies. This is probably due to an absence of genome duplication events in *Amborella*'s history. Phylogenetic and synteny analyses of *Amborella* expansins have improved our understating of the evolutionary history of expansins in angiosperms. It was possible to place all of the *Amborella* expansins into an existing *Arabidopsis*-rice expansin clade, with the exception of AmtEXPA4. This expansin was not placed into any clade by either synteny or phylogenetic analysis, which suggests that it may belong to another clade of expansins not present in either *Arabidopsis* or rice. The results of

phylogeny and synteny analyses allow us to estimate the number of expansins found in the last common ancestor of all angiosperms at 8-9 EXPA genes, 2 EXPB genes, 1 EXLA gene, and 2 EXLB genes. (66)

**Serino, Katelyn\*, Lydia Watkins, and Anthony Serino.** Misericordia University, Dallas, PA 18612. *The Distribution of Parasites at Forest Edge Sites*—The installation of new gas pipelines in Northeastern Pennsylvania has resulted in a large amount of deforestation and forest fragmentation. This has caused an increase in the frequency of areas where forested and non-forested sites meet. With the increase in these sites, the geographical range of the host species are extended, leading to an increased likelihood of contact between the host species and parasites (Gregory, 1990). This study looks at how these environmental changes affect the population densities of parasites (ticks, fleas, and botflies) at these sites. In order to quantify the number of parasites present, host species, in this case, small mammals were trapped and measured at two sites (Montrose, Pennsylvania and Shavertown, Pennsylvania) that had a forest adjacent to a field. Each site had twelve traps set: four in the field, four at the edge, and four in the forest. The body length, weight, sex, species, and overall health of each small mammal was recorded at each site. Parasites that were present on the small mammals were counted and collected for identification. The target host species in this study were deer mice, white-footed mice, and meadow voles. Deer mice were the most prevalent host species, with twenty-one deer mice, thirteen meadow voles and no white-footed mice captured, measured, and released during this study. Of the collected parasites, ticks were the most abundant and showed a more frequent presence on the mammals trapped at edge sites. This suggests that the creation of edge sites may lead to an increase in parasites, and therefore, a possible increase in the diseases that they may carry. (128)

**Shade, David\* and Caroline Nielsen.** Cabrini College, Radnor, PA 19087. *Bacteriophage Predation is Amplified by Increased Temperature in Soil Systems*—Microbial respiration is responsible for the largest flux of global carbon from soil organic matter into the atmosphere. Predation of these common soil bacteria by bacteriophages and the variables that effect their relationship is widely unknown. Extensive study has been conducted understanding the relationships between bacteriophages and their prey in aquatic systems due to the relative homogeneity. However, many questions still remain on the role that phages have on bacterial carbon mineralization in soil ecosystems. With climate change accelerating, one variable with untested effects on this relationship is rising temperature. Using a novel method, we measured microbial respiration through gas chromatography with a mass spectrophotometer by extracting headspace from a closed microcosm. Each microcosm was setup with known concentrations of bacteria and phage and

incubated at a specific temperature (17 °C, 19 °C, or 21 °C) for 24 hours. Our results demonstrate that bacteriophage predation has less impact on bacterial respiration in soil based microcosms than in liquid microcosms. This suggests that the refuges provided by the soil particles may significantly reduce bacteriophage predation. However, with increasing temperatures, bacteriophage predation has increased impact on bacterial respiration. These slight increases in temperature have shown a substantial impact on the interaction between bacteria and bacteriophages. Our results suggest that, in order to make accurate predictions about the impacts of climate change on carbon flux from soil systems, temperature impacts on bacteriophage predation will need to be considered. (29)

