Natural Science and Mathematics Research Symposium

Abstract Guide

Spring 2019

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Full Abstracts:

#	Title	Authors	Program(s)	Abstract
1	Comparing Vitamin E Content in Locally Grown and Commodity Wheat	Lindenau, Colleen, Smarra, Gianna, Trout, Joseph, Pollock, Elizabeth	Biochemistry, Physics, Biology	Vitamin E has many health benefits and wheat is a good source of vitamin E. There currently is a trend in buying locally sourced due to its environmental and economic benefits. We tested multiple extraction methods for the vitamin E using different solvents, for example: hexane, acetone, ethyl acetate, and ethanol. All samples were analyzed using High Performance Liquid Chromatography (HPLC) to determine the amount of vitamin E component alpha-tocopherol. The extraction method using hexane produced the best results; we are currently working to perfect this method. Once the extraction method is perfected, various sources of commodity and locally sourced wheat flour, and bread from the various sources of flour will be examined.
2	Experimental Determination of Amino Acid and Peptide pKa Values Using NMR Chemical Shifts	Tran, Trang; Rojas, Catherine	Biochemistry/ Molecular Biology	There are many applications for studying how small changes in chemical make-up influence the acid dissociation constant (pKa) of biological residues, such as pharmacokinetics which is known to be affected by pH changes in the body. This work was to show proof of concept that NMR spectroscopy can be effectively used to determine the pKa of the alpha proton in the amino terminus of small peptides by looking at the change in chemical shift. The pKa values of glycine, proline, and the tripeptide leucyl-glycyl-glycine were determined to be 10.03, 10.79, and 8.94, respectively. Both glycine and proline pKa values compare well with the literature and the added complexity of the H$\propto$ region of the tripeptide was shown to not be a deterrent. Future studies will focus on short peptides for which several endogenous sequences are known, such as endomorphins and enkephalins.

3	Levels of Folic Acid in Flour	Murphy, William	Biochemistry/ Molecular Biology	The comparison of commercially versus locally milled whole wheat flours was focused on during this research opportunity. Over the 9 months each flour had multiple trials run on it to confirm our finding of Folic Acid concentration. Each concentration was compared to a calibration curve that was prepared prior to sample extraction. Overall, it was discovered that Commercially milled flour had a concentration of 0.98µg/mL while Locally milled flours contained 1.56µg/mL. Both types of flour had an identical process to extract the Folic Acid performed along with an HPLC examination. Other types of flour used in baking were analyzed for Folic Acid. This additional research was able to conclude that Rye flour had the highest concentration of Folic Acid of any of the types of flours tested.
4	Effect of Hydrogen Peroxide on Collagen	Patel, Feny and Patel, Viraj	Biology	Americans spend over a billion dollars per year whitening teeth and the active ingredient in over the counter whitening strips is hydrogen peroxide, which has been shown to damage proteins. Previous research in our lab showed a decrease in both collagen and non collagen proteins extracted from teeth that were treated with whitening strips. The goal of this project was to characterize the effect of hydrogen peroxide on collagen. In order to do this, collagen was treated with hydrogen peroxide and placed in dialysis tubing. Only small fragments, produced by hydrolysis due to hydrogen peroxide, are able to leave the dialysis tubing. Our results show that hydrogen peroxide causes the release of small fragments from collagen. The protease pepsin did not produce any small fragments. This effect was only seen with collagen. In addition, collagen was run on sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS PAGE) in order to visualize the protein. When treated with hydrogen peroxide, the collagen disappeared completely which suggests that the treatment produced very small fragments. These results suggest that hydrogen peroxide is able to hydrolyze collagen in a way that produces very small fragments.

5	mTORC1 Activation Alters Neural Stem Cell Fate	Nolan, Katie; DeSimone, Nicole	Biology	In the postnatal brain, the subventricular zone (SVZ) is a niche that maintains neural stem cells and fosters ongoing neurogenesis. Previous studies have shown that neural stem cells in different regions of the SVZ are primed to produce specific types. For example, neural stem cells in the dorsal SVZ preferentially produce TH+ neurons. We examined whether neural stem cells in these areas differ in gene expression. RNA-Seq analysis demonstrated that Pax6 is enriched in dorsal neural stem cells, whereas Nkx2.1 is enriched ventrally. Immunostaining of the SVZ illustrates that Pax6 is restricted to dorsal regions while the mRNA is not. Driving protein translation by activating mTORC1 increased the protein expression of Pax6 and reduced Nkx2.1 expression in vitro. Additionally, mTORC1 activation can increase the number of Pax6+ cells in the SVZ. Taken together, our data suggest that terminal fates of neural stem cells can be modulated by protein translation control.

6	Analysis of p27 and p53 in Cul3 deficient Murine Mammary Tissue	Rosa, Nicholas; Parikh, Sahil; Cummings, Cristina	Biology	Precise control of mitotic factors is crucial for the proper regulation of cell division. A major means of regulating proteins, including those involved in cell division, is by ubiquitin-mediated protein degradation, where a specific protein is targeted for destruction. The small molecule, ubiquitin, is attached to a protein, marking it for destruction by the proteasome. In the process of ubiquitination, an E3 ligase is used to determine which substrate protein will be targeted. Cul3 is an E3 ligase which has been shown to target many different substrates for ubiquitination, by pairing up with different substrate adaptor proteins. One major substrate of Cul3 is cyclin E, which regulates the G1/S transition of the cell cycle. Previous studies indicate that when there is decreased Cul3 activity, large amounts of cyclin E protein accumulate. When cyclin E is overexpressed, cells remain in S-phase for prolonged periods and are unable to proceed through mitosis normally. Some breast cancers and cell lines derived from breast cancers are shown to have overexpressed cyclin E, which results in a worse prognosis. We hypothesize this may be due to reduced Cul3 activity.
7	The mTOR Pathway in Embryonic Stem Cell-Derived Neural Progenitors	Kaufman, Nicole; Grant, Ryan	Biology	Neural progenitors are the building blocks of the nervous system. Stem cells have the capability to generate more stem cells (self-renew) or create more specialized cells (differentiate). Understanding the molecular mechanisms that control self-renewal and differentiation may lead to better therapies for neurodevelopmental diseases. The mTOR pathway lies at the convergence point for many different intracellular signaling cascades that affect proliferation, growth and metabolism. Here, we derived neural progenitors from embryonic stem cells and tested how activators and inhibitors of the mTOR pathway affected proliferation. Our results indicate that our in vitro model is a good system to investigate the role of the mTOR pathway's activity in early nervous system development.

8	Next Generation Genomic Analysis of Achondroplasia in White Pekin Ducks	Richards, Paige & Dr. Barbato, Guy	Biology	Last year, an autosomal dominant mutation, resulting in achondroplasia, was identified in White Pekin ducks. In an attempt to identify the molecular origin of the mutation genome sequence analysis was performed. Genomic DNA was collected and pooled from 2 pureline families (1 male and 6 females) of both achondroplastic and wild-type adult ducks. The genomes were sequenced at North Carolina State University, using the Illumina NextSeq 75 PE. Afterward, they were assembled using Galaxy at Penn State against both builds of the Pekin Duck genome (BGI_duck_1.0/anaPla1 and GCA_0002743455.1_CAU_duck1.0). Further analyses were performed using both Integrative Genomics Viewer (IGV) and Genomic Workbench, where the first three chromosomes were investigated. Chromosome 2 (PEDO01021441.1) displayed differences between families at the following location of base pairs: 1574-1890, 1469-1544, and 730-860. While chromosome 3 (PEDO01021440.1) displayed differences between families at the location of base pairs: 838-865, 1345-1368, 3205-3280 and 3937-3972. Another approach was to identify any FGF4 homologies (KB743402 and KB742617) and FGF3 homologies (KB743402) in the sequences, as dominant mutations in the FGF genes are known to cause achondroplasia in both human and canine families. Chromosome 2 has homology to mammalian and chicken FGF4, and the duck genome exhibits variation at contigs KB743402 at the 1021bp and KB742617 at the 236bp. Having identified these differences, the next step is to analyze whether they play a role in the resulting achondroplasia variant.

