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Symposium for Student Research,  
Scholarship and Creative Achievement

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**Message from the Provost and Vice President for  
Academic and Student Affairs**



Greetings,

Slippery Rock University is known for its experiential learning. We believe that in order to educate students holistically, we need to blend classroom teaching and learning with complementary experiences outside the classroom. Indeed, our vision is that “Slippery Rock University will excel as a caring community of lifelong learners connecting with the world.” In addition, we use the tagline “Experience the Difference.” This can be read two ways – with “experience” being a verb or a noun: experience is the difference at SRU, or come to SRU and experience the difference.

So how do we connect with the world? How is experience the difference? Over the last five or six years we have made a concerted attempt to increase undergraduate research, service learning, study abroad, and internships in recognition of their potency in student development and achievement. Educational research shows that high-impact practices or HIPs, characterized by significant time and effort on task, learning outside the classroom, work with diverse other individuals, and interaction with faculty who provide feedback, are associated with gains in deep learning, persistence and graduation at the institution, career success, and satisfaction with the university. Undergraduate research is an HIP found to be particularly powerful.

The Symposium for Student Research, Scholarship and Creative Achievement provides a forum in which original work in all disciplines is shared and celebrated. The Symposium’s *Journal of Scholarly Endeavor* includes abstracts from every presentation.

My thanks go to the faculty members who have gone above and beyond to mentor students and to involve them in their research projects. I would also like to thank the Symposium Committee for reviewing the proposals and organizing the event.

Congratulations to all students and faculty sponsors acknowledged in this publication!

A handwritten signature in black ink that reads "Philip K. Way". The signature is written in a cursive, slightly slanted style.

Philip K. Way, Ph.D.  
Provost and Vice President for Academic and Student Affairs

# Art

## **Screen Print Enameling**

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### **Exhibit**

#### **ABSTRACT:**

My project for the 2019 SRU Symposium for Student Research, Scholarship and Creative Achievement involves presenting the process and application of screen print enameling. I will demonstrate the process of applying enamel onto metal through screen printing and exhibit 10 or more examples of various patterns achieved through screen print enameling. Enameling is the process of fusing powder glass onto metal. Through enamel, color can be achieved in various ways. Screen print enameling is a process that uses thin screens to transfer an image, pattern, or texture to a desired surface. This specific technique is relatively new and allows for complex designs that cannot be achieved through other enameling methods. Thanks to the funding of the Student Research, Scholarship and Creative Activity Grant, I was able to attend the ECU Symposium, a regional symposium centered around wearable art and contemporary adornment. During which, I had the honor of learning screen print enameling from master enamellist, Jan Harrell, who has been perfecting her craft for over 46 years. I have used funds provided by the grant to purchase necessary equipment and supplies so that I may experiment with intricate patterns through screen print enameling. This experimentation will further my knowledge in enameling and inform my future work as an artist.

# Biology

## **An Analysis of the Potential of Eryngial as a Treatment for Neosporosis**

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### **Poster Presentation**

#### **ABSTRACT:**

Neosporosis, a serious disease caused by the intracellular parasite *Neospora caninum*, afflicts an extensive variety of wild and domestic animals. Neosporosis causes stillbirths, fetal miscarriages, and irreversible weakening of newborn calves. In the US alone, damage to beef and dairy industries equates to over 2 billion USD lost per annum. There are no known drugs or vaccines that are effective against neosporosis. Eryngial, a compound found in the plant *Eryngium foetidum* that is commonly used as a seasoning in the Caribbean, has been shown in previous studies to have antiparasitic, antifungal and antibacterial properties. This, together with its food-safe nature, make eryngial a potential safe treatment for neosporosis in domestic cattle. We continue an ongoing study to investigate the effect of eryngial on both the survival and reproduction of *N. caninum* tachyzoites (the infectious stage) in cell culture. Vero cells (African Green Monkey kidney cells: ATCC®CCL-2) are grown to monolayer in 24-well cell culture plates, then infected with  $1 \times 10^6$ /ml of the tachyzoites. Eryngial (0.3mM), a concentration previously determined to be safe for Vero cells, is added to the cell culture medium at the time of infection. A negative control (no *N. caninum*) and a positive control (no eryngial) are also included. Three replicates of each treatment are performed. At 24 and 48 hours post infection, cell cultures are examined by phase contrast microscopy for signs of cytoplasmic effect or cell death. Total monolayer establishment was the criterion for no infection and approximately 75% cell death for uncontrolled infection. In this presentation, we report the efficacy of eryngial against *N. caninum* tachyzoites in cell culture. However, our findings to date indicate that eryngial shows little activity against the tachyzoites in our Vero cell culture model. Further refinement of the cell culture model are planned as we continue our investigations.

## Utilizing Live-Cell Imaging in *Drosophila* Cells To Identify Stressors That Induce Protein Misfolding

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### Poster Presentation

#### ABSTRACT:

Proteins drive many of the biological processes in cells. To do this, they fold into complex 3D structures that are integral for their functionality. Notably, various environmental and chemical stressors can disrupt protein folding and thus disable the functions of proteins, threatening the livelihood of cells. To mitigate this stress, organisms initiate the highly-conserved heat shock stress response. In eukaryotes, the master heat shock activator heat shock factor (HSF) is rapidly recruited to the *Hsp70* heat shock protein genes and triggers the recruitment of additional co-activator proteins that facilitate gene expression. This leads to the production of heat shock proteins that function as molecular chaperones to promote refolding of proteins, prevent aggregation and increase protein degradation pathways. Notably, induction of the heat shock response pathway, can be visualized by measuring the binding of HSF tagged with green fluorescent protein (GFP-HSF) to the heat shock protein genes in living *Drosophila* salivary gland nuclei. Our lab is currently using this technique to identify novel compounds that induce the heat shock response pathway. Our pioneering experiments have shown that diamide and hydrogen peroxide, two chemicals known to cause protein misfolding and activation of the heat shock response pathway, trigger the recruitment of GFP-HSF to the *Hsp70* loci in living salivary gland cells to a similar level as HS stress. In addition, to our surprise, high levels of Dithiothreitol (DTT, 100 mM), a chemical known to cause protein misfolding and activation of the unfolded protein response pathway (UPR), results in the recruitment of GFP-HSF to the *Hsp70* gene loci. Here we describe experiments to further explore a possible dose dependent activation of HSF by DTT.

## **Dosage and Temporal Effects of Imidacloprid Exposure on the Expression of Pathogenesis- Related 1 Gene in Lettuce (*Lactuca sativa*)**

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### **Oral Presentation**

#### **ABSTRACT:**

This study was undertaken to determine whether a defense response occurs in lettuce (*Lactuca sativa*) following dosage and temporal experiments with Imidacloprid. Imidacloprid is a type of commercial pesticide that is universally used among commercial crops. Imidacloprid's mechanism is based on a neurotoxic property that acts directly on the central nervous system of target insects binding irreversibly to nerve receptors causing paralysis. Imidacloprid is designed to be readily absorbed and metabolized in plants upon application. Previous studies have shown that there is some evidence that Imidacloprid treatment invokes a defense response in plant. Defense responses are triggered by external stimulants in which the organism senses a threat and acts to defend itself. In plants, when a defense response is triggered defense response genes become expressed. Salicylic acid (SA) is one central signaling molecule in plant defense that elicits the expression of the pathogenesis-related protein 1 (PR1) defense gene. PR1 encodes a protein that provides protection against pathogens. PR1 was examined as a marker to determine if Imidacloprid treatment elicited a defense response in lettuce. In preliminary studies, low-level Imidacloprid dosages (300ppb and 3ppm) did not induce a defense gene response in lettuce. In this study, a temporal experiment analyzed the variation in PR1 response using amplified dosages of Imidacloprid.

## Identification of the Digits in Embryonic Laysan Albatross (*Phoebastria immutabilis*)

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### Poster Presentation

#### ABSTRACT:

The ancestral land vertebrate had five fingers (digits), numbered I through V on their hands (manus). In both birds and dinosaurs, there are only three digits present. The identity of these digits is a source of great dispute. Dinosaur paleontologists state that the digits are I, II, and III, while bird embryologists claim that the digits are II, III, and IV. The bird embryological data is based on chicken fetal development, which is only a very short 21 days long. The Laysan Albatross (*Phoebastria immutabilis*), has a much longer fetal developmental period of 65 days and is known to possess several transient ancestral features (e.g.: extra toes). Because of the long incubation time as well as the presence of the transient features, it is possible that the Laysan Albatross might have extra manus digits that develop embryonically that would affect how the digits are numbered. The purpose of this study is to histologically examine the manus digit formation in the Laysan albatross. Laysan albatross fetuses of stages 28 to 34, which are the stages in which manus digit development occurs, were serially histologically sectioned to allow for an examination of these digits at different developmental stages. The histological examination enables the identification of the condensation of cells, these are the precursors to bones, which cannot always be observed anatomically. The serial sections were digitally photographed, and the images were imported into AMIRA for 3D reconstruction. The 3D reconstructions will allow for accurate digit numbering. A discrepancy was found initially between the number of digits observed with more digits identifiable histologically than anatomically. Investigation of intervening specimens will determine the extent of this discrepancy, and possibly lead to a revision of the digit identification in the bird and dinosaur lineage.