**Shastay, Allison\*, Brad E. Engle, and Rebecca M. Smith.** Wilson College, Chambersburg, PA 17201. *The Effects of Dietary Vitamin E on Colorectal Adenoma Formation, ROS Production, and p53 Activation in APCmin/APC+ Mice*—Colorectal cancer is the second leading cause of death by cancer in the United States, and many are turning to supplemental diets to help boost their bodies' ability to fight the cancer. Antioxidants, such as Vitamin E, are often the supplements of choice since many have been shown to have anti-cancer properties by lowering the amount of damaging Reactive Oxygen Species (ROS). By reducing the levels of ROS, p53, a known tumor suppressor gene, which normally responds to cellular damage by producing a growth suppressing protein may be down regulated. Therefore, antioxidants may actually promote the development of cancers in patients with early precancerous lesions. This study aims to show whether Vitamin E plays a crucial role in the accelerated advancement of early precancerous intestinal polyps to adenomas. Polyps typically form following mutation of the Adenomatous Polyposis Coli, or APC, gene, which is a common occurrence in patients with colorectal cancer. Mice with altered APC genes are also more susceptible to the formation of polyps. In this study, thirty APCmin/APC+ and thirty age-matched control mice were fed diets with altered Vitamin E content, low (0 IU/day), normal (0.062 IU/day), or high (4.115 IU/day), beginning at 7 weeks of age for 10 weeks. After 10 weeks, mice were euthanized and the intestine from the pyloric sphincter to the rectum was resected, opened and photographed for polyp counts; blood was collected for phenotypic/genotypic analysis; ROS levels were measured with the redox-sensitive probe 2',7' – dichlorofluorescein diacetate (DCFDA); and p53 levels were quantified with SDS-PAGE and Western blot. Preliminary results indicate that mice receiving a diet high in Vitamin E have, on average, more polyps than those receiving diets with a low Vitamin E content indicating that Vitamin E may promote polyp growth and progression if administered during early precancerous stages. (13)

**Sirnic, Teresa\*, Ashley Hummel, and Edward P. Levri.** Penn State Altoona, Altoona, PA 16601. *Does the production of defensive spines come at a reproductive cost in an aquatic snail?*—The New Zealand mud snail, *Potamopyrgus antipodarum*, is capable of producing spines which decrease vulnerability to fish predators. However, spines come at an energetic cost. The purpose of this study was to determine if spine production comes at a cost of reduced brood sizes in the snail. We estimated the degree of spinyness and counted the number of offspring in the brood of 2097 snails between the sizes of 3.5 to 6 mm in length. We examined the relationship between length and brood size in the three spine classes (no shell ornamentation, ridged shell, and spiny shell). Using a multiple regression analysis, we found no difference between the different spine classes in brood size. When examining only the top 20% of individuals with brood sizes greater than 0, we still found no difference in average brood size between the different spine classes. We conclude that the spine condition does not affect brood size, but this does not rule out other potential reproductive related effects. (80)

**Skutnik, Emily\* and Meda Higa, Ph.D.** York College of Pennsylvania, York, PA 17403. *Studying the Effects of Temperature on Hantavirus Pseudovirus Infection of Vero E6 Cells*—Haantan Virus (HTNV), Puumala Virus (PUUV), and Andes Virus (ANDV) are all negative sense RNA viruses that use their hosts to replicate and infect more hosts. Scientists do not fully understand the effect of temperature on the ability of viruses with different glycoproteins to gain entry into host cells. Studying the effects of temperature and differences in viral glycoproteins on viral infection into cell lines could allow health care professionals to understand the life cycle of viruses in different physiological conditions in the body. Pseudoviruses are viruses with an identical genome lacking a glycoprotein gene but containing a reporter gene, *Renilla luciferase*. Different glycoproteins can be expressed on their outer surfaces. They can only infect a host cell once before they lose these projections. This study examined the viral infection rates of four pseudovirus strains in Vero E6 cells at 37 °C and 39 °C and cell viability at these temperatures. All pseudoviruses showed significantly less infection at the higher temperature and cell viability was also significantly lowered when subjected to 39 °C. Differences in the glycoproteins of each pseudovirus type may be responsible for the differences in the ability of each virus type to enter and infect Vero E6 cells at the two different temperatures. Future studies could look at different temperature ranges and cell lines to see if there are changes in the ability of viruses to infect. (135)

**Sneeringer, Marissa M.\*, Kristopher J. Davis, Lynne C. Davies, and Anya Goldina.** Elizabethtown College, Elizabethtown, PA 17022. *How does education alter collegiate athletes' assessment of severity of sports-related injuries?*—A concussion is a traumatic brain injury that

causes a change in brain function. It is estimated that 1.6-3.8 million sports-and-recreation related concussions occur in the United States each year. Most concussive symptoms resolve within a few weeks; however, multiple concussions can result in permanent impairment and sustaining a second concussion during the post concussive phase of an initial injury can result in death. The aim of our study was to assess if education can increase collegiate athletes' overall knowledge about the dangers of head injuries and alter their assessment of injury severity during athletic events. We recruited 27 athletes in team sports at Elizabethtown College to participate in our study. In a pre-test survey, athletes were shown a set of sports-related videos of orthopedic and head injuries and were asked to rank the severity of each injury on a scale from one (least severe, not dangerous), to five (requires immediate medical attention by a doctor). The athletes then participated in an educational event that involved videos with educational and personal accounts of brain injuries. To assess the effectiveness of the educational event, we administered a second survey in which athletes were shown the same sport-related videos as in the pre-test survey and were asked to rank injury severity. The scores of the pre-test and post-test surveys were compared. Preliminary data show that athletes commonly identify head injuries as more severe than orthopedic injuries. Future data will assess how athlete's gender and sport affect differences in injury assessment. (43)