9	Effects of Seasonal Acclimation on Pygmy Rattlesnake Complement Protein Bactericidal Ability	Farmer, Joseph	Biology	Environmental temperature is key to the physiological function of ectotherms because they are unable to internally regulate body temperature. Body temperature affects the rate of biochemical reactions, and here we are interested in the effects of temperature on immune function of reptiles in relation to seasonal temperature acclimation. It has been shown that temperature acclimation affects the thermal performance of ectotherms, and we seek to apply this concept to the immune function of ectothermic vertebrates, specifically to the performance of acellular components of innate immunity (i.e. complement proteins). To this end, we conducted a study on the bactericidal ability of complement proteins of the pygmy rattlesnake (Sistrurus miliarius) in summer vs winter-acclimated snakes. We hypothesized that the thermal performance of complement proteins in snakes is significantly impacted by seasonal acclimation. Samples of S. miliarius plasma from Florida snakes were obtained in summer and winter. The samples were subjected to a bactericidal assay at a range of temperatures, and the results were analyzed via two-way ANOVA and Tukey-Kramer pairwise comparisons. We found significant interaction between temperature and season, but no significant differences between same temperatures of different seasons, despite no overlap of standard error ranges. The results suggest an effect of seasonal acclimation on the thermal immune performance curve of snakes.

10	Forensic Individualization of Unknown Human Skeletal Remains	Bridda, Alison	Biology	In forensic anthropology, an important aspect of identifying unknown human remains is individualization: determining specific features, such as sex, age, stature, and ancestry, through metric and non-metric methods. Several years ago, skeletal remains were donated to Stockton University. This study assessed the minimum number of individuals (MNI=4), followed by the individualization of a hypothesized single individual (A) from the group. Bones were assigned to individual based on coloration, degradation, relative size, and whether those bones that articulated fit perfectly together. Measurements were taken using linear and spreading calipers. Non-metric analyses were used to determine age and create hypotheses of sex and ancestry. Discriminant function analysis (DFA) and other analyses were performed in ForDisc 3.1, a forensic database and statistical program, to assess sex, ancestry, and stature. Upon initial examination of non-metric traits, Individual A was hypothesized to be a White male with some feminine features. Non-metric pelvic analysis indicated an age of 25-35 years. Lack of vertebral lipping and tooth wear was consistent with estimated age. DFA indicated that some bones initially assigned to Individual A (clavicle, humeri, ulna, tibia, calcaneus, talus) may have belonged to a second individual. These remains were removed from analysis of Individual A. DFA of the reduced material (skull, pelvis, femur) indicated that Individual A was a White female. Sex and ancestry-based stature calculations yielded an estimate of 5.0-5.5 feet tall. Male-like features may have been due to activities during her lifetime that led to hyperdevelopment of muscle attachments in the nuchal and basioccipital regions.

11	Pedal Biomechanics	Rizzolo, Rylee	Biology	Running shoe companies tailor shoes to provide custom stability for the various arch types (neutral, low and high) to avoid lower leg injuries commonly found in runners. These arch-specific shoe types are made so orthotics are not necessary, since some insurance companies do not cover their expenses. The purpose of this experiment was to determine if high arch and low arch shoes benefit their respected arch type. Four arch- specific shoes, two low arch (Nike Air Zoom Structure 22 and GEL-Kayano 24) and two high arch (Adidas UltraBoost 19 and New Balance Fresh Foam Zante Pursuit) running shoes were tested on two female runners, one with a defined high arch and one with a defined low arch. Both industrial pressure paper (Fujifilm Ultra Low Prescale) and carbon paper were tested and showed inconclusive results. Heat sensitive paper was then used to assess the two participants' arch types through comparison with printouts of normal and neutral arch types. The heat sensitive paper was also cut to fit the soles of each shoe, and each participate stood for one minute on each sole to show its effect on their respected arch type. Pictures of each trial using all four shoes were then compared to the print out of the normal arch imprint to see if the soles adequately supported their respective arch type. Recommendations were then made to Stockton Athletics regarding arch type and shoe choice.

12	The Effect of Pregnancy on Cellular Immune Function of Field-Active Pigmy Rattlesnakes	Loughlin, Jamie and Gandhi, Priya	Biology	Emerging wildlife diseases such as snake fungal disease are a potential threat to snake populations. Predicting and mitigating the threat of disease in vertebrate populations requires an understanding of sources of variation in host immune function. Reproduction, for example, is a costly physiological process that may force allocation of resources away from immune function. White blood cells are a component in innate and adaptive immunity in vertebrates. The WBCs of pigmy rattlesnakes were analyzed to compare cellular immune function in pregnant snakes compared to non-reproductive snakes. We hypothesized that pregnant snakes would show a decrease of lymphocytes and heterophils due to energy conservation and immunomodulation during pregnancy. There was no significant difference in lymphocyte to red blood cell ratio or heterophil to lymphocyte ratio in the pregnant females when compared with non-reproductive females sampled in the field. Field snakes were also brought to the lab and injected with lipopolysaccharides (LPS) derived from E. coli to induce an inflammatory response. We hypothesized that pregnant pigmy rattlesnakes would demonstrate a reduced cellular response to LPS due to immunomodulation. The LPS injected pregnant and non-reproductive rattlesnakes exhibited a significantly increased heterophil to lymphocyte ratio ($P = 0.021$) when compared to saline-injected controls. However, there was no significant difference in the immune response to LPS in pregnant compared to non-reproductive snakes. Our results do not indicate any significant change in cellular components of immune function associated with pregnancy.

13	Garlic Field Trials (Years 1-3): Measuring Yield and Photosynthesis to Determine which Varieties are Best Adapted to Growing in Southern New Jersey	McBride, Sean; Huchison, Ron	Biology	Low temperatures cause overwintering crop plants to undergo photochilling stress, a main constraint to plant growth, resulting in lower crop yields. To defend against photochilling stress, some crop plants have developed adaptive strategies referred to as photoinhibition, which are implemented to different degrees depending on the variety. Understanding these differences give insight into which varieties are more adapted to growing in specific climates, and may be key to improving overall crop yield. Field trials conducted on the Stockton Sustainable Farm beginning in 2017 were designed to evaluate which garlic, Allium sativum, varieties are best adapted to growing in the Southern New Jersey climate and soil. After each year's harvest, individual bulbs are processed, weighed, and separated into categories based on size. Then the percentage of bulbs within each category, and the average bulb size was calculated for each variety to determine those that gave the highest yields. Additionally, the photosynthetic rates of each variety were measured using the LI-6400XT portable photosynthesis system. In the future this information will be used in compilation with yield measurements to determine the degree of winter photoinhibition (WPI) carried out by each variety. Results will be discussed in the poster.

14	DNA Analysis of The Eastern oyster, Crassostrea virginica from the Mullica River/Great Bay Estuary	Cofie, Adjoa; Warner, Natalie; Mass, Josue; Romanowski, Joseph; Luke, Tara	Biology / BCMB	The Eastern oyster, Crassostrea virginica, is a species of bivalve native to the Atlantic Coast of North America and is a vital part of the local estuarine ecosystem. Due to a rise in human activity, environmental destruction, and disease, populations have declined in recent years. Genetic research on the Eastern oyster has provided a deeper understanding of how diseases and other various environmental factors affect the oyster and how to potentially restore local populations. In this study, DNA sequencing and data analysis were performed on local Crassostrea virginica populations noting any geographical differences. Genetic material was extracted from oysters from Graveling Point, Little Egg Harbor, NJ. Samples were then isolated and a region of the small subunit rRNA gene was amplified using polymerase chain reaction (PCR) prior to sequencing analysis. The DNA sequences collected from these samples were compared to other known sequences we previously identified from oysters harvested from another area of the Mullica River Great Bay Estuary, as well as to known sequences of other species via a BLAST search of Genbank. These sequences were compared and were used to generate sequence alignments, which were subsequently used to infer phylogenetic trees that displayed the genetic similarities between this region of the 18s rRNA gene of Crassostrea virginica and other various species. These analyzed genetic data showed >99% identity of the extracted DNA from the Graveling Point oyster samples to published sequences of Crassostrea virginica. Additional primer sets were also evaluated for amplifying more variable regions of these organisms.