## Evaluation of Activation of HSF and UPR Protein Folding Pathways by Chemical Stressors Using a Yeast Reporter System

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### Poster Presentation

#### ABSTRACT:

Heat shock factor (HSF) is a transcription factor that is activated in response to an accumulation of misfolded proteins in the cytoplasm. In contrast, the unfolded protein response (UPR) is a transcriptional response pathway that responds to the accumulation of misfolded proteins in the endoplasmic reticulum. Both pathways, when activated by misfolded proteins, result in a transcriptional response that helps the cell to survive by making factors to help the cell sequester and destroy the misfolded proteins. Using aseptic techniques, *Saccharomyces cerevisiae* with UPR or HSF Beta-galactosidase reporter plasmids were grown and tested with various doses of 4 different chemical stressors (Dithiothreitol, Diamide, Hydrogen Peroxide, Beta-Mercaptoethanol) that may induce protein misfolding. Beta-galactosidase assays were completed to determine the transcriptional response of the HSF and UPR pathways to the chemical stressors. Ultimately, these assays will identify: 1) if the chemical treatments that trigger the HSF (cytoplasmic response) or the UPR (ER response) pathway or both pathways 2) if there is a dose dependent response of the compounds (do they function differently at high and low doses).

## **Examination of Nuptial Pads in *Xenopus laevis* Exposed to the Pesticide Imidacloprid**

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### **Poster Presentation**

#### **ABSTRACT:**

Amphibian populations are dramatically declining around the world. Exposure to contaminants and disease are two of the most immediate threats to amphibian survival. Amphibians are particularly vulnerable to contamination of aquatic resources because of their reliance on water for reproduction and development. A common contaminant of ground and surface waters is the neonicotinoid pesticide, imidacloprid. The contamination of amphibian environments with imidacloprid has been linked to sublethal disruptions of the endocrine and immune systems. Imidacloprid has also been shown to impact the male reproductive system in other species such as salamanders and mice. Little is known about the effects of long-term and early life stage imidacloprid exposure in amphibians. In this study, African clawed frogs (*Xenopus laevis*) were exposed to four environmentally relevant doses of imidacloprid throughout development until sexual maturity. Photographs were then taken of the nuptial pad from the forelimb area. The nuptial pad is of significance because it contains male breeding glands sensitive to androgens. It is a secondary sex characteristic that may serve as a biomarker for endocrine disruption. The images are currently being examined to determine the effects of imidacloprid exposure on nuptial pad intensity and size. Preliminary results indicate a dramatic reduction in nuptial pad visibility occurring in the highest treatment group of imidacloprid, however there was no significant difference in relative size or mean intensity of nuptial pads between imidacloprid treatment groups. Additional analysis is being done examining other characteristics of the nuptial pads. The data obtained will allow us to gain some understanding into the impact of pesticides on amphibian reproduction.

## Protein Localization of CCS52 Proteins

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### Oral Presentation

#### ABSTRACT:

During the typical cell cycle, the cells grow, DNA replicates, and the cell divides. In certain cases, DNA replication occurs, but the cell does not divide. This has been observed in many organisms and it is known as endoreduplication. The regulation and the importance of this process is not fully understood. In plants, cell cycle switch 52 (CCS52) proteins have been associated with endoreduplication. In plants, there are typically one to two CCS52A genes and one CCS52B genes. To date, CCS52A proteins are known to regulate endoreduplication by controlling cyclin degradation. The involvement of CCS52B protein is currently unknown. In soybeans (*Glycine max*), there are a total of six CCS52 genes, four CCS52A genes and two CCS52B genes. To understand the role of all six CCS52 proteins in soybean growth and development, each CCS52 gene was expressed in *Schizosaccharomyces pombe*, a model organism for studying cell division. When all six genes were expressed, a phenotypic change occurred resulting in an increase in cell size, a phenotype associated with endoreduplication. We are in the process utilizing a transient plant assay to verify the subcellular protein localization of the CCS52 proteins to better understand how these proteins function.

## **Analysis of the Role of Melatonin in Tissue Regeneration in *Drosophila melanogaster***

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### **Poster Presentation**

#### **ABSTRACT:**

Melatonin (N-acetyl-5-methoxy-tryptamine) is a highly conserved indoleamine present in eukaryotes and bacteria. In eukaryotes, melatonin is involved in various biological processes, including circadian rhythm regulation, sleep and aging. Interestingly, recent studies have shown both a negative and positive role for melatonin in cellular regeneration in metazoans. To gain a clearer understanding of the role of melatonin in regeneration in animals, we propose to examine the influence of melatonin on wound healing in *Drosophila melanogaster*. A hallmark of epithelial healing is that cytoskeletal proteins, including Meosin, accumulate in epithelial wound-edge cells and function as a sort of purse-string to draw the epithelial wound hole closed. Notably, in *Drosophila*, this wound healing process can be visualized in living cells by confocal microscopy. In particular, in *Drosophila* that express Meosin tagged with green fluorescent protein (GFP), wounding of the larval epidermis causes the fluorescently tagged protein to localize to the sides of the cells facing the wound. This ring of fluorescent proteins shrinks until the wound is healed. This progressive decrease in wound area is a measure of the kinetics of wound healing. Our lab is utilizing this assay to examine the rate of wound healing in punctured larvae reared on food with or without melatonin. Preliminary results show that 250  $\mu\text{M}$  melatonin treatment increases the rate of wound healing at 84 hours after wounding. Intriguingly, the melatonin treatment also increased the size of the wound 2 hours after wounding. Additional biological replicates are required to verify these observations. Moreover, 250  $\mu\text{M}$  melatonin resulted in increased mortality of larvae, therefore lower concentrations of melatonin will also be tested. Together, these experiments will determine the role of melatonin in cellular regeneration in *Drosophila*.

## **Evaluation of Heat Shock Factor Activation by the Chemotherapeutic Agent, Bortezomib, in a *Drosophila melanogaster* Model System**

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### **Poster Presentation**

#### **ABSTRACT:**

Bortezomib is both an anti-cancer drug and therapeutic proteasome inhibitor. It blocks the activity of the proteasome, the major protein degradation complex in the cell. This blockage can lead to the death of cancer cells. It has been reported in mammalian systems that bortezomib activates heat shock factor (HSF). HSF is a transcription factor that mediates the major stress response pathway known as heat shock response (HSR). The HSR is activated in cells exposed to conditions that induce protein misfolding such as: high heat, oxidants, reductants and other chemical stresses. HSF activates expression of the Hsp70 chaperone and other protein folding and degradation factors to help the cell deal with protein folding stress. *Drosophila melanogaster* has frequently been used as a research model in drug screen studies. In this study, we are examining whether or not bortezomib activates HSF in fruit flies at the following concentrations: 1uM, 10uM, and 100uM. These dosages were utilized in a previous study where HSF was activated in human melanoma cells. Determining if Bortezomib functions in a similar manner in both human and *Drosophila* systems may yield insight into whether *Drosophila* is a viable model organism for studying this class of chemotherapeutic agents.

## Examination of HSF Activation in a *Saccharomyces cerevisiae* Model for TPI Deficiency

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### Poster Presentation

#### ABSTRACT:

Triose Phosphate Isomerase (TPI) is a glycolytic enzyme that catalyzes the inter-conversion of DHAP to G3P. Mutations in TPI have been identified that are associated with a neurodegenerative disease in humans known as TPI deficiency. To study the cause of TPI deficiency pathogenesis, we constructed six different *Saccharomyces cerevisiae* yeast strains each expressing a different TPI allele that is associated with the development of TPI deficiency in humans and *Drosophila melanogaster*. Interestingly, not all of the TPI alleles exhibit similar characteristics in terms of stability, temperature sensitivity and activity. Yeast with the M80T allele exhibits significant changes in growth and metabolic activity at all temperatures. Yeast with the E104D allele exhibit an acute temperature sensitive phenotype for growth and metabolic activity at 37°C. All of the alleles except C41Y demonstrate protein instability at 37°C. This study further examines the role of protein folding in TPI deficiency disease pathogenesis. Yeast expressing the mutant TPI alleles were examined for activation of HSF, a cytoplasmic protein folding stress response transcription factor. Understanding the activation of cell stress pathways in TPI deficient yeast may lead to understanding of disease pathogenesis in TPI deficiency patients and provide potential pharmacological targets.

# Chemistry

## Evaluation of MitoNEET in an Alzheimer's Disease Model

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### Poster Presentation

#### ABSTRACT:

Alzheimer's disease (AD) is one of the most common neurodegenerative diseases that affects over 5 million Americans. Symptoms usually develop slowly and get worse over time, becoming severe enough to interfere with daily tasks. This disease is commonly characterized by the formation of senile plaques of the amyloid beta ( $A\beta$ ) peptide and neurofibrillary tangles commonly developed in the specific brain regions, thus jeopardizing the patient's memory, thinking, language, planning, and behavior.

Past hypotheses have led to the development of approved medications to alleviate some symptoms of AD, but there is still no cure. The most recently developed hypothesis, mitochondrial dysfunction, provides a new avenue of research for a potential cure. Mitochondrial dysfunction occurs when the mitochondria, the powerhouse of the cell, releases reactive oxygen species (ROS) from oxidative stress causing changes in expression and damage to tissues, proteins, and genes.

We plan to begin a project in the spring 2019 semester to help elucidate the mechanism of Alzheimer's disease, and identify potential targets for a cure. The goal of our project is to see how the newly discovered mitochondrial metalloprotein, mitoNEET, plays a role in oxidative stress by evaluating it when exposed to other proteins or current therapeutics. Examples include  $A\beta$  or a high oxygen environment. We will utilize UV/Visible spectroscopy to measure changes in redox state or mitoNEET [2Fe-2S] clusters, and atomic absorption spectroscopy to measure changes in iron concentration and association in mitoNEET. Changes in protein trafficking and expression will be monitored using fluorescence microscopy in conjunction with immunochemistry and Western blot analysis. As the proposed project progresses, we expect that our results will indicate changes in mitoNEET when exposed to the above conditions, based on similar behavior in a Type II diabetes model.