**Snyder, Angela\* and John A. Cigliano, Ph.D.** Cedar Crest College, Allentown, PA 18104. *Behavior Patterns of Captive African Penguins (*Spheniscus demersus*) at the Lehigh Valley Zoo Compared to Those in the Wild*—The African penguin (*Spheniscus demersus*) is classified by the IUCN as endangered because of habitat destruction, overfishing of prey, and climate change. Efforts to prevent the extinction of this animal have been unsuccessful, including captive breeding. Because prior attempts at increasing this species' numbers in captivity and the wild have failed, the American Zoological Association (AZA) organized a Species Survival Plan (SSP) for *S. demersus* in the late 1990s. The SSP lays out strict guidelines that must be followed by participating organizations including studbook keeping and breeding restrictions. The ultimate goal of the SSP is to release viable individuals into the wild to survive and reproduce. One of the main indicators of future survival is behavior. For an individual to survive successfully and produce offspring, it must be able to carry out the natural behaviors in the wild, as opposed to behaviors developed in captivity. The goal of this study was to observe the behaviors of African penguins in captivity at the Lehigh Valley Zoo via video recording, and compare those behaviors to wild behaviors as documented in the literature. Identifying important behaviors that are missing or different will allow the Zoo to develop management plans to preserve natural behaviors. Initial observations indicate that some behaviors,



such as preening, are conserved whereas other behaviors are more greatly affected. Quantitative statistical analysis is in progress, and conclusions will be presented and discussed. (47)

**Sperratore, Morgan M.\*, Shannon R. Cook and Sheryl L. Fuller-Espie Cabrini.** College, Radnor, PA 19087. Using microbe-associated molecular patterns to induce nitric oxide production in the coelomocytes of *Eisenia hortensis*—The earthworm *Eisenia hortensis* possesses only innate immunity which is non-specific, employs both cellular and humoral components, and is able to effectively recognize a wide array of pathogens that bear on their surface microbe-associated molecular patterns (MAMPs). MAMPs constitute a range of highly repetitive patterns located both on the cell surface and intracellular compartments of pathogens including viruses, bacteria, and fungi. This study employed flow cytometry to analyze the induced production of nitric oxide (NO), a highly reactive free-radical gas, by coelomocytes of *E. hortensis* when challenged in vitro with three different types of MAMPs. First, three classes of unmethylated CpG oligonucleotides (A, B and C) with CpG motifs containing phosphorothioate, phosphodiester, or a combination of the two, were tested together with the appropriate negative controls lacking CpG sequences. Additional assays tested whether flagellin or laminarin have the capacity to induce NO production. The cell permeable fluorescent indicator 4-amino-5-methylamino-2'-7'-difluorofluorescein diacetate (DAF-FM DA) was used to detect NO in MAMP-stimulated coelomocytes. The reagent (S)-nitroso-N-acetylpenicillamine (SNAP) was included as a NO donor control. The overall results of this study investigating three distinct types of MAMPs are presented including statistical analyses using the Student's t test, paired two sample for means. (123)

**Stavish, Gary\*, Nada Alghithi, Lyndsie Johndrow, and Robin P. Ertl.** Marywood University, Scranton, PA 18509. *Identification and Annotation of Cytochromes P450 in the Purple Sea Urchin Genome*—Cytochrome P450 (CYP) is a membrane bound mono-oxygenase primarily involved in detoxification processes (i.e. removing toxins from the cell). Interestingly, *Strongylocentrotus purpuratus* (Purple Sea Urchin) has over 128 unique CYP genes, yet the diversity of CYP is poorly understood. The overall goal of the project is to explore the possibility that CYPs are involved in cell differentiation. The genome of *S. purpuratus* has been fully sequenced and partially annotated. There are 160 CYP genes predicted based on sequence algorithms. To confirm the predicted genes, this study compares sequence alignment between those predicted genes and known CYP genes across numerous organisms. Using these gene sequences, future studies will construct probes to investigate gene expression in *S. purpuratus* embryos. If CYP is involved in specifying cell differentiation there should be a definitive

pattern of CYP expression during embryonic development. Sea urchins are an ideal research organism because their embryos are transparent. This allows the use of fluorescent probes in combination with confocal microscopy to identify the pattern of gene expression. Understanding what specifies cell differentiation is important to efforts in regenerative medicine attempting to generate specific cell types from stem cells. (18)