15	Analysis of double-stranded DNA break repair in haploid Saccharomyces cerevisiae under spaceflight conditions.	Elko, Matthew1; Romanowski, Joseph1; Stoyko, Daniel1,2.	Biology / BCMB	Due to the advancement of space age, all spaceflight-associated health risks should be studied in detail. Mistakes in double-stranded DNA break (DSBs) repair can lead to carcinogenesis. Previous studies reported contradictory results regarding the effect of microgravity on DSB repair. Cells have two major mechanisms that repair DSBs: homologous recombination (HR) and non-homologous end joining (NHEJ). HR requires a second, good copy of the damaged DNA for repair, while NHEJ adheres two DNA ends together. The goal of this experiment is to determine how spaceflight impacts NHEJ. To accomplish this goal, we will use the budding yeast Saccharomyces cerevisiae as an experimental model. Yeast have several advantages for this line of investigation: 1) Their NHEJ repair mechanisms are well conserved with humans; 2) Their fast proliferation rate generates sufficient material for cellular and molecular analyses; 3) Yeast can live as either diploids or haploids; haploids must exclusively use NHEJ to repair DSBs; 4) DNA damaging agents have been well-studied in this model. Using the confines of a NanoRacks MiniLab, we have engineered an experimental system which will expose proliferating haploid yeast to bleomycin, a DNA damaging agent. Preliminary experiments have identified an optimal bleomycin concentration (1-5 μg/mL) and a sufficient cell density (2.5 x 106 cells/mL). Using these parameters, we will measure NHEJ in both an experimental sample sent to the International Space Station and an Earth control. The results of these analyses will be crucial in forwarding our understanding of NHEJ in space.

16	Analysis of Soil Bacteria for Production of Antibiotics.	Stoyko, Daniel; Neff, Brian; Anelle, Vincent; Kirk, Ellis; and York, Karen	Biology / BCMB	Due to the rise of antibiotic resistant bacterial pathogens the need to discover new antibiotics has never been greater. One approach to the discovery of new antibiotics is through testing soil bacteria for the production of antimicrobial compounds. A typical 10 gram soil sample can contain up to 2 billion bacteria, each producing hundreds of different organic compounds. Considering that most of the known antibiotics are produced by soil bacteria, some of these compounds could have antimicrobial activity. In this study, soil bacteria from the New Jersey Pine Barrens were isolated, cultured, and screened against non-pathogenic bacteria closely related to common pathogens. Organic compounds were extracted from these soil bacteria and subsequently characterized using gas chromatography-mass spectroscopy (GC-MS). Of the compounds in the extract, some are known for their antibiotic activity (e.g. phenazine). The bacteria were identified by DNA sequencing of the 16S ribosomal RNA gene. Preliminary sequencing results suggest some belong to the genus Burkholderia. The following study improves our knowledge of antibiotics produced by soil bacteria. In addition, this study offers novel compounds with possible antibiotic activity.

17	Control of Cell Fate in Saccharomyces cerevisiae	Sanchez Zevallos, Diana Kennedy, Wilhemina, Nguyen, Kai, Ciccaglione, Kerri	Biology / BCMB	While all of the cells in our body are genetically the same, the way that the genes are expressed in each cell is different. Proper gene expression requires that cells sense their environment and make decisions to determine their final fate. For example, the budding yeast S. cerevisiae will divide via mitosis in rich conditions, but will scavenge for food when nutrient deprived. To accommodate these decisions, the RNA polymerase II holoenzyme complex must transcribe certain genes while repressing others. RNA pol II activity is regulated by interactions between proteins in the holoenzyme complex and post-translational histone modifications. Previous work in the lab identified a genetic interaction between cyclin C, a component of the RNA pol II holoenzyme, and Jhd2, a histone demethylase, that regulates cell fate decisions. Cells lacking both cyclin C and Jhd2 are filamentous even when cultured in rich growth conditions. Interestingly, these observations were strain-specific as mutating these genes in a closely related strain did not cause filamentation. This suggests that the mechanism in which this important decision is made is different for each yeast strain. The focus of this work is to identify these differences using both genetics and cell biology. The phenotypes of various gene mutations were examined in each strain background using both quantitative and qualitative measures. These studies revealed that yeast are acutely sensitive to the nutrients in their surroundings when considering filamentation. In addition, our results suggest that the filamentous decision is regulated by a multi-layered process involving numerous gene products.

18	Yolk-Derived Proteins Associated with Egg Production in White Pekin Ducks	(Slaza, Michael) (Sandler, Hannah) (Freeman, Christopher)	Biology / BCMB	Vitellogenin and phosphogenin are the predominant proteins found in the egg yolk of the avian species. Previous research suggested that concentrations of these two proteins are correlated with the rate of egg production in White Pekin ducks. The rate of reproduction of any species can be determined by both genetic and environmental factors. To identify potential sources of variation, genetically high producing (J-line hens) and poor producing ducks (S-line hens) were used. Using egg production within each line, we ranked the top and bottom producers and extracted proteins from pooled egg yolk on an equal volume basis (N=24 S-line and N=70 J-line). Proteins were extracted from independent yolk samples via triphasic (ammonium sulfate + butanol) and chloroform-methanol techniques. Resulting samples were diluted to 2mg protein/ml and separated by SDS-PAGE. The chloroform methanol protocol provided a cleaner separation of proteins when compared to the triphasic protocol due to lipoproteins being preserved in the triphasic extraction. The J-line was missing two protein bands at molecular weights of approximately 70 and 80 kDa when compared to the S-line. Qualitative analysis further revealed that the top 10% producing ducks across lines have greater band intensity compared to the bottom 10% producing ducks across lines. These findings suggest that the variation of yolk proteins in the J- and S-lines is due to both genetic and environmental factors. Future studies will explore the identity of the missing proteins and determine the causal relationship between the yolk proteins and reproduction.

19	Exploring Elbow Kinematics of the central Bearded Dragon (Pogona vitticeps) Using XROMM	Dizinno, Jenna; Muller, Kelly; Smith, Justine; Walker, Jenna; Bonnan, Matthew F.*; Crisp, Alexis*	Biology, Environmental Science	Lizards are a successful group of squamate reptiles that retain the sprawling posture of the ancestral amniote (common ancestor of mammals and reptiles). Despite decades of research on lizard locomotion, the mechanics of the elbow joint and its relationship to hand orientation remain understudied. Previous studies have hypothesized that hand orientation is dictated by long-axis rotation of both the radius and ulna relative to the humerus. To test this hypothesis, we used XROMM (X-ray Reconstruction of Moving Morphology) to explore elbow movements in the central bearded dragon, Pogona vitticeps, a docile and hardy lizard. Lizards were trained to walk on a trackway, and videofluoroscopes captured their movements from two calibrated perspectives. Tantalum markers were affixed to the forelimb and body axis with medical tape to improve accuracy and semi-automate the reconstructions. A typical step cycle consists of two phases: stance (when the hand is in contact with the ground) and swing (when the hand is lifted off of the ground). Our results show that during stance the radius and ulna both rotate laterally on their long-axes relative to the humerus, movements which collectively maintain palmar contact of the hand with the ground (pronation). At the end of stance and the beginning of swing, the long-axis rotations of the radius and ulna reverse, rotating medially relative to the humerus and pushing the hand off the ground (supination). Our data support previous hypotheses regarding elbow and hand orientation in lizards and suggest the earliest amniotes may have employed similar kinematics during locomotion.

20	Assessing the SSEP Program: Effects of Student-Driven Experimental Design on Interest	Caravano, Francesca and Zwick, Melissa	Biology, Health Science	The Student Spaceflight Experiments Program (SSEP) engages K-12 and undergraduate students in an authentic research experience focused around the development of microgravity experiments. Students are grouped into small teams and partnered with a faculty mentor to develop a project proposal. After a series of reviews, one proposal is chosen for flight to the International Space Station (ISS) to be exposed to microgravity conditions. Two cohorts of Stockton University undergraduate students participated in this program during fall 2016 and fall 2017. Space, microgravity, and the research experience act as potential triggers of student interest. Interest manifests as either personal or situational. Personal interests are associated with the inherent preferences of the student that have been developed over a long period of time. In contrast, situational interests are features of the learning environment that are immediately stimulating to the student. Studies have shown that high interest, both situational and personal, is linked with increased student learning. The SSEP provided an opportunity to explore the changes in situational and personal interest that occurred during the program. Participants were administered survey questions that measured personal and situational interest over 3 different timepoints. Our results show there was an effect of time on personal interest, but not on situational interest. Additionally our findings indicate that students who enroll in the program developed high situational interest early on. Overall, participation in the SSEP maintained student interest but did not substantially increase it.