## **Advancing Methods to Obtain Reflectance of Light Absorbing Particles in Snow Using a Hyperspectral Imaging Microscope Spectrometer (HIMS)**

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### **Poster Presentation**

#### **ABSTRACT:**

In recent years, there has been an increase in melt rates of glaciers and snowpack. This increase has been largely attributed to rising temperatures; however, the presence of light absorbing particles (LAP) on snow and glacier surfaces also contributes to increased melt. LAP, which include black carbon, mineral dust, algae, and other organic matter, darken the surface allowing more heat absorption and melt. The relative abundances of LAP can be determined geochemically, however characterization of the optical properties of LAP are important to determine the contribution of the different types of LAP to melt. In order to better characterize LAP, a new method using a Hyperspectral Imaging Microscope Spectrometer (HIMS) was recently developed (Dal Farra et al., 2018). In this study, we further developed this method by (1) comparing the spectra of mineral dust measured in 2D and 3D samples and (2) developing a method to image organic LAP, particularly snow algae. Our results show that 2D and 3D spectral reflectance of particles are similar, however 2D particles have lowered measured reflectance due to having only one surface for light to reflect. The optimal method for imaging organics appeared to be the optically thick filtered samples, although this method is challenging because images must be taken before the filter dries.

## **Calcium Dependence of Transglutaminase and Its Function in a Human Cancer Cell Line**

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### **Oral Presentation**

#### **ABSTRACT:**

Tissue transglutaminases (TGases) are typically overexpressed in human terminal cancer cells. TGases are shown to have a regulatory effect on apoptotic (programmed cell death) machinery. This is important for controlling the degree of inflammation that results from the treatment of tumors. The goal of our study was to visualize the activity of TG-II to better understand its role in regulating apoptotic pathways. This was accomplished by attaching an antibody and a fluorescent tag to intracellular proteins. TG-II, the transglutaminase present in human erythroleukemia cells (K562), displays properties of localization and recruitment into the nucleus with changes in the presence of intracellular calcium ions. Thapsigargin inhibits the function of calcium-dependent ATPases and increases the amount of calcium ions within the cell. When thapsigargin was introduced to K562 cultures, apoptosis increased. K562 cells were then cultured with thapsigargin and CaCl<sub>2</sub>, as well as shocked with calcium upon the preparation of samples. The degree at which TGII is expressed in K562 cells can be visualized with immunofluorescence using a combination of two antibodies, CUB74 (monoclonal) and goat anti-mouse-FITC. Immunofluorescent studies suggest that thapsigargin, with an increase in available Ca<sup>2+</sup> ions, upregulates the expression of transglutaminase type proteins. Cells exposed to calcium shock demonstrated an increase in the presence of TG-II, but also demonstrated translocation of TG-II into the nucleus of the cell. The translocation of TG-II suggests the presence of DNA binding domains or a possible role in gene regulation.

## Synthesis of Unnatural Amino Acids and Impacts on Peptide Folded Structures

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### Poster Presentation

#### ABSTRACT:

Polypeptides are sequences of amino acids that can fold into secondary structures such as  $\alpha$ -helices and  $\beta$ -sheets. Certain polypeptides have the ability to stack on top of each other; a characteristic that is correlated with the formation of plaques in the brains of Alzheimer's patients. These folding patterns can be manipulated by the insertion of unnatural amino acids into a polypeptide; which could theoretically disrupt the formation of plaques in the brain. We have examined the synthesis of unnatural amino acids using a metal-ion complex. This complex is dialkylated with unique side-chains and then broken down by way of a hydrolysis procedure to afford newly synthesized unnatural amino acids. In utilizing a metal-on complex, a variety of unique side-chains can be built onto the amino acid at the  $\alpha$ -site. After dialkylation, the complex is broken down via acid-facilitated hydrolysis to isolate newly synthesized amino acids. Alternatively, hydrolysis can be facilitated by ethylenediaminetetraacetic acid (EDTA), a chelating agent. The metal ion is the centerpiece of the complex and holds together all of the components of the molecule. Removing this ion causes the complex to break apart, revealing the alkylated amino acid. Increased water content from hydrolysis results in a dilute product and low yield in subsequent Fmoc protection reactions. Fmoc, fluorenylthoxycarbonyl, is a protecting group used to preserve functional groups and stereoselectivity in chemical reactions. To reduce the water content, we are studying the ability of citric acid and PDTA, an EDTA derivative, to facilitate hydrolysis. NMR spectroscopy indicated that citric acid is able to disrupt the complex. We incorporated the unnatural amino acids into an  $\alpha$ -sheet peptide model system using microwave-assisted solid-phase peptide synthesis. 2D NMR will then help to determine the stability of the folded structure of the peptide.

## Investigating Solution Properties of Manganese 12-Metallacrown-4

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### Poster Presentation

#### ABSTRACT:

Magnetism results from the movement of charged particles called electrons. A magnet can take one of two orientations and requires energy to switch between these orientations. When a molecule behaves this way, it is a single-molecule magnet. Single-molecule magnets have been suggested as the next generation of data storage devices or in quantum computers. While there is interest in preparing new single-molecule magnets, we are exploring the steps necessary to make single-molecule magnets functional materials by depositing them onto surfaces. We study metallacrowns (MCs), a family of molecules that contain a metals in a predictable geometry. Our work utilizes **Mn(OAc)<sub>2</sub>[12-MC<sub>Mn(III)N(shi)</sub>-4]** a planar, 12-membered ring with four Mn(III) ions oriented in a ring and a Mn(II) ion in the central cavity. **Mn[12-MC-4]** exhibits single-molecule magnetic behavior, making it an ideal choice for our study. We present our efforts towards depositing **Mn[12-MC-4]** onto surfaces, an important step towards preparing functional magnetic devices.

## **Increased Expression of Transglutaminase 2 in Human Erythroleukemia Cells**

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### **Poster Presentation**

#### **ABSTRACT:**

The objective of the study was to explore the biological responses of retinoic acid and sodium butyrate on the human erythroleukemia cell line (HEL). Transglutaminase (TG2) is a protein found in various types of cells including cancer, heart, liver, and the small intestine. Depending on the type of cell, TG2 changes its subcellular localization and biological activity, which can further play an apoptotic role. The process of apoptosis (programmed cell death) is exemplary in that the cytoskeleton collapses and the DNA is broken into fragments. Furthermore, a cell that has experienced apoptosis does not disturb its neighbors. Cells were treated with either buffer (control), retinoic acid (10  $\mu$ M), sodium butyrate (100  $\mu$ M), or a combination of retinoic acid (10  $\mu$ M) and sodium butyrate (100  $\mu$ M). Cell growth rates declined when the cells were treated with the chemicals; the greatest difference being in the combination culture of retinoic acid and sodium butyrate when comparing them within a growth curve. When the cells were treated with a monoclonal antibody to TG2, the amount of TG2 appeared to increase in all the cultures with the greatest increase occurring in the combination cultures. After 144 hours, a portion of the combination cultures had been converted to apoptotic bodies. Future research will attempt to localize the transglutaminase when treated with both chemicals, and if it promotes or suppresses the viability of the cancer cells. Studies are currently underway to determine the amount of transglutaminase that is present in each sample.

## **A Study of L-Neplanocin Analogues: Synthesis and Antiviral Properties**

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### **Poster Presentation**

#### **ABSTRACT:**

In the past fifty years, infectious diseases have been rigorously studied because of the extreme threat that they pose on mankind. The most common biological molecule used to combat the infectious diseases are analogues of nucleosides, such as aristeromycin and neplanocin. Many antiviral agents focus on chronic viral infections such as hepatitis B virus (HBV) or human immunodeficiency virus (HIV), while other deadly viral diseases such as the Ebola viral infections are minimal in the number of antiviral agents. In this project we successfully designed and synthesized three antiviral candidates, two with potent anti-Ebola activities. The key feature of our target compounds is their structural resemblances of the mirror image of naturally occurred nucleosides, known as L-nucleosides. L-nucleosides become the focus of this project due to our recent discovery of their antiviral activity and historically lack of attention in respect with their D-enantiomer counterparts. Multi-steps synthesis was performed to acquire the desired product such as, protecting and deprotecting of functional groups, reduction, oxidation, Grubbs Metathesis, and Mitsunobu coupling reaction. Extraction, distillation, column chromatography, and recrystallization were also used to allow the product to be purified. Antiviral activity was tested through NIH contracted virology laboratories.

## **Cell Growth Inhibition and Transglutaminase Expression in Human Erythroleukemia Cells**

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### **Poster Presentation**

#### **ABSTRACT:**

Transglutaminase (TG-2) is a calcium-dependent enzyme that has been linked to numerous biological functions including wound healing, receptor signaling, cellular proliferation, and cellular motility. This enzyme is also thought to play a role in cancer, as TG-2 expression is elevated in several types of cancer cells. Some studies have also shown that patients with neurodegenerative diseases like Parkinson's, and Alzheimer's have exhibited elevated levels of TG-2, the elevation may be linked to the formation of protein aggregates that cause these diseases. The goal of this study was to explore the biological responses of human erythroleukemia cells (K562) to retinoic acid and sodium butyrate. These chemicals were chosen because of the effects they have on cells. Sodium butyrate has been well known to affect cell proliferation and cause cell death at high concentrations, and retinoic acid has been shown to have an effect on cell division, differentiation, and protein synthesis. Preliminary data has shown that TG-2 is elevated in cells treated with sodium butyrate while retinoic acid does not affect TG-2 expression. The control cells grew continually over the 72-hour observation period, the growth of cells treated with sodium butyrate and the combination of sodium butyrate and retinoic acid were slowed to approximately 50% of the growth of the control cells. Immunofluorescent photo-microscopy was used to measure the expression of TG-2. The cells were also examined for programmed cell death using fluorescent microscopy to differentiate between viable, necrotic, and apoptotic cells. Future research will attempt to localize the TG-2 when treated with both chemicals and determine if it promotes or suppresses the viability of the cancer cells.