**Strömbom, Daniel\*, James E. -Read, David J.T. Sumpter, and Kolbjørn Tunström.** Lafayette College, Easton, PA 18042. *Modeling bistability and switching behavior in moving animal groups*—Animals often move together in groups. Examples include schools of fish and flocks of birds. Each individual in the flock only experience, and interact with, its immediate surroundings, there is no central control, and often no leader exists. Despite this flocks can move, and respond to external stimuli, essentially as one unit. Exactly how this works is not fully understood. The most common tools for investigating this are self-propelled particle (SPP) models. In these models individual animals are represented by particles that follow biologically inspired interaction rules. For example, move away from other particles that are too close, and move toward other particles if isolated. These models are then analyzed with the aim of finding out what flock shapes and behaviors emerge as a consequence of the specified interaction rules. Over the past few decades a set of biologically plausible interaction rules has been identified that can produce particle flocks whose shape and dynamics is similar to natural flocks. However, there is one specific feature of natural flocks that most of these models fail to reproduce. Seemingly spontaneous, or stimuli induced, switching between various flock shapes and dynamics. Here we present a novel SPP-model that do exhibit switches between different states, and compare it with the switching behavior observed in experiments with golden shiners (*Notemigonus crysoleucas*). We find that the model reproduces the switching behavior exhibited by the Golden shiners, both qualitatively and quantitatively. We believe that further investigation of this model will provide new insights into the general mechanisms operating in natural flocks. (6)

**Sturdivant, Brittany\* and Krystal Tolson\*.** Immaculata University, Immaculata, PA 19345. *The analysis of microbes on common college surfaces and their survivability in the presence of anti-microbial agents*—From study sessions to part-time jobs to involvement in campus activities, college students cannot afford to be sick. Thus, staying healthy is key for students to balance and stay on top of everything in their life. However, college students come across many surfaces that are touched by numerous people, causing students to pick up bacteria that can ultimately affect their health. Constantly on-the-go, students do not have the time nor ability to properly wash their hands throughout the day, thus hand sanitizers are popularly used as an alternative.



Therefore, this research was conducted to determine the detrimental impact this issue may present for students, and to test the effectiveness of hand sanitizers as an alternate to hand washing. We tested a number of hand sanitizer brands, including Purell, Germ Ex, a Bath & Body Works brand, and Avagard, a brand often used in hospitals. In addition, we made our own hand sanitizers using different concentrations of alcohol to compare them to the common brands. We swabbed our hands after the use of each brand in order to determine the effectiveness of the hand sanitizers. In addition, we also swabbed at different time points to determine how long it took for the hand sanitizer to have an effect on the bacteria. Finally, we used DNA barcoding to identify the bacteria (or at least the genus) that grew on the various surfaces around campus. Ultimately, if we find a potentially pathogenic bacteria on the common surfaces we use, specifically bacteria that was transferred to the hand and not killed by a hand sanitizer, we should focus on using a more effective hand sanitizer in the future. (71)

**Surgener, Trevor\*.** Mercyhurst University, Erie, PA 16546. *Comparing the Viability of the Black Soldier Fly and Darkling Beetle Pupae as Sustainable Feed Alternatives in Indoor Production Systems*—As ocean fisheries are depleted, a substitute for fish meal (the main component in pelletized feed) needs to be developed to create a sustainable way to produce food in aquaculture systems. A research project was conducted to explore the utility of two potential insect species; *Hermetia illucens* (the black soldier fly) and *Tenebrio molitor* (the darkling beetle). Although individual studies have been conducted previously to explore the efficacy of each insect species alone, no previous comparative studies have ever been done exploring the production rates of both species in identical rearing conditions. Three replicate rearing containers with a separate breeding system for each species were built as model small scale production systems. The systems were housed in an indoor, controlled environment with temperature of 26 degrees C and 16/8 hour light cycle. As insects pupated, weights were recorded before transfer into breeding containers. The success of adult reproduction of black soldier flies and mealworms was measured by recording larval weights, two weeks after their emergence. I found no statistical difference in productivity rates between black soldier fly and mealworm pupae, although observed differences in species behavior would make one insect species more suitable than the other in certain scenarios. (1)