21	Immune function in pregnant pygmy rattlesnakes (Sistrurus milliarius)	McLaughlin, Katie; Das, Nilanjana	Biology, MARS	Organisms have a limited amount of energy to allocate to physiological processes required for survival. These limitations lead to what are known as physiological trade-offs, w here energetically costly processes receive larger shares of the available resources, leaving the remaining functions with less energy and potentially reduced functionality. The tradeoff between immune function (both adaptive and innate responses) and energetic investment is one classic example of this. While adaptive responses produce specific antibodies for previously encountered pathogens, innate immunity includes a non-specific response to pathogen-associated molecular patterns. For example, complement proteins that circulate in the plasma directly kill pathogenic cells regardless of prior exposure. In order to understand how immune function may be affected during the energetically costly reproductive process, we compared the ability of snake plasma to kill a generic bacterial pathogen, E. coli, in pregnant compared to nonreproductive pygmy rattlesnakes (Sistrurus miliarius). We also measured the innate immune response to a simulated bacterial infection by injecting females with lipopolysaccharrides (LPS) extracted from bacterial cell walls. Results from bacteria-killing assays (BKAs) suggest that unmanipulated pregnant snakes sampled in the field naturally have an upregulated innate immune system compared to their non-reproductive counterparts. Conversely, the bactericidal ability of pregnant female plasma significantly decreased in response to LPS injection, indicating that pregnancy may be associated with impaired immune function snakes. As the lab and field observations provide mixed support for the hypothesis that reproduction forces energetic allocation away from innate immunity, further study is required to make more definitive conclusions.

22	Synthesis and characterization of nickel and ruthenium complexes of primary amido-functionalized N-heterocyclic carbene ligands and evaluation of their catalytic activity for transfer hydrogenation	Tiffany Roacha, Michelle Schmitza, Valkyrie Leacha, Dangkhoa Voa, Josef DeMarioa, Marcus Millera, Benny Chanb, and Steven Kalmana,*	Chemistry	New nickel complexes of primary amido-functionalized N-heterocyclic carbene ligands have been synthesized, characterized, and evaluated for their catalytic activity for transfer hydrogenation, which is the addition of hydrogen across a π-bond using a dihydrogen surrogate. The nickel complexes show moderate catalytic activity for base-free transfer hydrogenation of ketones under aerobic conditions. Synthesis of half-sandwich ruthenium complexes featuring these ligands has also been explored. Current work is focused on studying the scope of the catalytic reactions with the nickel complexes, modifying the nickel catalysts for increased activity, and improving the synthesis of the ruthenium complexes. Once the ruthenium complexes have been successfully synthesized, they will be assessed as catalysts for base-free transfer hydrogenation in air.

23	An Investigation of Tin(IV) Based Phosphors for OLED Application	Kern, Christopher; Ngo, Kathleen; Averkiev, Boris; Reeves, Gordon; Ki, Wooseok	Chemistry	Organic light emitting diodes (OLEDs) have been proven to be a viable light source in displays and light fixtures due to their excellent optical and electronic properties. They have wide viewing angles, can be used on flexible displays and are more efficient than conventional light bulbs. However, current commercially available OLEDs have used rare earth elements in displays, such as iridium (Ir), ruthenium (Ru), and rhenium (Re), which drive up cost and limit this technology. In this study, we have synthesized and characterized novel Sn (IV) complexes to develop low-cost, highly efficient light-emitting phosphors; SnL2X2 (L= 8-hydroxyquinoline and 5,7-dimethyl-8-hydroxyquinoline; X=Cl or F). Comprehensive structural, optical, thermal, and electrochemical properties of the Sn complexes were characterized by single crystal x-ray diffraction, UV-Vis spectroscopy, fluorescence, thermal gravimetric analysis, and cyclic voltammetry (CV). The CIE (International Commission on Illumination) color coordinates of the Sn(IV) complexes were measured from emission spectra. Clearly, halide exchange and the electron-donating methyl group of the hydroxyquinoline affect the photoluminescence properties and thermal stability of the complexes. We also demonstrated solution processed Sn (IV) complex thin film using spin coating technique for its potential for light emitting device fabrication.

24	Synthesis and Characterization of Novel Tin(IV) Complex Phosphors for Light Emitting Devices	Ngo, Kathleen; Averkiev, Boris; Reeves, Gordon; Ki, Wooseok	Chemistry	Development of organic light emitting diodes (OLEDs) to replace mercury-containing fluorescent lighting devices has become a widely researched field due to the efficiency and sustainability of OLEDs. To improve upon the cost efficiency of OLEDs, which typically use expensive rare earth metals such as platinum and iridium, coordinated metal complexes have been intensively developed using earth-abundant elements to achieve low-cost, highly efficient phosphors. Herein, we have developed Tin (IV) complexes with derivatives of the hydroxyquinoline ligand (8-Hydroxyquinoline and 5,7-dimethyl-8- hydroxyquinoline) that have the potential to be fabricated into highly efficient organic light emitting devices. The complexes share the molecular formula of SnL2X2, where L is the ligand, and X is the halogen (chlorine or fluorine). The chlorine in the complexes originated from the metal salt, but the fluorine was incorporated in the system via halide exchange reaction with ammonium hexafluorophosphate (NH4PF6), which is typically used to balance out cationic metal complexes. Further studies show that incorporation of fluorine into the system significantly enhances the photoluminescence properties of the Sn complexes. The structural properties of the Sn complexes were analyzed by single crystal X-ray diffraction. Optical properties were analyzed using UV-Vis spectroscopy, fluorescence, and quantum yield. Electrochemical properties of the complexes were characterized by cyclic voltammetry.

25	Chalcone Scandium Complexes – Synthesis and Characterization	Sheila M. Asiago, Isaiah Ailes, Boris B. Averkiev, Barry C. Pemberton	Chemistry	We have developed a series of chalcone derivatives to explore their potential functions in device applications ranging from light harvesting dyes in solar cells to light emitting diodes in cell phone screens. These molecules were synthesized through an aldol condensation reaction giving a highly conjugated chromophore. Upon complexing the chromophore with scandium (III) triflate a drastic color change can be observed. This paper highlights our observations and characterization of several chalcone derivatives with and without the presence of scandium using UV-vis, NMR, and emission spectroscopy. We have also looked at the electronic nature of the complex with a potentiostat and observed the color change through Spectralelectrochemistry.
26	Detecting MBT: Flavor Profiles in Beer	Sherfey, John; Gray, Sarah E.C.; Zingales, Sarah K.	Chemistry	The presence of MBT (3-methyl-2-butene-1-thiol) causes an off-flavor in beer, even at parts per trillion concentrations. In beer, MBT is an undesirable contaminant whose concentration levels must be monitored by breweries to ensure a quality product. Large scale breweries typically have access to chromatographic methods of detecting MBT, but microbreweries often cannot afford such instrumentation. To identify and quantify the presence of MBT in beer, a less inexpensive UV/VIS spectrophotometric detection method is being developed. To minimize interference effects from different components in beer, an extraction procedure will be developed to selectively remove MBT from beer. Once an effective extraction procedure is developed, a UV/VIS spectroscopy method for detecting MBT will be developed. One compound which exhibits selectivity and reactivity towards MBT is Probe 1, 7-nitro-2,3-dihydro-1H-cyclopenta[b]chromen-1-one. The extracted MBT will be reacted with Probe 1, and the absorbance of the solution measured. By optimizing this procedure to detect MBT at parts per trillion levels, an inexpensive UV/VIS spectroscopic method can be used to reduce quality control costs for microbreweries.

27	Tracking Climate Change in Coastal Aquatic Ecosystems: Development of Low-Cost CO2 Sensors	Levy, Frances; Royster, Elizabeth; Gray, Sarah E.C.	Chemistry	Ocean acidification is a pressing concern related to climate change and is due largely to the amount of anthropogenic carbon dioxide (CO2) that is emitted every year. As atmospheric CO2 in equilibrium with water forms carbonate species that contain hydrogen ions the oceans are experiencing lower pH levels, resulting in the subsequent depletion or migration of marine species. To inexpensively monitor atmospheric and aqueous CO2 concentrations, a commercially available CO2 sensor for industrial use will be adapted to work as an *in situ* sensor that can withstand changing environmental conditions while collecting fresh air samples. These sensors, in conjunction with iSAMI-pH sensors, conductivity loggers, and dissolved oxygen loggers, will be co-deployed in local waters such as Lake Fred and Barnegat Bay. The sensors will collect data over a span of weeks to months, and the results will be used to determine what factors are driving the short-term and seasonal changes in the carbonate cycle at these locations.