## Purification and Reconstitution of Recombinant H-chain Ferritin

Austin Wilhelm

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### Poster Presentation

#### ABSTRACT:

Ferritin is a protein whose primary function is to sequester excess iron in the cell. Iron is released by ferritin when iron is needed such as in the synthesis of iron-containing proteins. Ferritin releases iron only when the iron (III) in the core is reduced to iron (II). When ferritin is reduced electrochemically in the presence of iron-chelating agents the reduction potential shifts to more positive value. We aim to determine the reason for the shift in potential by conducting voltammetric experiments on recombinant H-chain ferritin (rHF) and variants in the presence of iron chelating agents. The first phase of this investigation is to express and purify rHF. *E. coli* cells were transformed with plasmids containing the rHF gene, and then cultured in a growth medium. Cells were harvested by centrifugation, and lysed to release the rHF from the cells. A heated water bath denatured cell proteins, while the rHF was largely unaffected. Centrifugation separated rHF from cell proteins. rHF was further purified using size-exclusion chromatography. Polyacrylamide gel electrophoresis was used to identify which fractions contained pure rHF. rHF was reconstituted by incubating the protein with small aliquots of ferrous ammonium sulfate at room temperature. Enough iron was added so that each rHF molecule contained approximately 2000 iron atoms. Dialysis was used to remove adventitious iron.

rHF was covalently immobilized on gold electrodes using a semi stable ester derivative of 6-mercaptohexanoic acid (6-MHA). The current-to voltage curve of the electrode, scanned in buffer, showed the reduction of the iron core at -0.38 V, versus the Ag/AgCl electrode. This result indicates that the reconstitution of ferritin was successful.

# Communication

## **West Meets East: SRU Students Perceptions on China's Modernization**

Aisha Aldubayan, Thomas Fabian

Faculty Sponsors: Dr. Li Pu, Dr. John Golden

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### **Exhibit**

#### **ABSTRACT:**

In an attempt to bring awareness to the modernization effects in rural China, *West Meets East* captures the three-week journey four Slippery Rock University students and two Slippery Rock University faculty members embarked upon in Southwest China during the summer of 2018. Produced by two Digital Media Production majors, Thomas Fabian and Aisha Aldubayan, the documentary follows along with the group as they explored Chinese city life and the rural Chinese Miao and Gelao ethnic community.

The documentary is formatted in a vlog-styled structure, which is composed of a variety of shot compositions. Starting off with a fast-paced montage of activities the students and faculty members participated in while exploring the cities and Chinese culture, the documentary ends with a slow-paced reflection of the Miao and Gelao ethnic community, complete with interviews of the villagers about how the modernization has directly affected them.

*West Meets East* spans over a mass variety of locations in three different cities in China – Beijing, Chengdu, and Chongqing. The documentary features on-site, unscripted footage of the team fully immersing themselves into Chinese culture. Recording was constructed with two DSLR high definition Canon cameras. After arriving back in the United States, editing was conducted using Adobe Premiere Pro editing software. The documentary runs for a total time of 20 minutes.

## **The Development and Benchmarking of Contemporary Sustainability Indicators for Rural Ethnic Chinese Villages: A Case Study of the Social, Economic, and Ecological Issues of Two Gelao Villages Near Chongqing Municipality**

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### **Poster Presentation**

#### **ABSTRACT:**

Rural poverty is a persistent and severe problem in many Asian countries. As the largest developing country of the world, China has committed to ending rural poverty by 2020. This presents an intriguing case of how to achieve sustainable rural development while promoting social justice and maintaining cultural identity. By combining interview, survey questionnaire and document analysis, the research team developed specific and relevant sustainability indicators that evaluate human vulnerability to the social, economic and environmental stresses created by poverty-alleviation strategies in the ethnic rural villages Tianjia and Haokou in Southwest China. Students developed interview questions by observing and directly interacting with Chinese collaborators, ranging from government officials at the local Rural Poverty Reduction Office, Chinese students and professors in Public Affairs College at Southwest University of Political Science and Law, and indigenous villagers. Conducting research with Chinese students and professors provided access to government and academic sources, and also ensured basic understanding of political, social, and cultural context of rural development. The interview questions explored indicators drawn from local data, such as poverty, income, profits, air quality, water quality, and crime statistics. After the qualitative data was analyzed, it was concluded that the government-implemented strategies, such as the development of roads, health centers, and tourist sites, positively contributed to the villagers' standards of living. Many villagers were able to increase their income through employment in construction or tourism. New roads also provide farmers with the means for easier transportation to nearby cities to sell agricultural goods. However, new roads also allow tourists in the area to completely circumvent the village, which contributes to the loss of an important source of income for many villagers. Additionally, new roads provide greater access to cities and many young villagers have relocated, creating an unsustainable gap between the young and elderly population.

# Computer Science

## **Towards Modeling the Scheduling of Scientific Applications**

Alexander Gessinger

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### **Poster Presentation**

#### **ABSTRACT:**

Large-scale systems provide a powerful computing platform for solving large and complex scientific applications. However, the inherent wide distribution, heterogeneity, and dynamism of the computing environments along with frequent occurring resource failures can lead to performance degradation of the scientific applications executing on these computing systems. In general, various scheduling approach was employed to maximize scientific throughput and to maximize reliability. A high level modeling methodology based on simulation for the analysis and evaluation of resilience of the scheduling approaches in presence of resource failures will be presented in this research poster. With the aid of this model, a wide class of dependencies existing between applications and computing system will be captured for quantifying the performance impact expected from changes in application and system characteristics. The experimental results were used as an input to the proposed methodology, which in turn has been used to experimentally analyze the resilience of a number of dynamic loop scheduling methods on a heterogeneous system with variable availability and system failures.

## **An Analysis of Data Mining Techniques as Related to Induced Seismic Activity**

Cory Milligan, William Herb, Nathan Zeiger

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### **Poster Presentation**

#### **ABSTRACT:**

Recent swells in seismic activity around regions which employ abundant hydraulic fracturing, or “fracking”, have raised serious alarm among scientists globally. It has been widely shown that the physical procedures of fracking (drilling, removal of material, the injection of wastewater and byproducts underground and the depth at which wells are seated) all play a crucial role in the development of these circumstances. To further understand these complex events, we implement a method comprised of consecutive data mining techniques (simple k-means clustering where  $k=1$  paired with either the J48 or the Random Forest decision tree algorithm) to analyze regions where fracking and seismicity are present.

We constrain the scope of our study to two regions which in recent years have seen a sizable increase in the number of fracking operations: Oklahoma and Texas. First, we collate, organize and reduce the data as necessary for our study. This data contains the recorded instances of seismic activity in Oklahoma and Texas. Each dataset is divided into two sets: one containing all instances of seismic activity from 2011-2018 (all of the years for which we have fracking data available), and another set containing all instances of seismic activity from 2004 to 2011. Next, we treat each region as one large cluster, in order to identify the geographic mean of seismic activity. We use the same procedure to group the data containing instances of fracking operations. This provides us with comparable central tendencies to determine the distance and direction of movement of seismic activity.

Finally, we highlight characteristics which are different between 2004-2011 and 2011-2018 seismic data by employing classification techniques to examine the latitude, longitude, magnitude and depth in kilometers below the surface. This shows us that there are significant differences in the seismic “fingerprint,” or defining characteristics, of seismic events before and after heavy fracking is introduced in an area. Additionally, we examine and compare the success of our two classification algorithms and the effect of their respective parameters.

Our results show that in each case the centroid of seismic activity moved directly toward the centroid of fracking activity indicating a dependent relationship, the exact geophysical nature and extent of which cannot be determined in the scope presented here. Also, both classification techniques employed were successful at rates nearing 97% indicating significantly different seismic characteristics after heavy fracking. Our results, magnified by the relative simplicity of the methods, indicate usefulness on studying large scale data of the same type.

# Criminology and Criminal Justice

## **Juvenile Justice in the United States and Germany**

Victoria Combs

Faculty Sponsors: Dr. Sarah Kuehn, Dr. Kerry Edwards

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### **Oral Presentation**

#### **ABSTRACT:**

This presentation will be discussing the current developments in the juvenile justice system ranging from processing minor delinquents to serious offenders in the United States and Germany. The presentation will compare Germany and the United States, and discuss how each country implements its juvenile justice system and if there are common trends. The presentation will conclude by suggesting what each of the two countries could learn from the other's perspectives, strategies, and difficulties in responding to juvenile offending.

## **Students' Characteristics and Their Choice of Major**

Lauren Fedorek, Sarah Hess

Faculty Sponsors: Dr. Rebecca Ridener, Dr. Sarah Kuehn

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### **Oral Presentation**

#### **ABSTRACT:**

To date, minimal research has been completed on why students choose criminology as a major and if certain personality characteristics are associated with this specific major. This study surveyed students from a Western Pennsylvania university majoring in all academic fields of study. It explores why students select their particular major as well as which demographic factors and personality characteristics are distinctive to criminology students at the commencement of their college careers. Findings and policy implications will be discussed.

# Dance

## **Incorporating Dancers with Disabilities into the Dance Curriculum**

Whitney Bryan-Chapman

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### **Oral Presentation**

#### **ABSTRACT:**

In my research I argue today's dance curriculum is in need of a thorough revision in order to be inclusive to all types of dancers. Dancers with disabilities are finding they are being discriminated and not given the opportunity to develop their physical and creative skills in the realm of dance. Few college dance programs provide courses that are appropriately designed to include dancers with differing abilities. Few college dance programs' curricula offer courses to prepare future dance teachers to effectively teach this specific population of students. In my research presentation I will present the various ways that college dance programs could provide a more inclusive curriculum that focuses on students who are physically and cognitively disabled. Additionally, I will bring into my narrative the methods used by ground breaking adaptive physical activity programs led by mainstream companies such as the Boston Ballet. If dance teachers are more prepared and willing to teach students with disabilities, the stigmas that are associated with this specific population will finally disappear. Both abled - bodied and disabled- bodied students should have equal opportunity to learn and take part in the art form that students, teachers, and choreographers continue to fall in love with every time they walk into a studio.