**Surmacz, Cynthia A.\*** Bloomsburg University, Bloomsburg, PA 17815. *Vision and Change in the Biology Classroom: Meet the Life Science Teaching Resource Community*—This presentation will introduce the Life Science Teaching Resource Community, an online community ([www.lifescitrc.org](http://www.lifescitrc.org)) established by the American Physiological Society. The website houses the Life Science Teaching Archive, a collection of 6,700+ free digital

resources that encompass a wide range of biology disciplines. Resources in the Archive have undergone peer-review by subject experts from seven different member scientific societies. The focus of this session will be on how to find and evaluate these teaching resources and how to effectively use them in student-centered classrooms. The ultimate goal is to promote the objectives of “Vision and Change in Undergraduate Education,” a report of the American Association for the Advancement of Science, supported by the National Science Foundation. This national call to action provides an agenda for improving biology education by integrating core concepts and competencies throughout the curriculum and by focusing on student-centered learning. The Life Science Teaching Resource Community not only provides an archive of teaching resources that can be used to effect change but provides a forum for educators to share and discuss teaching resources, to report on their effectiveness in the classroom, and to reflect on the impact of these practices. The Life Science Teaching Resource Community is an important tool to enhance biology education by providing students with experiences that explore the nature of science and its application to real-world problems. (31)

**Talabiska, Nicholas\* and David Matlaga.** Susquehanna University, Selinsgrove, PA 17870. *The effects of resource translocation on the success of clonal offspring of Fallopia japonica*—Japanese knotweed (*Fallopia japonica*) is an aggressive invasive shrub spreading within the Riparian forest of central Pennsylvania. The primary mode of reproduction for this species is asexual via the fragmentation of rhizomes. The aboveground shoots of *F. japonica* last only one season yet the dense, underground rhizome network is long-lived. Resources are translocated between aboveground shoots below ground rhizomes seasonally. It is known that Nitrogen and Carbon are transported from aboveground shoots to belowground rhizomes prior to the onset of winter. However, it is not known how resource translocation influences the potential recruitment success of rhizome fragments. To address this knowledge gap we conducted a manipulative experiment in four sites of dense-monoculture stands of *F. japonica* along the West Branch of the Susquehanna River in Selinsgrove, Pennsylvania. The experiment consisted of two treatment factors: cut/uncut (0, 1 cut, and 2 cuts) and neighbor inclusion (0 m, 0.5 m, 1.0 m, and 1.5 m). The first treatment administered cuts to aboveground shoots, cutting focal ramets to ground level. The focal ramet received the cut/uncut treatment along with neighbor inclusion, where shoots within an assigned diameter to the focal ramet were cut to ground level. After 18 weeks, ramets were excavated, cut into rhizome fragments and planted in the Susquehanna University green house for 18 weeks. Maximum shoot height, aboveground biomass, and leaf area were all measured. There was a significant positive correlation observed between each dependent

variable (terminal leaf area and aboveground biomass) and the uncut ramet treatment. This is consistent with previous observed resource translocation and remobilization in *F. japonica*. (56)

**Thalathoti, Samuel P.\* and Anya Goldina.** Elizabethtown College, Elizabethtown, PA 17022. *Individual Recognition in the crayfish Orconectes rusticus depends on social status*—Individual recognition occurs when one individual identifies another according to its individually distinctive characteristics. Individual recognition is important for establishing and maintaining stable social hierarchies, territoriality, mating, and parental care. In crustaceans, evidence for individual recognition is scarce. The goal of our study was to assess whether crayfish *Orconectes rusticus* can recognize individuals based on previous experience with the individual. We examined the ability of *O. rusticus* to distinguish between previously known opponents and unknown opponents of the same status. After a 1 week isolation period, two individuals were placed in a tank and allowed to establish dominance in a familiarization trial. Once dominance was established, the opponents were isolated for another week. At the end of this isolation period 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) naïve individual. Order of opponent presentation was randomized. We compared average fight durations, aggression levels in familiarization trials to subsequent fights, and event frequency of behaviors. While aggression intensity between known and unknown opponents did not differ significantly, fight duration reflected extent of previous experience with opponents. Fights were shortest with known opponents. Dominants exhibited same levels of aggression towards all opponents, while subordinates decreased aggression towards unknown dominants and naïves. Our data suggest that losing experience and subordinate social status facilitate individual recognition in *O. rusticus*. (34)