28	Stability of Trace Quantities of Erythritol Tetranitrate	Graf, Nicole; Schneidereit, Sheana; Richard, Marc	Chemistry	Transportation infrastructure such as those associated with airports, subways, and bus stations are extremely vulnerable to explosive threats used by criminals. In these locations, individuals and luggage are tested for trace explosives with the use of explosive trace detectors (ETDs), generally ion mobility spectrometers, while bulk explosives may be found using full body x-ray scanners. The Transportation Security Laboratory (TSL) enhances detection techniques by completing test and evaluation to eliminate the threat of explosives. In this work, the stability of erythritol tetranitrate (ETN) solutions were compared under two different storage conditions. In addition, the shelf-life of solid standards of ETN stored under different conditions, covered and under ambient light, were compared. The results suggest that ETN solutions are most stable when stored in freezer conditions at or below -20 ℃. Furthermore, the recovery of ETN was found to decrease under both ambient and covered conditions during a 7 hour period. Specifically, the average recovery loss of ETN was observed to be 4.07% per hour under ambient conditions and 3.76% per hour under covered conditions. The recovery difference between these two conditions was only 0.31%, which indicates that recovery loss is most likely not the result of photodegradation processes.

29	Development of Nanoporous Thin Film Semiconductors for Sun-Driven Water Splitting Applications	Morozova, Anastasia; Do, Daniel; Shulman, Jason; Ki, Wooseok	Chemistry, Physics	Hydrogen is an ideal renewable energy source that can be stored, transported, and can be converted into electricity using fuel cells as a clean energy source without producing CO2. Recently, sun-driven water splitting semiconductor materials have drawn considerable attention because they require only sunlight and water as their medium to produce hydrogen. Particularly, nanoporous semiconductor materials have been widely studied to improve performance in the field of energy conversion and storage applications because of their exceptional properties, including high surface areas, tunable pore sizes, and shape. However, the preparation of nanoporous semiconductor materials involves multiple fabrication steps, such as template preparation, synthesis of target materials, and template removal. [2] To tackle this, we have developed a simple solution processed fabrication of nanoporous MoS2 and WS2 thin films by incorporating polystyrene microspheres (500nm in size) as a template in molecular precursor solutions via self-assembly. Nanoporous semiconductor thin films were obtained after removing polystyrene microspheres by annealing. Consequently, this simple solution processed synthesis not only provides a new synthetic route to create nanoporous materials, but also allows control of pore size by changing the size of the polystyrene spheres so that we can engineer the functionality of the semiconductor materials. Structural, optical, and electronic properties of the synthesized thin film semiconductors were characterized by Power X-ray diffraction, UV-Vis spectroscopy, and Cyclic Voltammetry, respectively. The surface morphologies of the synthesized thin films were investigated by Atomic Force Microscopy.

30	Air Quality at Five Indoor Track & Field Facilities	Lodge, Abby	Environmental Science	Studies by the USEPA indicate that indoor levels of air pollutants are higher than outdoor levels. This is of concern because people spend more than 90 percent of their time indoors. There is an even greater risk for athletes who are training/competing indoors due to higher respiration rates and a larger portion of inhaling through the mouth. From January to March of 2019, five indoor athletic facilities were chosen for an indoor air quality (IAQ) study: Lehigh University's Rauch Fieldhouse in Lehigh, PA; Ursinus College's Floy Lewis Baker Center in Collegeville, PA; Ocean Breeze Athletic Complex in Staten Island, NY; The Armory (The New Balance Track & Field Center) in Washington Heights, NY; and Ithaca College's Glazer Arena in Ithaca, NY. A Graywolf Environmental Test Meter was used to simultaneously measure VOCs, CO2, CO, NO2, NO and H2S. For five minutes, readings were taken every ten seconds before the track and field meets started, at the conclusion of the meets, and outside of the facilities. Box and whisper plots were created in Excel to display the data. Results indicate that, in general for the facilities studied, VOCs and CO2 increased during the duration of the meets and were found in higher concentrations inside the facilities than outside. However, NO2, NO, and H2S were mainly found in higher concentrations outside of the facilities. In conclusion, none of the facilities had air quality that exceeded federal standards. More studies are needed before concrete inferences can be made about these facilities' IAQ.

31	Understanding Lake Fred's Response to Precipitation Events	Neidigh, Karlton; Witt, Emma	Environmental Science	The purpose and scope of this study was to measure the influences on Lake Fred from stormwater and groundwater. Three data loggers were placed within the lake near the two inlet sides from Lake Naomi and an unnamed lake that we will call Lake Gifu. The third data logger was placed within the lake near the dam where water is discharged. Biweekly, the data was collected and adjusted with known barometer readings. The results were then compared with documented rain events. Tide cycles were identified to determine if there was any influence and was ultimately deemed negligible. Possible research could be performed to determine if the lake itself responds to lunar cycles much like the ocean in another study. Considering the relatively flat terrain, high ground water tables, and the size of the watershed, the lake can remain high for long periods after significant rainfall.

32	Rare Species Surveys and Assessments at NJARNG Facilities	Klein, Laurel	Environmental Science	Stockton University's Environmental Internship Program (SUEIP) was tasked to write a formal report as part of an Integrated Natural Resource Management Plan (INRMP) by the The New Jersey Department of Military and Veterans Affairs Environmental Management Bureau (NJ DMAVA EMB). This report addresses federal and state regulations pertaining to protected wildlife species that could impact operations at 21 New Jersey Army National Guard (NJARNG) installations. New Jersey "Rare Species" listings describe species that are endangered, threatened or present as candidates for listing by the USFWS. From 2014 through 2016, NJ DMAVA EMB, in conjunction with Rowan University, conducted rare species planning level surveys (PLS), which included Phase I habitat assessments and limited Phase II presence/absence surveys for selected rare mammals and birds. SUEIP organized, analyzed, interpreted survey data and developed maps and figures in ArcMap to portray the habitats present at each installation. Site narratives represented the habitat availability, historical land use dating back to 1930, and any documented species occurrences on and/or adjacent to each site. Historical land use at each NJARNG site was significantly different from 2015 land use data. Recogniser settings for rare species that may occur on and/or adjacent to each NJARNG site were developed for three species of rare mammals and 12 species of rare birds, although other species were included in the survey. The PLS serves as the most recent five-year review and update of the statewide PLS program to ensure that NJARNG maintains compliance with federal and state regulations.

33	Influence of forest management and storm intensity on throughfall volumes	Myers, Jeanette; Witt, Emma. McGuinness, Kathleen; Beck, Lara	Environmental Science	The amount of rain that makes it through the forest canopy is termed throughfall and is an important component of a forested watershed's water budget. Forest canopies vary in their abilities to intercept and hold water, and the magnitude of a storm event is one factor that influences canopy water holding capacity. Stockton has recently implemented a forest management plan that provides the opportunity for further study into how forest management influences hydrology. This experiment will attempt to show how different canopy types affect throughfall amounts. The canopy types included in this study are : clearcut (no canopy), thinned (moderate canopy removal) and uncut (no canopy removal). Six collectors were placed in each treatment and throughfall volumes measured after rain events. . Initial data indicate minimal differences in throughfall volumes as measured in Fall and Winter of 2018-2019. The influence of storm magnitude will be examined to determine the influence of storm size on throughfall volume in each treatment. These data will add to our understanding of forest hydrology.

34	Pine Barrens Tree Frog Presence/Absence Surveys at NJARNG Installations	Cordivari, Nicholas	Environmental Science	The Pine Barrens Tree Frog (PBTF, Hyla andersonii) is one of the smaller species of tree frogs, measuring about 1-3 inches in length. PBTF populations in NJ have been slowly decreasing due to loss of habitat and pollution of breeding ponds. New Jersey Army National Guard (NJARNG) sites were surveyed for the presence/absence of the PBTF. Phase I assessments were conducted to identify NJARNG sites that have potential breeding habitat on-site, or within 100m of the property boundary. Typical PBTF habitat includes lowland pine forests with nearby wetlands. Results of the Phase I assessment showed that of the 51 NJARNG sites, 12 are within the species range and have potential habitat onsite. These sites are categorized as high priority. A total of 5 sites have potential habitat within 100m of the property boundary. These are considered as medium priority. Starting in May, Phase II assessments will be conducted at all high and medium priority facilities. Acoustic recorders will be deployed in forested areas surrounding the potential habitat and analyzed using acoustic analysis software. Results for both phases will be compiled into a formal report to be added to the NJ DMAVA Integrated Natural Resource Management Plan (INRMP) and Planning Level Survey (PLS). These plans and surveys outline the Federal and State regulations that may impact operations at each facility.