## Sidra Bell's *MODULE*

Kaitlin Kulasa

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### Performance

#### ABSTRACT:

I received a Student Research, Scholarship and Creative Activity Grant to fund my participation in Sidra Bell's *MODULE* in January of 2019. *MODULE* is an award winning, week long intensive held in New York that encourages dancers to explore themselves as an individual through body research, as well as interact with other artists to work on connections, patience, choreography, collaboration, and more. In addition, discussion groups as well as one-on-one meetings were held in order to provide participants with the opportunity to ask questions and partake in artistic conversations. Given these experiences, my symposium presentation will be a hybrid of lecture and performance that invites the audience into a concise overview of my experience through both word and movement. This approach would be a beneficial format because it will allow both myself and the audience to reflect on this journey through two different formal approaches: lecture and performance. I plan to begin with an overview of *MODULE*, and touch upon key discussions and lecture points that helped me develop and evolve my research through dance making. I will follow this with a movement study that shows the audience how I apply this knowledge to my choreography. As an artist, I firmly believe that dance and choreography can benefit both dancers and non-dancers because of its ability to help people express themselves through movement rather than words.

## **Celebrating Martha: The Relevance of Martha Graham and Her Technique Through the Lens of "Celebration"**

Madeline McKissick

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### **Oral Presentation**

#### **ABSTRACT:**

Revered as a pioneer of modern dance, Martha Graham revolutionized this art form throughout the 20<sup>th</sup> century with her avant-garde technique and choreography. After studying and performing with Ruth St. Denis and Ted Shawn's Dennishawn Company and performing with the Ziegfeld Follies, Graham performed solo concerts of her original choreography, founded the Martha Graham Dance Company, and forged her own dance technique. Some of her several accolades include the Presidential Medal of Freedom and TIME Magazine's Dancer of the Century. Graham's three movement principles of contraction and release, shift of weight, and spiral around the body's axis influenced her succeeding generation of dancers and choreographers. A few of her noteworthy dancers include Anna Sokolow, Merce Cunningham, and Paul Taylor, and each made their own significant contributions to modern dance inspired by Martha Graham. As dancers continue to study and perform her technique, Graham's influences on dance are still observed today. Furthermore, since its establishment in 1926, the Martha Graham Dance Company still thrives today. Interestingly, instead of first developing her technique then implementing it in her choreography, Graham's early choreography directly influenced her technique as it developed. In this research presentation, I focus on one of Graham's earliest works, titled *Celebration*. This 1934 piece for 12 dancers portrays an abstraction of celebratory joy and energy. Known for its hundreds of jumps and complex floor patterns, *Celebration* provides an example of how Graham took compositional risks and intuitively developed her iconic technique. In this research presentation, I discuss the principles of the Graham technique present in *Celebration* as well as compositional observations from critiques about this rarely performed yet ingenious dance.

## **Developing Choreography Through Contact Improvisation**

Olivia Nellis

Faculty Sponsors: Ms. Ursula Payne, Ms. Melissa Teodoro,  
Ms. Jennifer Keller-Birkes, Ms. Nora Ambrosio

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### **Performance**

#### **ABSTRACT:**

Olivia Nellis traveled to New York City during the winter session of 2018 to take part in The American Dance Festival's Winter Intensive at NYU Tisch School of Dance. Here, she was able to continue her Senior Capstone research addressing the importance of physical contact that dance provides, specifically through a dance genre called contact improvisation. Under the guidance of dancers and educators from around the country and world, she expanded her creative process and choreographic methods. The American Dance Festival Winter Intensive included tickets for professional concerts at acclaimed theatres in New York City and brought in the choreographers and dancers the next day to teach class. Nellis was able to learn their repertory and study their choreographic process. Through her independent study in contact improvisation this semester, Nellis will continue to engage in the weekly dance practice as well as acquire the tools necessary to teach contact improvisation to others. In February of 2019 she auditioned dancers for her senior project that includes creating an independent concert. Nellis will guide these dancers in the operation of generating choreography through contact improvisation, utilizing the skills learned in NYC. In the SRU Symposium for Student Research, Scholarship and Creative Achievement, the selected dancers will demonstrate the development of choreography as Nellis discusses her process. The theory and practices learned through studying contact improvisation, journaling, and viewing performances at the ADF winter intensive grounded the movement development and helped prepare Nellis for her interaction with the dancers in the studio to conceptualize a fully produced dance concert in April 2019 for her final senior project.

## **Going Gaga: Flowing through Israeli Dance and Politics**

Caroline Ready

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### **Performance**

#### **ABSTRACT:**

The focus of this research aims to examine the influence of politics and religion in experimental contemporary Israeli dance known as Gaga Technique. Observation, historical analysis, embodied practice, and conversations with choreographers, dancers and political activists, has allowed for a deeper understanding of how each element influences the other. Examining the various components of Gaga and revealing how they are all connected allows for a complete view of the controversies that develop in response to conflicting opinions. In addition to the lecture presentation of my research, there will also be a brief showing of my work in progress that directly responds to my investigative inquiry.

# **Elementary Education/** **Early Childhood**

## **Through the Eyes of a Teacher: A Look at Instructional Strategies that Foster Discourse in Early Childhood Classrooms**

Katlyn Allison

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### **Oral Presentation**

#### **ABSTRACT:**

The evolution of discourse throughout a child's education is influenced by the teacher's actions and reactions within the classroom. In subjects such as literacy and mathematics, specific techniques engage the students in peer-to-peer and peer-to-teacher conversation and enrich the child's vocabulary and understanding. The purpose of this scholarly project is to highlight methods teachers can use to nurture richer discourse, resulting in deeper understanding, confidence, and vocabulary. A literature review revealed multiple instructional practices that foster classroom discourse. Through an analysis of the strategies and practices, the most appropriate methods for teachers to utilize in literacy and mathematics lessons were selected. Discourse in literacy learning can be encouraged with the application of decontextualized language - the recognition of rare words and turn taking among the students. These methods characterize extended discourse (Olaussen, 2016). Discourse in mathematics learning can be encouraged with the instructional strategies of "revoicing" and "wait time," which clarifies a student's development and reasoning with an appropriate amount of time allotted between asking a question and the student providing a response (Hunt, 2018). In the presentation, examples of the instructional strategies will be shared to enhance student engagement. The strategies can be woven into the classroom during individual conferences with students, small group instruction, or whole class instruction, acting as a catalyst for conversation and understanding. Positive initiation of conversation by the teacher will encourage the students to create the environment necessary for rich talk, engagement, and learning. Discourse throughout the classroom will assist the children in acquiring new vocabulary, as well as transparent comprehension skills that will create a foundation of learning.

## **Head Start Pre-School Teachers Phonemic Awareness Coaching**

Lauren Denny, Sara Lydick, Victoria St. Claire, Christina Donatelli

Faculty Sponsors: Dr. Sara Tours, Dr. Laura Kelley

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### **Poster Presentation**

#### **ABSTRACT:**

There is a need for professional development on phonemic awareness skills for preschool teachers. This study will utilize coaching sessions to reinforce phonemic awareness teaching skills for Head Start preschool teachers. The coaching sessions will have preschool teachers actively practice phonemic awareness within their classroom, as it directly correlates to student's future literary success. This is done through weekly coaching sessions on iPads with the use of the ShowMe App to supply direct feedback composed of differing instructional tools on phonemic awareness to help improve the growth and grasping of phonemic teachings and understanding. This study will be conducted at two different Head Start Schools in Western Pennsylvania.

## **Self-Efficacy of Phonemic Awareness After Coaching Sessions: A Qualitative Study**

Lauren Denny

Faculty Sponsor: Dr. Sara Tours

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### **Oral Presentation**

#### **ABSTRACT:**

This qualitative pilot study explored the impact of phonemic awareness coaching interventions in relation to the self-efficacy of three Head Start preschool teachers in Western Pennsylvania. The qualitative design was approached as a case study through the analysis of one school, with three participants for the case. Studies have supported high-quality and collaborative coaching to be one of the most successful forms of professional development (Ippolito, 2010; Landry, Anthony, Swank & Monseque-Bailey, 2009; Shanklin, 2006; Hindman, & Wasik, 2012). The implementation of the coaching sessions, via the iPad application ShowMe, aimed to boost each teacher's self-efficacy in teaching various phonemic awareness skills. Self-efficacy is tied to student achievement and quality of instruction (Skaalvik & Skaalvik, 2007; Skaalvik & Skaalvik, 2010; Guo, Justice, & Kaderavek, 2010). Self-efficacy is influenced by factors such as personal beliefs, experience, education, and understanding of concepts, which directly impacts a teacher's success outcomes (Bandura, 1993). In evaluating the growth of each teacher over the duration of the study, all three of the teachers and the two coaches concluded the coaching sessions with a semi-formal focus group. This focus group provided the participants involved an opportunity to respond to prepared open-ended questions from the coaches. The focus group was a prime opportunity for each teacher to express their opinion about the coaching, and their individual progression. All three teachers recommend the coaching sessions and felt it was a positive learning experience. All three teachers commented that the coaching sessions were applicable to their classrooms and increased their phonemic awareness knowledge. The focus group contained many conversations that revealed the teacher's outlook on coaching as professional development, their progress, and ways their self-efficacy increased.