**Tran, Lam\*, Steven Buczek\* and Jeramia Ory.** King's College, Wilkes-Barre, PA 18711. *Degradation of Lignin and its Analogues by C. neoformans*—*C. neoformans* is a basidiomycetous organism found in pigeon droppings and soil. While many basidiomycetes are involved in lignin degradation, there is no genomic evidence of *C. neoformans* having traditional lignin degradation enzymes such as manganese peroxidase and lignin peroxidase. *C. neoformans* does contain five laccase enzymes, however. A related species to *C. neoformans*, *P. cinnabarinus*, also produces only laccases and has demonstrated the ability to degrade lignin. It is therefore possible that *C. neoformans* has the ability to degrade lignin. Azure B is a synthetic lignin analog, used to track ligninase activity in a variety of organisms. We have demonstrated that wild-type *C. neoformans* (KN-99  $\alpha$ ) has a binding affinity to Azure B. In addition, in rich

media liquid culture KN-99 $\alpha$  can bleach Azure B and a related compound, thionine. In an effort to characterize the phenotypes of the various strains of *C. neoformans* several types of plate cultures were performed. Birdseed agar media demonstrates the  $\Delta lac1$  strain completely lacks melanin, but none of the other mutants ( $\Delta lac2$  –  $\Delta lac5$ ) fully reproduce wild type activity. Finally, we have begun characterizing *C. neoformans* growth on lignin plates. Initial experiments with linin as the carbon source have yielded very small colonies, suggesting lignin can be utilized by *C. neoformans*. Work is currently underway to determine the ability of  $\Delta lac$  mutants to utilize lignin as their sole carbon source. (132)

**Ventresca, Juliana\*, Sedomo Agosa, and Laurie Caslake.** Lafayette College, Easton, PA 18042. *Small World Initiative at Lafayette College: crowd sourcing antibiotic discovery*—The Small World Initiative (SWI), developed at the Center for Scientific Teaching at Yale, uses an undergraduate research course approach to crowd-source the search for new antibiotics from soil bacteria. Soil samples were collected from two areas on Lafayette College campus. Soil samples were weighed and serially diluted onto several types of media. Microbial isolates were prioritized and tested for antibiotic activity against eight tester strains: *Enterococcus raffinosus*, *Bacillus subtilis*, *Staphylococcus epidermidis*, *Escherichia coli*, *Acinetobacter baylyi*, *Pseudomonas putida*, *Enterobacter aerogenes*, and *Erwinia carotovora* by the patch-patch and soft agar overlay methods. Each of these strains is a “safe relative” of a human pathogen that is considered a major threat, not because they cause the most devastating illnesses but because they comprise the majority of antibiotic-resistant infections observed in health care settings. The SWI is being piloted at many institutions and has two ultimate goals: to find new antibiotics, and to engage undergraduate students in authentic research experiences in their college career. (60)

**Villaverde, Leslie\* and Laurie Caslake.** Lafayette College, Easton, PA 18042. *Dot blot analysis of desert crust organisms for the presence of oxyR*—In arid and semiarid lands, the desert crust plays a very important role in soil stability and nutrient cycling. The evolutionary adaptations that allow microbes to survive in this environment of prolonged, recurrent desiccation are unknown. In response to desiccation and other environmental stressors, reactive oxygen species form, damaging cellular proteins, lipids, and nucleic acids. The well-studied *Deinococcus radiodurans* employs an elaborate DNA repair mechanism that protects DNA (by Dps binding) and proteins from reactive oxygen species. Both OxyR and Dps (DNA-binding protein from starved cells) proteins are involved in this resistance mechanism. We were interested in investigating these genes, oxyR and dps, in other organisms from the desert crust. PCR primers were designed to *D. radiodurans* genomic sequence and used to amplify *D. radiodurans* genes, which

were labeled for non-radioactive hybridization against dot blots of genomic DNA from several desert crust organisms. The presence of these genes will shed light on their oxidative stress responses and how they thrive and maintain genomic integrity in harsh conditions. (61)