35	Evaluation of bluefish (Pomatomus saltatrix) cohort-splitting from a fishery independent seine survey in the Mullica River-Great Bay Estuary (NJ)	Risch, Kevin	Environmental Science	Fishery independent surveys are useful for monitoring fish population trends over time (in combination with landings data from recreational and commercial efforts). Over three years, a 100-foot haul seine was used to survey 10 sites in the Mullica River-Great Bay Estuary (New Jersey) as part of a broader state coastal inventory project. One common economically and ecologically important species collected through this effort is bluefish (Pomatomus saltatrix). Bluefish juveniles exhibit bimodal or "split" cohort patterns (spring, summer spawned) within multiple estuaries along the U.S. East Coast. Various hypotheses have been proposed to explain the observed variability in these cohorts (water temperature, physical oceanography, cannibalism). Length and abundance data from bluefish collected in the present study were used to evaluate two main questions related to bluefish "cohort splitting": 1) Are multiple cohorts detectable within this survey design? 2) If so, which cohort is dominant? Given the relatively short time series available, future work is proposed to evaluate the factors driving cohort timing and abundance trends in this survey.

36	Analysis of soil fertility and copper content and distribution in vineyard soil	Burns, Joseph; Favorito, J.E.	Environmental Science	Mushroom composts are periodically used in vineyards and often in conjunction with copper fungicides to prevent grape loss from fungal pathogens. Soil fertility and background copper content were analyzed on the Stockton campus farm where mushroom compost is used. Grape vines (Vitis vinifera) were separated into two groups, healthy and unhealthy, based on appearance. Soils were sampled near vines (depth of 0-20cm) and analyzed for multiple physicochemical properties. The soils were classified as sandy loams based on particle size analysis. There was an average sand percentage of 81.66 ± 4.39 and an average clay percentage of 12.44 ± 1.42. Soil pH, soil organic matter (SOM), and mass moisture for the unhealthy vines were significantly higher than values for the healthy vines, as determined from an ANOVA analysis. This suggest that vine health is directly attributed to the aforementioned soil properties. High SOM can impede drainage, which explains high moisture content. Suboptimal pH often results in low nutrient uptake, which affects vine growth. This data will be used to formulate planting strategies for grapevines grown at the campus farm. Total copper and exchangeable copper were determined for healthy vines using Flame Atomic Absorption (FAA) to prepare for an upcoming study involving a comparison between background and fungicide soil copper. Total copper ranged from 1.48-14.18 mg Cu kg-1, while exchangeable copper (plant available) was between 0.17-0.43 mg Cu kg-1. Low copper values were expected as there have been no additions to the soil.

37	Land Use Effects on Aquatic Macroinvertebrate Diversity	Berlin, Elana	Environmental Science	Ecotourism has resulted in increasing development and degradation of natural environments. In the NY Adirondacks, Lake George is a particularly important hotspot for ecotourism that supports visitation by more than 3 million people each year. As with any lake, researchers have noted that stability and functionality of Lake George is strongly related to the diversity and composition of the streams that feed into the lake. We hypothesized that diversity of streams is inversely related to the percentage of land developed around the stream. To test this hypothesis, we made use of an extensive dataset comprising ID'ed samples of aquatic macroinvertebrates from nine major streams surrounding Lake George. We calculated diversity using Shannon's Index (H) and we employed ArcGIS to conduct spatial analysis of land use characteristics based on data from the National Land Cover Database (NLCD). In contrast to our hypothesis, we found a positive relationship between stream diversity and land development. Since most of the streams are nutrient-poor in their natural state, this trend might be a result of nutrient enrichment. More research is necessary to fully understand this relationship.

38	The effects of microplastic leachate on the reproduction and growth of Daphnia pulex	Belskis, Alice	Environmental Science	Plastic pollution is a ubiquitous element in nearly all natural and man-made environments. Small fragments of plastic pollution, known as microplastics, have now been found in various waterways, including lakes, streams, oceans, and drinking water. Although the primary concern relates to the ingestion and internal damage caused by microplastics, there is emerging evidence that these particles might also leach chemicals that interfere with organismal growth and development. To better understand how the leachates of these pollutants influence the organisms that inhabit aquatic ecosystems, we investigated the response of a cosmopolitan zooplankton species (Daphnia pulex) to microplastic leachates. We hypothesized that increasing concentrations of leachates would be inversely correlated with growth rate of the zooplankton. To test this hypothesis, we exposed zooplankton to three common microplastics; polystyrene, polypropylene, and polyethylene glycol. We exposed zooplankton to six concentrations of microplastic leachate, which we created by adding six different concentrations of physical microplastic particles to teabags (0, 0.5, 1.0, 2.5, 5.0, and 10.0 g/L). Our results show that there is no significant effect on growth from indirect exposure to each microplastic used. However, daphnia in PVC treatments were found to have less reproductive success than daphnia in PS and PET-G treatments. We did not find any significant difference among the six concentrations. Results indicate indirect exposure to microplastics may impact freshwater daphnids.

39	Influence of forest management and canopy density on throughfall volumes	McGuinness, Kathleen; Beck, Lara; Witt, Emma	Envoronmental Science	Throughfall is an important source of moisture on forest floors, and canopy characteristics can influence the amount of bulk precipitation that reaches the soil. Forest management strategies that alter canopy characteristics can therefore also alter throughfall volumes, which may have a cascading impact in terms of available moisture for plant and animal communities. A group of 18 rain collectors were set up in control, thinned, and clearcut areas of a coastal plain pine-oak forest in southern New Jersey. The data from these collectors will be analyzed to determine the effect of forest management on throughfall amounts. It is anticipated that the clearcut area will exhibit more throughfall than the thinned and control areas, although this relationship may vary seasonally. Initial data indicate minimal differences in throughfall volumes as measured in Fall and Winter of 2018-2019. Further investigation into canopy structure was performed for leaf-off conditions and will be evaluated to determine the relationship with throughfall volume. These results may be useful to forest managers and ecologists interested in the impact of forest management on water availability and alterations to the hydrologic budget.

40	*Petrogenesis and magmatic relationships of cretaceous laramide igneous rocks of southeast Arizona*	Murray, Allyson N.; Fuorry, Donald T.; Severs, Matthew J.; Webber, Jeffrey R.; Moskalski, Susanne	Geology	Connections between volcanic and plutonic sequences can provide insight into the mechanisms of magma generation, evolution, and eruption. Our investigation focuses on the geochemical signatures of igneous rocks associated with the Laramide Orogeny in southeast Arizona, which provides a geochemical fingerprint to help constrain the relationship between a suite of volcanic and plutonic rocks. Several contemporaneous plutonic and volcanic sequences are found within close proximity, however, an unequivocal genetic link between these rocks remains incomplete. Additionally, the details concerning magma generation within this area is enigmatic. Volcanic and plutonic rocks of Cretaceous to early Tertiary age were collected from several locations in southeast Arizona in the Galiuro, Dripping Springs, and Sierrita Mountains during the spring of 2018. The first set includes the Galiuro Mountains Late Cretaceous igneous suite and plutonic rocks of the Copper Creek Granodiorite. The second set includes the Williamson Canyon volcanics and possibly associated plutonic rocks. The third set includes the Red Boy Rhyolite and Ox Frame volcanics and the associated plutonics, including the Harris Ranch Monzonite. The geochemical and petrographic analyses of these samples will lead to a better understanding of the relationship between these igneous units, as well as the volcanic history of southeast Arizona. The geochemistry of the bulk rocks will be determined by x-ray fluorescence/ inductively coupled plasma mass spectrometry. The results of this study may also lead to a better understanding of spatial and temporal relations between source magma(s), as well as the geochemical evolution of these magma(s).