## **Poetry Writing and STEM Learning as a Community Outreach Project in an Afterschool Program**

Juli E. Thomas

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### **Oral Presentation**

#### **ABSTRACT:**

In a scholarly project as community outreach, writing poetry and demonstrating mathematical learning is integrated in an afterschool event for learners and their families. Development of the event was based on research, theory, and instructional strategies from NCTE (National Council of Teachers of English) and NCTM (National Council of Teachers of Mathematics) publications. English language arts and math teachers value the idea that writing is a tool to make meaning. Therefore, students wrote haikus about mathematical concepts. Selected activities fostered interaction among learners, real world connections, and Science, Technology, and Math (STEM) concepts while strengthening students' usage and knowledge of poetry writing. Students also evaluated the application of the haiku in examples of popular music. In this session, instructional resources from the event will be shared.

As a pre-service teacher, the experience of researching current educational literature, and planning and implementing a family engagement event in an afterschool program allowed me to develop new insights. I learned the value of the integrating writing in multiple subjects, fostering high levels of student engagement, and differentiating instruction. I saw that my role as a teacher extends beyond the walls of my classroom and involves collaboration with community partners. I also gained an understanding that communicating with families and inviting them to participate in learning events is important. I now understand that my role as a teacher goes well beyond learning standards.

# **Exercise and** **Rehabilitative Sciences**

## The Effects of Isomeric Handgrip Exercise and Arterial Occlusion on Inter-Arm Systolic Blood Pressure Difference in Young Adults

Stephanie Ace, Rachel Borland, Lance Neuscheler, Marlea Sprandle

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### Oral Presentation

#### ABSTRACT:

Individuals may have different blood pressures (BP) between arms. A greater inter-arm difference (IAD) in systolic BP is linked to cardiovascular disease. Aerobic exercise alters IAD, but IAD responses to isometric exercise (IE; which alters intramuscular pressure) and occlusion (OCC; which traps metabolic byproducts) are unknown. Changes in intramuscular pressure or the metabolic environment can influence BP and the cardiovascular response, which can be contextually related to heart rate variability (HRV).

**PURPOSE:** To examine the effect of IE and OCC on IAD and HRV.

**METHODS:** Participant characteristics including sex, body mass index (BMI), and waist circumference (WC) were recorded. At one visit (IE), bilateral BP and HRV were measured at rest and following sustained handgrip at 20% of maximum for two minutes. At another visit (OCC), bilateral BP and HRV were measured at rest and following the occlusion protocol (i.e. identical IE protocol in the opposite arm, followed by BP cuff inflation above systolic BP for three minutes).

**RESULTS:** A higher resting IAD was related to a higher BMI (.354;  $P < 0.05$ ) and WC (.383;  $P < 0.05$ ). Across all participants, IE and OCC both resulted in a marked increase in IAD above rest ( $P < 0.05$ ). Further, males demonstrated higher IAD at rest ( $7 \pm 6$  vs.  $3 \pm 3$  mmHg;  $P < 0.05$ ) and during IE ( $12 \pm 9$  vs.  $5 \pm 4$  mmHg) than females. In males, IAD was positively correlated with indicators of low-frequency HRV at rest (.574;  $P < 0.05$ ), IE (.538;  $P < 0.05$ ), and OCC (.674;  $P < 0.01$ ).

**CONCLUSIONS:** Isometric exercise and post-exercise occlusion were shown to increase inter-arm difference in young adults. Considerations for potential sex differences may be of importance when investigating the relationship between inter-arm difference and heart rate variability.

## **Predicting Musculoskeletal Injuries from Functional Movement Screening (FMS)**

Martin Doyle, Alec Uttech

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### **Oral Presentation**

#### **ABSTRACT:**

Functional Movement Screening (FMS) is a functional test that can be used to prevent and reduce many injuries. The purpose of this study was to determine if poor motion quality could be found during FMS. FMS assesses functional balance between stability and mobility. By assessing participants' movement patterns, evaluating medical history and collecting injury data during the season the researchers will be able to evaluate how previous injury affects FMS scoring, and if FMS is a valid predictor of injury sustained during a full season. Previous research concentrated on only preseason injuries. Participants underwent FMS screening, provided detailed injury history, and have been providing weekly reports including injuries sustained, type of injury, days missed in competition due to injury, and medical assistance provided. Data are continuing to be collected and will be analyzed prior to the symposium's date. X<sup>2</sup> test will be used to evaluate the difference between the injured and non-injured participants for categorical variables and t-test for continuous variables. Pearson's Correlations will be used to evaluate the relationships between FMS and injuries. The level for significance will be set at  $p < 0.05$ .

## Using Weather Devices to Determine Outdoor Activity Modifications

Kelsey Tanler

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### Poster Presentation

#### ABSTRACT:

**Context:** Determining the environmental safety for athletes is an essential aspect of an Athletic Trainer's (AT) job. When athletes participate in hot and humid environments, their risk for developing exertional heat illness increases. Currently, little research on the clinical usefulness of weather measurement equipment exists. The purpose of the study was to determine the reliability and variability of weather measurement equipment and "weather apps" to make safety recommendations for outdoor exercise in the heat.

**Methods:** Measurements were taken every 4 hours from 7am-7pm over 14 days in August in an unshaded, outdoor location. Measures were collected using a sling psychrometer (SP), a digital psychrometer (DP) and common weather applications (apps), Weather.com (WC) and Weatherbug (WB). We collected SP and DP humidity and temperatures. Humidity and temperature were collected from the WB and the WC apps.

**Results:** The mean humidity for the SP, DP, the WC and WB were:  $81.98 \pm 13.81$ ,  $70.54 \pm 17.80$ ,  $78.44 \pm 16.29$ , and  $75.91 \pm 18.59$  respectively. There was a statistically significant difference between the humidity measurements,  $F(3,51) = 19.214$ ,  $p < .000$ . Post-hoc testing revealed statistical differences in humidity measurements for the four tools. The cronbach's alpha for all measurements was 0.947. Heat index categories varied across devices in 16 of 56 (28.57%) collection points.

**Conclusion:** Each device proved to be reliable, but the difference between readings was substantial. Some measurements differed in heat index category and therefore recommended different activity modifications based upon National Weather Service Guidelines. This difference in category readings could have ill effects on determining safe outdoor participation during hot and humid conditions. It is recommended ATs utilize multiple forms of weather data collection to determine safe participation to make the best decision for player safety. The potential for one tool to under estimate the severity of environmental conditions is why ATs should utilize more than one tool for comparison and utilize the reading that provides the highest level of precaution to minimize heat related illness.

## **Assessing Functional Stability and Flexibility Using Y-Balance Test**

Alec Uttech, Martin E. Doyle

Faculty Sponsor: Dr. Marketa Schublova

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### **Oral Presentation**

#### **ABSTRACT:**

The Y-Balance Test (YBT) is a valuable tool to assess muscular imbalances and functional stability in physically active patients. Many injuries are preventable by limiting the risk factors including biomechanical abnormalities, strength and range of motion asymmetries, and previous injury. The purpose of this study was to investigate if YBT can serve as a predictor of injuries sustained throughout a full athletic season. Previous research concentrated on a shorter period such as preseason. The secondary purpose of this study was to evaluate if history of injuries affects the YBT performance. All subjects participated in YBT testing and provided detailed injury history. Weekly surveys have been sent out asking about sustained injuries, type/severity of these injuries, amount of days missed in competition, and medical services received. The researchers are collecting data and will analyze them prior to the symposium's date.  $X^2$  test will be used to evaluate the difference between the injured and non-injured participants for categorical variables and t-test for continuous variables. Pearson's Correlations will be used to evaluate the relationships between YBT and injuries. The level for significance will be set at  $p < 0.05$ .

# **Geography, Geology** **and the Environment**

## **Drone Assisted Investigation of Dune Field Morphology in the White River Badlands, South Dakota**

Henry Kramer, Colton Byers, Patrick Burkhart

Faculty Sponsor: Dr. Patrick Burkhart

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### **Poster Presentation**

#### **ABSTRACT:**

The intent of this research is to investigate late Holocene landscape development in the White River Badlands of South Dakota. Our previous investigations, which utilized <sup>14</sup>C dating of paleosols, revealed that pediments along the margins of badlands ridges were dissected into sod tables within the last 1500 years. This time period indicates that the Medieval Climate Anomaly (900 to 1,300 AD) or the Little Ice Age (1,300 to 1,850 AD) droughts could have denuded slopes of vegetation, resulting with incision of the landscape and the formation of sod tables. This study investigates this latest Holocene climate change and landscape development using drone-collected, high-resolution imagery of the landscape to help visualize the dune morphology. The orientations of dunes were measured on resulting images. The analysis revealed that parabolic dunes on Bouquet Table are aligned in the NW-SE direction, consistent with modern wind direction, but also suggesting consistent dominant wind for at least the recent millennium. High resolution maps of dunes, loess sheets, and aeolian clifftop deposits, based on topography and vegetative cover, will be presented.