**Wanner, Samuel E.\*, Sarah D. Pedrick, and Peter J. Petokas.** Clean Water Institute, Lycoming College, Williamsport, PA 17701. *Use of Artificial Nest Boxes to Facilitate Egg Collection for an Eastern Hellbender Head-Starting Program in the Susquehanna River Watershed*—Population declines have been taking place throughout the entire geographic range of the eastern hellbender (*Cryptobranchus alleganiensis*) in North America. The declines and local extinctions have led to multiple head-starting programs to augment or restore hellbender populations. Once widespread throughout the Susquehanna River basin, the eastern hellbender is now restricted to several tributaries of the West Branch watershed. In order to establish a head-starting program for the Susquehanna River basin, we are collecting fertilized eggs to be transported to zoological facilities that are prepared to raise larval and juvenile hellbenders until they are of a size where they are unlikely to be subject to predation (3-5 years of age). To facilitate the collection of fertilized eggs, we installed 17 artificial nest boxes in the late summer of 2014. The boxes are distributed across three stream reaches occupied by hellbenders and within a single tributary of the West Branch watershed. The boxes are made of concrete and weigh 27 kg. By mid-September 2014, no adult hellbenders had taken up residence in, nor had nested within, the concrete boxes. We now believe that the nest boxes should have been installed in late spring so that adult hellbenders would have had more opportunities to find the boxes and take up residence before the fall breeding season. The installed boxes will remain in place until the next nesting season, and have since been modified to darken the chamber, making it more suitable for permanent residency and egg deposition. In lieu of collecting eggs from the artificial nest chambers, we successfully collected eggs from two natural nests and transported the eggs to the Bronx Zoological Park for rearing. Eighty-five hellbender larvae were hatched from the collected eggs and all have survived the first four months of rearing. (93)

**Watkins, Lydia\*, Katelyn Serino, and Anthony Serino.** Misericordia University, Dallas, PA 18612. *The Effect Habitat Selection has on the Prevalence of Lyme Disease in Northeastern Pennsylvania*—Forest fragmentation is increasing within Northeastern United States due to the installment of gas pipelines. Species diversity is declining because of the decreasing amount of forest habitats available. Previous studies have suggested mice populations tend to increase in edge habitats. As mouse populations increase, data has suggested that tick (*I. scapularis*) populations will increase as well. Studies have also shown that the increase of

tick population has led to an increase risk of Lyme disease. The purpose of this research was to study the prevalence of Lyme disease in ticks from small mammals and whether that increases with forested habitats. Throughout the months of July through September, mice and voles were trapped using havahart traps and peanut brittle as bait in deep forest, edge forest and open field habitats. Four traps were set up linearly at each of the three sites. Each trap was placed approximately 10m apart. Ticks were removed from the mice and voles that were trapped and were then placed into a cooler to be tested for *Borrelia burgdorferi*. The ticks and were tested for *Borrelia burgdorferi* and other species of *Borrelia* by using PCR and primers. None of the ticks tested positive for the presence of *Borrelia burgdorferi*. However, there was evidence of other species of *Borrelia* which can cause other pathogenic diseases such as Tick Borne Relapsing Fever and Southern Tick Associated Rash Illness (STARI). Overall, more mice were trapped in the edge forest sites and over 50% of ticks were collected from edge sites. These findings support evidence that mice thrive in edge habitats and mice populations and tick populations are directly correlated. (129)

**Wood, Shannon\* and David Matlaga.** Susquehanna University, Selinsgrove, PA 17870. *Effects of planting depth on Japanese Knotweed (*Fallopia japonica*) rhizome performance*—*Fallopia japonica* is an aggressive invader of riparian habitats in both North America and Europe. Within these environments its primary mode of spread is by the fragmentation and dispersal of rhizomes during flooding events. During such events rhizome fragments may be covered by sediment and debris. It remains unknown how burial depth and rhizome size interact to influence the recruitment success (sprouting and growth) of rhizomes. We hypothesized that rhizome recruitment success would decline with burial depth but increase with rhizome mass. To test this hypothesis, we conducted a greenhouse experiment where *F. japonica* rhizomes (N=170), ranging in length from 0 cm to 13 cm were planted at three different depths (0 cm, 10.2 cm, 17.8 cm). We believe the treatment doesn't directly influence whether or not the rhizomes sprout. Weekly sprouting censuses revealed that rhizomes planted at the deepest burial depth produced slightly more sprouts than both the other burial depths. These preliminary results are in contrast to our hypothesis. However, in order to better understand the effects of the treatments on rhizome performance, data from the final destructive census needs to be analyzed. By understanding the performance of Japanese knotweed rhizomes, methods for controlling and better understanding the problematic invader can be discovered. (57)