41	Investigating the Origin of Lamprophyre Dikes in the Beemerville Complex, Sussex County, New Jersey	Castle, Evan; Appaluccio, Elizabeth; Severs, Matthew; Moskalski, Susanne	Geology	The Cortlandt-Beemerville magmatic belt extends roughly 100 km from the eastern Cortlandt complex of southern New York into the western Beemerville complex of northern New Jersey. Lamprophyre dikes intrude through the Cortlandt complex and trend east-west into the Beemerville complex. The lamprophyre dikes are hypothesized to have been emplaced roughly 420 Ma using bulk-rock major chemistry and cross-cutting relationships. The origin and association of lamprophyres in the Beemerville complex are still poorly understood because these dikes have been petrographically and geochemically examined in the immediate vicinity of Beemerville proper. In 2018, 7 mapped Beemerville dikes in Sussex county were analyzed using petrographic microscopy and bulk rock chemistry. Resulting data indicated that 4 of the 7 dikes were true lamprophyres, and the other 3 were intermediate to felsic with significant negative Ta and Nb anomalies and positive K anomalies; because of this, these dikes could not have resulted from single source fractionation. Instead, the felsic dikes likely resulted from crustal melting, probably driven by heat from the Cortlandt-Beemerville intrusion. Fifteen additional lamprophyres in the Beemerville proper were examined in the field and samples were analyzed using bulk-rock major chemistry and petrographic analysis. Several of the 15 dikes collected using maps produced by the New Jersey Geological Survey and United States Geological Survey, mineralogically resemble the felsic dikes previously collected. Additionally, several locations have been improperly mapped, as no dike outcrops were present at the field locations. The updated petrology of the 15 dikes will be discussed and compared to previous studies.

42	Habitat enhancement for finfish and mobile invertebrates in an oyster restoration reef in Barnegat Bay, NJ	Bauer, Madeline	Marine Science	Assessing habitat value for finfish and crustaceans is critical when monitoring oyster reef health and quality. We determined the impact of an oyster restoration reef in Barnegat Bay, NJ on habitat for motile organisms by recording their abundance and diversity using un-baited fish traps and substrate baskets containing oyster shell. This study tested the hypothesis that the reef provides evidence of enhancement of mobile species, demonstrating the reef's importance in the ecology of Barnegat Bay. Substrate baskets were deployed in July of 2018 and sampled in August and November. Replicates were set amongst three oyster cohorts and planting methods. Un-baited mesh fish traps were deployed for 48 hours in August 2018 to determine if there was a significant difference in abundance, richness, and relative percentages of resident versus transient species between the reef areas and a control. An ANOVA tested the impact of differing shell type and oyster age on habitat enhancement, as well as the impact of the reef habitat versus a control area with no vertical relief. From ANOVA testing, results show no clear difference between observed locations of resident and transient species. Despite greater abundance of fish at some reef sites there was no significant difference in species abundance or size between the fish traps or substrate baskets. The habitat value will continue to be monitored in the 2019 summer season.

43	Acoustic bottom classification of oyster habitat in the Mullica River estuary	Birdsall, Courtney; Forster, Taylor; Moskalski, Susanne	Marine Science	Acoustic methods allow seafloor sediment types to be mapped at higher spatial density and more quickly than manual methods. These technologies can be used as well for mapping new oyster bed habitats and monitoring the spatial extent of known oyster beds. The Mullica River in southern New Jersey contains one of the last known self-sustaining wild oyster populations in the Mid-Atlantic. With increasing sea levels, oyster habitat may move further landward in the river. Preservation of this vital resource will be helped by the ability to rapidly assess bottom types and locate new reefs. The goal of this study was to develop a bathymetry map and acoustic bottom classification of a section of the Mullica River estuary. We used an Edgetech 6205 dual-frequency multibeam and sidescan sonar system in conjunction with Hypack surveying and data processing software to map a 37.2 hectare region of the study area. Grab samples of bottom sediment were described in the field and subject to sieve and pipette analysis to ground-truth the acoustic results. The acoustic bottom classification found large areas of the bottom to be predominantly clay. Other part so the channel had very patchy sediments ranging from clayey sand to gravel. Known oyster beds were not identified by the acoustic response analysis. Grab sample sediment types were consistent with the range of sediment types determined by the acoustic analysis, but included oysters. The correspondence between grabs and acoustic analysis will also be discussed.

44	Early life history dynamics of oyster populations in the Mullica River estuary	Cacace, Robert; Seymour, Rebeka; Vincent, Cassidy	Marine Science	The eastern oyster, Crassostrea virginica, is an ecologically and economically important species of shellfish in NJ. Due to population declines associated with habitat loss, it is important to understand its population dynamics by observing spat settlement and larval concentrations. The Mullica river is one of the few areas in NJ with natural oyster populations. In 2017 and 2018, we sampled oyster larvae by collecting plankton samples from four Mullica River sites every two weeks. We compared bivalve larval abundance to oyster spat data collected by the Stockton Marine Field Station at similar sites and dates. Bivalve larvae from the samples were processed using an automated imaging microscope under polarized light, and oyster identifications were made using shell birefringence patterns. In 2017, the highest degree of spatfall was observed in August both upriver and downriver; this followed a peak in larval abundance in July. There were two pulses of spatfall in 2018, with one in July and one in August; however, only one pulse in larval abundance was observed at the end of July. In both 2017 and 2018, although all sites had notable spatfall, both spatfall and larval abundance were greater at the two downriver sites, suggesting that sources of larvae may originate in downstream areas and contribute to settlement upstream. Connections between larval supply and spat settlement will help provide information for restoration and management of these important subpopulations in southern NJ.

45	Seagrass Community Response to Environmental Stressors in Barnegat Bay, New Jersey	Graham-Frock, Chloe; Lacey, Elizabeth	Marine Science	Barnegat Bay-Little Egg Harbor Estuary is an extremely productive, economically and ecologically important ecosystem in southern New Jersey. Seagrass in the estuary can be used as a bioindicator to judge ecosystem health as the region experiences impacts from poor water quality, increasing temperatures and anthropogenic involvement. To track any changes to ecosystem health, data on seagrass percent cover, biomass, epiphytic coverage, and macroalgae biomass were collected at nine sites in both spring and fall of 2015 and 2017. Previous studies have found that over the past 20 years, Zostera marina (eelgrass) has been declining while being replaced by the opportunistic Ruppia maritima (widgeon grass). In this study, far northern and southern regions of the estuary experienced significant decline in Zostera while central regions significantly increased cover. At northern sites which previously showed some presence of Zostera, there was no longer a presence and Ruppia did not increase at these sites. Water conditions have decreased greatly, including temperature and turbidity, which may be preventing the Ruppia from replacing Zostera in those areas. Along with this, macroalgae increased overall at all sites, which also indicates a decrease in water quality. These data show that Barnegat Bay Little-Egg Harbor Estuary is experiencing environmental change, which is leading to a degradation of the ecosystem and could cause a cascade of negative responses both environmentally and socioeconomically.

46	Tidal variability of estuarine circulation in Little Egg Inlet	Ertle, Nicole and Polcino, Jaclynne	Marine Science	Characterizing estuarine circulation is important for understanding larval dispersal, sediment transport and water quality. Estuarine circulation varies with buoyancy inputs, mixing from winds and tides, and changes in bathymetry. This study aimed to quantify momentum balances with changes in the tide in Little Egg Inlet, New Jersey, a major connection point between coastal bays and the Atlantic Ocean. During a 14-hour survey in Little Egg Inlet, an Acoustic Doppler Current Profiler (ADCP) was used to collect velocity data along set transects and a Sontek CastAway CTD was used to collect density profiles at several stations. Results presented here pertain to the Outer Inlet transect which spans from Little Beach (Pullen Island) to Holgate. Velocity data were used to determine vertical shear, and vertical density gradients were used to determine the buoyancy frequency. The Richardson number, a non-dimensional number that characterizes water column stability, was calculated from buoyancy frequency and vertical shear. Over the tide cycle there was variability in the tendency for the water column to go from turbulent mixing during the flood tide to slightly stratified conditions during the ebb tide. Overall net volume transport was landward (573.44 m3 s-1), and varied laterally across the inlet. The results add to our collective understanding of estuary-ocean exchange in well-mixed estuaries and can inform development of hydrodynamic models of the study area.