## Hydrogeology of Slippery Rock University

Nicholas Russo

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### Poster Presentation

#### ABSTRACT:

Slippery Rock University's campus is an intensively developed environment, presenting a highly disrupted hydrogeological setting. The goal of this research project is to develop a concise hydrogeologic report of the campus. Well logs from previous production wells and recent irrigation wells, as well as data from shallow wells installed for a hydrogeological laboratory, were compiled. These wells perforate the Pennsylvanian aged Allegheny and Pottsville groups, from the Kittanning Sandstone to the Mercer Shale and Coal. The Homewood Sandstone is the premier aquifer beneath the campus. Aquifer parameters (flow rate, well storage, and well yield) were determined by pump tests performed on the production wells in the 1960s and the 1970s. Since the wells perforated multiple formations, the values of flow rate and well storage determined are composites for a stratigraphic packet consisting of the Kittanning Sandstone, Vanport Limestone, and the Clarion and Homewood Sandstones. The well storage values for this stratigraphic sequence range from  $1 \times 10^{-4}$  to  $8 \times 10^{-4}$ , indicating confined conditions. The flow rates determined present a range of values from 1,000 to 13,000 gpd/ft. The well yield values for the wells spans a range of values from 1 to 15 gpm/ft, as determined with pumping rates that ranged from 30 to 110 gpm. The result of this research is an updated hydrogeologic report of Slippery Rock University's campus. This report will consist of a campus map with the previous production wells highlighted on it, structure contour maps, and a subsurface geologic model in order to better convey the hydrogeology of campus.

## **The Geology of Pittsburgh and the Surrounding Areas: Carnegie Museum of National History Interactive GIS Map**

Nicholas Russo

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### **Poster Presentation**

#### **ABSTRACT:**

The purpose of this project was to make an interactive map of the Pittsburgh region. The map was made using ArcGIS online and highlights the geology and paleontology of the region. This map features information on each rock formation exposed in the map area. This information includes; lithologic descriptions, the age of each tied to a stratigraphic column, and the names and pictures of the fossils that have been identified from each formation. To construct the map, location point data was first imported from the Carnegie Museum's Invertebrate Paleontology section's collections database to ArcGIS online. Information about each rock formation along with pictures of the fossils collected were imported and placed on the map. The result is a map of the Pittsburgh area with all the known exposed rock locations and their subsequent details. Along with the geological and paleontological information is a write up on the geologic history of this area. The geologic history is interpreted as time when large river systems carried debris from adjacent mountains to the east to a central marine basin located to the west. The formations exposed in Pittsburgh and included on the map are the Freeport through the Uniontown formation. These formations have recorded the details of deposition within these extensive river systems during the Late Pennsylvanian period approximately 307-300 million years ago. These include changes in rock lithologies and sedimentary structures such as cross-stratification, river channel fill, scours, and ripples. The sedimentary units also contain abundant fossils that provide evidence of the life that existed during this time. Combining the sedimentary rock and fossil data on this interactive map provides an understanding of the paleoenvironment that existed in the Pittsburgh region during the Late Pennsylvanian Period. This map will aid in teaching the geologic history and paleontology of the region around Pittsburgh and will highlight the extensive rock and fossil collections archived at the Carnegie Museum of Natural History.

# History

## **Dirty History: Podcasting to Bring Scholarship to the Public**

Thomas Thompson

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### **Oral Presentation**

#### **ABSTRACT:**

Many research projects involve a single question, then research, followed by an answer. The Dirty History Podcast, however, is a series of public history research projects delivered weekly in a digital humanities format. The aspect of the project that is unique for undergraduate work is the regularity of the timing of release, and the consistent exploration of new topics and ideas under a unifying theme.

This unifying theme is the analysis of the extremes of human behavior and experience (cannibalism, blood-sports, slaughter of animals, urban filth, and incest to name a few). Through these, we see the clearest illustration of our shared humanity. (Broadly, Jung spoke of these in terms of archetypes, Joseph Campbell saw them in the monomyth, and Hegel referred to it as the Spirit.) In concept, Dirty History is an exploration of those things that make us uncomfortable, but have nonetheless come to define much of what humans do.

The podcast is an ongoing project with more than twenty episodes. The primary goal is to inspire historical inquiry and curiosity in an international audience. Essentially, the podcast is a way of utilizing an accessible public forum to inquire about issues and ideas prevalent in scholarly histories—focusing on what is typically written and spoken about only tangentially, and mining all that those experiences and moments have to offer.

# Interdisciplinary Programs

## **If the Worst Thing a Man Can Be is a Woman, to What Extent is the Worst Thing a Woman Can Be is Fat?**

Margaret Calvert

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### **Oral Presentation**

#### **ABSTRACT:**

Bodies, attitudes, and actions of all people are regulated and controlled by a patriarchal society. This presentation will focus on the regulation of fat bodies, focusing specifically on how the regulation targets women in more cases than it targets men. To show this, regulations of fat women including dieting culture and eating disorders will be discussed. I will talk about the stigmatization of fat bodies as well as the medicalization and the moralization and how these two models may be the source of the stigmatization. I will argue that the medicalization, moralization, and stigmatization of fatness directly dehumanizes fat women and provide examples and discuss the portrayal of fat women in the media, specifically focusing on television and magazine representation. I will then discuss how these images create the abjection of the fat body and why fatness should be considered a disability worth discussing within the field of disability studies.

# Mathematics and Statistics

## **Maximum Likelihood Estimation (MLE) for Location and Scale Parameters of Burr Type III Distribution**

Emily Foley, Madeline Baillie, Michaela Piper

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### **Poster Presentation**

#### **ABSTRACT:**

In 1942, Burr type III distribution was first introduced by I. W. Burr for modeling lifetime data or survival data. In 1996, S. R. Lindsay introduced Burr type III distribution with location and scale parameters. In statistics, parameter estimation is one of the main purposes. Many statistical procedures to estimate parameters exist, but the MLE procedure is the most reliable method. If we have a likelihood function of parameters, we are able to find some numerical values to maximize the likelihood function. The calculated values are called maximum likelihood estimators. In this project, we will attempt to provide maximum likelihood estimators for location and scale parameters of Burr type III distribution using maximum likelihood estimation (MLE) procedures.

## **Applications of Partial Least Squares Regression**

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### **Oral Presentation**

#### **ABSTRACT:**

This project, which involves analysis of functional Magnetic Resonance Imaging (fMRI) brain scans, is investigating whether partial least squares regression (PLSR) is a more effective model to analyze fMRI brain scans than the current widely used model, multiple linear regression (MLR). We will use this model to determine if there is a lasting difference in the attention networks of children whose mothers used substances during pregnancy, versus those whose mothers did not. The data for this project comes from the Maternal Health Project at the University of Pittsburgh with fifteen subjects in each of three groups: the control group of children whose mothers did no substances during pregnancy, the “non-cocaine” group of children whose mothers did marijuana, alcohol, and tobacco during their pregnancies, and the “cocaine” group of children whose mothers did all of the aforementioned substances in addition to cocaine. The MLR model on this data showed no difference in the attention between these groups of children, and this project hypothesizes that this is because of limitations of the MLR making it ineffective in this type of analysis, and that the PLSR model can overcome these limitations and show a difference between these groups.

## **Location and Scale Parameter Estimation of Burr Type III Distribution by Monte Carlo Markov Chain (MCMC) Procedure**

Kyle Maraffi, Adam M. Majewski, Lucas E. Pilarski

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### **Poster Presentation**

#### **ABSTRACT:**

In 1942, Burr type III distribution was first introduced by I. W. Burr for modelling lifetime data and survival data. In 1996, S. R. Lindsay introduced Burr type III distribution with location and scale parameters. In statistics, parameter estimation is one of the many main purposes in determining descriptive measures of an entire population. There are many statistical procedures to estimate parameters. Monte Carlo Markov Chain procedures, such as Gibbs sampling and Metropolis-Hastings algorithm, are very popular to sample from arbitrary distributions. From the sample, we can get the sample mean, which is the estimate of a parameter. In this project, we want to estimate location and scale parameters of Burr type III distribution by Monte Carlo Markov Chain Procedure.

# Physical and Health Education

## **The Effects of Tactical Strength & Conditioning on Firefighters' Job-Related Task Performance**

Jacob Economou, Nathan Hoffman

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### **Poster Presentation**

#### **ABSTRACT:**

##### **Purpose**

As of 2015, there are 787,117 volunteer firefighters, and 70% are overweight or obese according to BMI readings. The obesity rate brings many health issues and quantifies another alarming statistic: The number one cause of death for volunteer firefighters on the job are cardiac related, accounting for 51% of all fatalities. Implementing a Tactical Strength and Conditioning Facilitator-led training program will combat these statistics.

##### **Methods**

An eight-week, three workout per week, training program was administered to eight volunteer firefighters (age:  $28.0 \pm 9.2$ ). Participants performed a job specific strength & conditioning program including traditional fitness training. An array of pre-test and post-test exercises were administered to test participant fitness: geared stair climb, simulated forced entry, hose advance, equipment carry, victim drag, and ladder raise. Data were collected for the whole circuit and each exercise via two measurements: Time and Rate of Perceived Exertion (RPE). T-test was used to calculate differences between pre- and post-test scores.

##### **Results**

Four of the six test exercises showed significant improvements either in time needed for completion or the RPE scores: the stair climb resulted in 19.1% improvement in time, the tire breach showed 3.7 pts. improvement on the RPE scale, the hose drag improved 30.6% in time, and the equipment carry resulted in a 19.1% improvement in time (all  $p < 0.05$ ). The victim drag and the ladder raise did not show significant differences between pre- and post-test scores. While participants needed less time to complete the entire circuit during the post-test, the 14.6% average improvement was not statistically significant.

##### **Conclusion**

This Tactical Strength and Conditioning based training program resulted in many positive increases in performance and perceived exertion. The majority of the exercises resulted in a significant improvement.

## The Effects of Tactical Strength and Conditioning Firefighter Training on General Health

Nathan Hoffman, Jacob Economou

Faculty Sponsor: Dr. Istvan Kovacs

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### Oral Presentation

#### ABSTRACT:

**PURPOSE:** Modern firefighter training is focused on repetitious activity of simulated real-world technical tasks. Fitness training in the firefighter community is usually based on traditional resistance training. This study examined how traditional-style fitness training and firefighter-specific strength and conditioning improve health and function among firefighters.