**Woodruff, Sarah\* and Megan Rothenberger.** Lafayette College, Easton, PA 18042. *Abundance, distribution, and social perceptions of two non-native crab species in the Raritan Bay system: an interdisciplinary approach to bioinvasion*—The anthropogenic introduction of non-native species is an ever-present concern in our increasingly globalized society. Invasive crustaceans *Hemigrapsus sanguineus* and *Eriocheir sinensis* made their way from Asian origins to the coasts of Europe, North America, and South America, destroying local biodiversity and economic infrastructures. The Raritan Bay system is a particularly vulnerable system due to its high amount of international boat traffic. Both *H. sanguineus* and *E. sinensis* have made appearances in this system within the past decade. Little is known about the size or distribution of these two non-native populations within the Raritan system. As a result, it is impossible to extrapolate the possible implications these species could have on this ecosystem and the people that make their living off of its commercial fisheries. Additionally, there is no information on the public awareness or social perceptions of these populations within the Raritan system, making it difficult to predict the success of potential management strategies. Thus, the objectives of this study are to 1) monitor the regional abundance and distribution of these non-natives in the Raritan system and 2) create and administer a survey to local commercial crab fishermen to assess their awareness of these non-native crabs. Analysis of preliminary data shows that overall species richness in the Raritan system decreased significantly from 2011-12 to 2014-15, and that populations of common prey species of these invasives have dropped drastically. Additionally, initial survey data show that the majority of commercial crab fishermen are aware of *E. sinensis* and *H. sanguineus* and that large numbers of these crabs have been captured in the Raritan system and surrounding systems within the past five years. These data will be used to assess possible management strategies for this system. (36)

**Wray, Katelyn\* and Rebecca A. Urban.** Lebanon Valley College, Annville, PA 17003. *Asexual reproduction of an invasive macrophyte grown over various sediment types*—Invasive species threaten biodiversity, ecosystem functioning, and the survival of native species. *Utricularia inflata* is a rootless submersed macrophyte that has invaded lakes in the Adirondack Mountain of New York (USA). The plant's prolific asexual reproduction may be a component to its rapid expansion in these lakes. A greenhouse experiment was conducted to investigate how sediment type influences the high asexual reproductive rate of this species. Sediment collected from Seventh Lake, Big Moose Lake, and Raquette Lake was packed into plastic cups, which were then placed into 2.4-l clear acrylic cylinders. RO water was added to each cylinder, and they were then randomly placed in a temperature regulated (23 °C) tank. After 10 weeks the plant fragments were weighed, measured, and the number of

bladders recorded. Sediment was analyzed for bulk density, loss on ignition; sediment and water column ammonium was also determined. *U. inflata* was able to effectively grow in each sediment type with limited complication. This likely explains why *U. inflata* is a successful invader, for it can survive in water over various sediment types, regardless of pH or nutrient levels. This experiment provides a further understanding of the invasive species and gives insight into how it can spread into new oligotrophic lake ecosystems. (94)

**Wright, Jessica\*, Margaret Raydo, Sara Turner, Ph.D.** Mercyhurst University, Erie, PA, 16504. *Identification of Anaplasma phagocytophilum and Bartonella henselae in ticks from Presque Isle*—Presque Isle is one of Pennsylvania's most visited state parks; in just one year as many as four million people can visit. Among the different activities available at Presque Isle, one of the most popular activities is hiking through the miles of wooded trails. Black-legged ticks, *Ixodes scapularis*, typically live in these wooded areas and, during the park's most active months, people are at the highest risk of coming into contact with these ticks. Ticks are known vectors of Lyme disease, but research has shown that they can be vectors for other diseases, such as anaplasmosis and cat scratch disease (CSD). Anaplasmosis is caused by the bacteria *Anaplasma phagocytophilum*, and can cause fever, headaches, malaise, myalgia, gastrointestinal symptoms, cough, stiff neck and confusion. It is important to recognize the symptoms of anaplasmosis because if treatment is delayed, severe illness and even death can occur. CSD is caused by the bacteria *Bartonella henselae*, and is characterized by fever, headaches, poor appetite, and swollen lymph nodes. In some cases, CSD can cause more serious complications including brain and eye disorders. Since both diseases are commonly reported in the same areas as Lyme disease, ticks from Presque Isle were tested to determine if *A. phagocytophilum* or *B. henselae* were present. Tick DNA was extracted, amplified through PCR, and run on gel electrophoresis to determine if either bacteria was present in the sample. By identifying either bacterium in the Presque Isle tick DNA, visitors will be able to increase their knowledge on ticks and defend themselves properly against potentially life altering diseases the next time they visit the park. (121)

**Zimmerman, Mel\*.** Lycoming College, Williamsport, PA 17701. *Contribution of Lycoming College Clean Water Institute to PFBC Unassessed Waters Project, 2010-2014*—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 536 stream surveys following PFBC protocols to assess reproducing trout populations in headwater streams in four major North Central PA watersheds (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 52% of the streams sampled support reproductive populations of brook and/or brown trout. 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 (91)