47	Investigation of Lateral Shear in Mullica River Estuarine Circulation	Cafone, Dana and Lang, Nicholas	Marine Science	The net direction of estuary flow can result in significant ecological consequences by determining gradients in factors such as pH, salinity, and overall habitability of the water for the various organisms that depend on it for survival. The primary drivers of estuary flow have been thoroughly documented for estuaries with varying levels of wind speed, pressure gradients, and tidal range. Typically, partially-mixed estuaries experience a two-layer flow: a shallow layer that flows seaward, and a deeper layer that flows landward. Well-mixed estuaries, however, do not always develop two-layered flow. The exact orientation and magnitude of this flow pattern can vary between estuaries depending on the level of stratification and the strength of the influencing factors. In this study, time series data from tilt current meters and bottom pressure sensors were collected from three sites in the Mullica River to obtain water velocity and pressure gradients along this estuary's channel. It was found that flows along the east and west side of Chestnut Neck were opposite in direction, which indicates that there is lateral shear instead of two-layer vertical shear. The lateral shear velocities are consistent with observations in other well-mixed estuaries. Neither station had a strong correlation with along-channel wind or along-channel pressure gradients, suggesting complex interactions between drivers. These detailed dynamics of estuary flow are important in describing other factors such as larval oyster dispersal from breeding grounds, and form an important baseline in describing the Mullica River ecosystem.

48	Habitat mapping of juvenile winter and summer flounder (Pseudopleuronectes americanus, Paralichthys dentatus) in the Mullica River-Great Bay Estuary (NJ) with progress towards a habitat suitability index using ArcMap	Kehoe, Liam	Marine Science / Environmental Science	Alongside data collected directly from commercial or recreational fishing efforts, fishery independent research surveys are valuable tools for monitoring fish population trends. Over three years, a 100-foot haul seine was used to survey finfish and select invertebrates from 10 sites in the Mullica River-Great Bay Estuary (New Jersey). One potential application of this data set is using the results to predict habitat use patterns in future collections and/or new locations. Juvenile fish abundance (CPUE), sediment distribution (% sand), temperature (C), and distance from inlet (km) were used to establish a baseline set of preferred environmental parameters for two commercially / recreationally important species of flatfish: winter flounder (Pseudopleuronectes americanus) and summer flounder (Paralichthys dentatus). Using a GIS map algebra framework (ArcMap spatial analyst function), habitat ratings were assigned for each species using a matrix constructed from the three environmental parameters (higher rating = higher likelihood of being collected at a given location). A random number generator was used to evaluate 5 novel sites not included in the original survey. This simple model can be expanded upon for new species and/or sets of parameters to help better understand habitat-use patterns of commercially and recreationally important finfish species in this system.

49	Analysis and Comparison of Light Intensity Spectra Using Wavelet and Fourier Analysis	Lindenau, Colleen; Feltner, Briena; Weber, Courtney; Buondonno, Gracie; Joseph Trout	Physics	This is a continuation of research on the analysis of light intensity spectra of stars that began in Fall 2017. Fourier Analysis and Wavelet Analysis is typically used to analyze stellar light curves. Data of the recorded light spectra from a space telescope can be analyzed using Fourier Analysis and Wavelet Analysis. Continuous data of the light spectra intensities are used for the analysis of astronomical phenomena such as discovering the orbit of previously unseen planets. The time series of light intensities given by space telescope is sometimes missing data, future plans include using data from land based telescopes to fill in the missing data. This poster used data from the Kepler Space Telescope and analyzed the data with Fourier Analysis and Wavelet Analysis.
50	Rebuilding the Harold E. Taylor Observatory and the State of Astrophysics Research	Weber, Courtney; Lindenau, Colleen; Feltner, Briena; Buondonno, Gracie; Cocola, Patrick, Trout, Joseph, Ph.D.	Physics	The Harold E. Taylor Observatory has been closed for many years. Two years ago, a few Stockton physics students proposed opening the observatory. A small cohort of students formed the astrophysics research group and began the process of refurbishing the observatory. This poster documents their efforts and reports on the state of atmospheric research. The group is also learning how to use telescopes and how to analyze the data recorded by telescopes.

51	Weather Research and Forecast (WRF) and Modeling Hurricane Michael	Briena Feltner, Joseph Trout	Physics	Using Weather Research and Forecasting model (WRF) in Linux, we are able to predict and/or review weather data. Using WRF, we can study atmospheric behaviors to determine path and many other atmospheric variables of intense storms like Hurricane Michael. Using a model of sea-level surface pressure and precipitation and our knowledge that tropical storms and hurricanes have a low pressure center and how the wind circulates around the eye of the cyclone, we can identify and classify this storm as it starts, tropical cyclone to a level 4 hurricane. Since Hurricane Michael was significantly powerful and long lasting, using WRF to "predict" the hurricane's path made a very clear depiction of where the hurricane travelled. Using a hurricane that has already passed we can compare the path produced by WRF and the actual path it took. Because hurricanes are classified by wind speed and pressure, we specifically analyzed wind direction, pressure, and precipitation to identify the path it travelled

52	The Role of Endogenous Opioids in Cerebral Glucose Metabolism Following Acute Exercise	Qadiri, Qudratullah & Guers John J.	School of Health Science	Exercise has been linked to several opioid mediated phenomena including exercise mediated analgesia, euphoria "runner's high" and addiction. The endogenous opioid system is verified using the opioid receptor blocker naltrexone. Despite this, a full understanding on how the endogenous opioid system influences brain activity under acute exercise conditions is lacking. Purpose: To investigate the role of the endogenous opioid system on brain glucose uptake following an acute bout of exercise with and without administration of naltrexone. Methods: Mice were fasted overnight and scanned using positron emission tomography (PET) in one of four assigned conditions: control (CON), exercise (EX), naltrexone injection (NTX) or exercise+naltrexone injection (EX+NTX). Mice performed 50 minutes of forced swimming (FS). NTX was given via intraperitoneal injection (4 mg/kg) 15 minutes prior to exercise or FDG administration. Data was imaged using VivoQuant software and analyzed using PMOD (PNEURO) software by a technician blinded to the experimental conditions. Results: Exercise increased the SUV of glucose in the cerebellum (EX=1.27±0.14;$P<0.05$) relative to CON (0.98 ± 0.07) or NTX (0.85±0.03) conditions. The exercise mediated increase in activity in the cerebellum was abolished ($P<0.05$) with the addition of NTX (0.88±0.10). EX+NTX increased the SUV of glucose in the hypothalamus region to all groups ($P<0.05$). Conclusion: Exercise appears to have a potent effect on brain activity specific to the cerebellum and may be at least partially mediated by endogenous opioids. Further, the endogenous opioid system may play a role in the attenuation of the hypothalamic-pituitary adrenal system during exercise.

53	StockBat: Habitat Preferences of Bats on the Stockton University Farm	Cross, Andy	Sustainability	Bats generate substantial ecosystem services through consumption of pest insects. This behavior has major relevance to agriculture, particular to small-scale, organic agricultural operations. With the spread of the deadly white-nose syndrome (WNS), bat conservation has become a chief ecological priority. This study was conducted to examine the factors determining habitat preferences of southern New Jersey bats on a small-scale farm, specifically, the Stockton University Farm. Using an EchoMeter acoustic module, ultrasonic recording were performed on six randomly determined geographic points in the periphery and interior of the farm, once a month during July and August 2018. Wind conditions and barometric pressure were noted, as well as geographic characteristics of each point. Sonic output was logged by the EchoMeter software, which then identified species through ultrasonic frequency patterns. Species misidentified by EchoMeter were then manually corrected by the researcher. Regression tests were performed using IBM SPSS 25.0 to examine species. Results showed big brown bats, silver-haired bats, and hoary bats were found to be most commonly identified, while little brown bats and eastern red bats least identified. Furthermore, all bat species preferred areas at the farm perimeter as opposed to farm interiors and that significant drops or rises in barometric pressure or wind speed reduced the likelihood of bat activity. It can be concluded that having forested areas on small farms can result in increased bat activity.

54	Social Structure of White Tail Deer and Grey Foxes at Stockton University.	Rosado, Nicole	Wildlife Management	Understanding the social structure of animals is crucial because it maintains genetic diversity and evolutionary processes in wildlife populations. In addition, it can sometimes help us understand demographic factors of a population living in a certain area. Camera traps are often used to capture social occurrences and understand population demographics, especially with abundant animals such as White-tailed deer and grey foxes. Because not many studies have been done on solitary white-tailed deer behaviors, and there is some confusion on the true sociality of grey foxes, I used camera traps to study the social behavior of deer and fox on Stockton University's campus, I found that, despite the fact that deer are considered social animals, they were 20 times more likely to be captured in photos by themselves than in a group, and foxes were around 5 times more likely to be found alone than in a group. However, both species had numerous occurrences where they were captured in social pairs or aggregations. This study can be used to further understand the true sociality of white-tailed deer and the grey fox due to the fact they both had abundant occurrences in which they were seen by themselves, as well as in groups.