**METHODS:** An eight-week training program was administered to 15 volunteer firefighters (age:  $31.3 \pm 12.3$ ). Participants were randomly assigned to the traditional group (TG) or the tactical (firefighter-specific) group (TACG) with each group having three 3 and eight 8 participants completing the program, respectively. TG received a three-workout per week training program of traditional weightlifting movements while TACG attended 3 workout sessions per week of fighter-specific strength and conditioning training blended with traditional fitness training movements. A post program survey was administered to record changes in health status such as bodyweight, physiological health parameters, and oxygen (O<sub>2</sub>) consumption during task-specific firefighter training.

**RESULTS:** 33% of TG and 50% of TACG indicated positive response to weight loss. None of TG and 50% of TACG reported at least one improvement in physiological health parameters. Reduced consumption of oxygen in breathing apparatuses was reported by 0% of TG and 50% of TACG. Cardiovascular capacity and endurance increase occurred in 100% of both groups. 66% of TG and 100% TACG noticed improvement in body mobility and everyday function. Injury resiliency confidence increased in one-hundred percent of both groups.

**CONCLUSION:** While any sort of structured exercise serves to improve job-performance and health of firefighters, tactical (firefighter) strength and conditioning yields a marginally higher gain across the board in firefighters. This service-learning experience has provided valuable information to future training protocols.

## **Self-Regulated Training with Robot Improves Table Tennis Forehand Efficiency**

Austin McClinton, Catherine Rauenzahm, Istvan Kovacs

Faculty Sponsor: Dr. Istvan Kovacs

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### **Poster Presentation**

#### **ABSTRACT:**

By participating in recreational table tennis practices, the adult population can meet the American College of Sports Medicine's (ACSM's) recommendations for neuromotor exercising. In this study, thirteen recreational players ( $46.2 \pm 18.3$  yr., 8 males, 5 females) trained to improve their spin rate (SR) and hitting speed (HS) of the most commonly used topspin offensive shot, the forehand loop-drive (FLD). The eight-week program followed ACSM's guidelines for neuromotor exercise training for increased balance, agility, hand-eye coordination, and proprioceptive abilities. Two practices per week were conducted. Each practice included a 20-minute FLD training against consistent backspin balls served by a table tennis robot. In addition, participants studied instructional materials and utilized self-regulated feedback during practices from peers and coaches. Biweekly tests were administered to assess average SR, HS, and ball contact location on the paddle (CL) from five successful consecutive FLDs. SR increased from  $41.6 \text{ rs}^{-1}$  to  $60.7 \text{ rs}^{-1}$ , while HS from  $8.57 \text{ ms}^{-1}$  to  $9.71 \text{ ms}^{-1}$  by the end of the program (both  $p < 0.05$ ). While SR increased consistently and gradually throughout the program, HS reached its peak after four weeks of training, then remained at the increased level. CL moved from 21 mm below the paddle's longitudinal axis (the paddle was usually in horizontal position at contact) to 35 mm below the axis. This study contributed to the knowledge-base of exercise type, intensity, and methodology of neuromotor exercise training for the adult population.

## Muscular Power vs. Muscular Endurance Push-Ups Training: Results from Two Different Six-Week Programs

Austin McClinton

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### Oral Presentation

#### ABSTRACT:

**PURPOSE:** The purpose of this study was to compare traditional muscular endurance (MEG) training to power training (MPG) for upper body strength. Using two different training protocols, participants trained for upper body strength via push-up variations for six weeks.

**METHODS:** 46 college students were randomly assigned into two training groups: MEG or MPG. Different training programs were provided to each group and weekly workouts were individualized based off pre-test results. Two push-ups tests were administered before and after the six-week training: (a) four consecutive ballistic push-ups for average flight height (T1), calculated from the flight time provided by a contact mat, and (b) regular push-ups for maximum repetitions (T2). The test results were compared within and between groups. Ballistic tests were measured using a JustJump (contact) mat that digitally measures the flight time and height of a movement. Participants were asked to complete three training sessions per week. Training sessions consisted of six working sets, repetitions differed depending on training group.

**RESULTS:** The MPG improved in T1 from  $6.53 \pm 1.76$  to  $7.59 \pm 1.74$  in., and in T2 from  $26.63 \pm 13.31$  to  $30.08 \pm 8.93$  reps. The MEG improved in T1 from  $6.64 \pm 3.63$  to  $7.33 \pm 2.86$  in. and in T2 from  $23.4 \pm 13.31$  to  $26.9 \pm 11.10$  reps. As for between-group comparisons, MANCOVA showed no significant differences in adjusted means in either pushups test after controlling for pre-test differences: MP  $7.48 \pm 1.74$  vs. ME  $7.06 \pm 2.86$  in. (T1), and  $29.01 \pm 8.93$  vs.  $27.39 \pm 11.10$  reps. (T2).

**CONCLUSION:** Overall, participants improved in almost all tests, regardless of training group. Each group had a different training focus, yet we could see that rate of improvements were similar regardless of training group. In terms of strength development it seems that both training types were effective for improvements in beginner trainees.

## **Influence of Trampoline-Based Activity Sessions on the Participation of Youth with Autism Spectrum Disorder in Afterschool Physical Activity**

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Faculty Sponsor: Dr. Dallas Jackson

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### **Poster Presentation**

#### **ABSTRACT:**

Youth with Autism Spectrum Disorder (ASD) have various functional issues making it difficult to participate in physical activity settings. There is a need for community-based physical activity programs to be designed to meet the needs of youth with ASD (Must et al., 2016). **Purpose:** The purpose of this project was to assess the influence of trampoline-based physical activity sessions on the undesirable behaviors exhibited by school-aged youth (chronological age = 5-12 years) with Autism Spectrum Disorder participating in an afterschool physical activity program. **Method:** A nonconcurrent multiple baseline design across participants was used to evaluate the influence of trampoline-based physical activity sessions on participants' undesirable behavior exhibited during inclusive physical activity time. Participants were randomly assigned to a predetermined baseline length (e.g. 3,5,8 sessions). Predetermined baseline data was collected prior to the intervention being introduced. Once introduced, intervention phase data was collected for the remaining sessions. The dependent variable (i.e. target behavior) was undesirable behaviors (e.g., motor off-task, verbal off-task, aggressive off-task, passive off-task). The independent variable (e.g., 2-min trampoline-based physical activity jumping session) was the trampoline-based physical activity. Data were analyzed with visual analysis. Visual analysis of graphed data were used to compare within-phase and between-phase data for changes in the dependent variable level and trend. **Results:** Preliminary results suggest that short durations of trampoline jumping prior to inclusive physical activity may influence participation of youth with ASD in afterschool physical activity. **Implications:** Participation restrictions due to off-task behavior of children with ASD in afterschool physical activity programs may be reduced by engaging in mini-trampoline jumping prior to inclusive physical activity.

# Physics and Engineering

## Optimization of Nanopillar Dimensions for Maximum Light Absorption

Evangeline Beeching

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### Poster Presentation

#### ABSTRACT:

Conductive organic polymers such as Poly(3-hexylthiophene-2,5-diyl) **P3HT**, Poly{2,2'-[(2,5-bis(2-hexyldecyl)-3,6-dioxo-2,3,5,6-tetrahydropyrrolo[3,4-c]pyrrole-1,4-diyl)dithiophene]-5,5'-diyl-alt-thiophen-2,5-diyl} **PDPP3T**, Poly{2,6'-4,8-di(5-ethylhexylthienyl)benzo[1,2-b;3,4-b]dithiophene-alt-5,5'-dibutyloctyl-3,6-bis(5-thiophen-2-yl)pyrrolo[3,4-c]pyrrole-1,4-dione} **PBDTDP** thin films are being studied for use in solar cells due to their flexibility, cost effectiveness, and low environmental impact when compared to traditional silicon or gallium arsenide thin films. However, these organic polymers do not yet have the same efficiency as their inorganic counterparts and as a result are not being commercially produced at a large scale. It has been established that replacing thin films with nanopillars will enhance the light absorption due to the nanopillars having smaller dimensions than the wavelength of light. We have fabricated P3HT nanopillars with approximate diameters of 76 nm using a porous aluminum oxide to serve as a template. We will be optimizing the dimensions (diameter, height and interval) of the nanopillars for maximum absorption in the wavelength range 400nm to 700nm. The dimensions of the pores can be controlled by varying the timings of pore widening process which in turn change the dimensions of the nanopillars. We aim to fabricate nanopillars of various polymers and compare their absorption to the more commonly used thin films using UV-Vis spectroscopy.

## Flow of Multicomponent Gases in Carbon-Based Organic Nanopores

William Briggs, Austin Gnesda, Jesse Hansel, Mohammed Kazemi, Manuel Valera, Athula Herat

Faculty Sponsor: Dr. Mohammed Kazemi

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### Oral Presentation

#### ABSTRACT:

In hydrocarbon recovery from shale, special attention should be paid to the species transport in organic nanopores due to their extremely small sizes and adsorption phenomena at the pore surfaces. To date, most of the current studies are focused on the transport of single component fluids, mainly methane. The objective for this work is to investigate the transport of multicomponent fluids in type II kerogen samples (organic matter of shale rocks) with different maturities (or rock composition) using molecular simulations.

In this study, adsorption and transport of two gas mixtures, that have different compositions, are studied by performing molecular simulations for six kerogen samples. The kerogen molecules are fabricated based on the Ungerer et al. (2014) molecular model. In order to build a representative solid-state model of kerogen, eight kerogen molecules are placed in a periodic cubic cell. Constant-temperature constant-volume (NVT) simulations and then constant-temperature constant-pressure (NPT) simulations are performed to obtain the final structure. Pore spaces within the structures are generated by the inclusion of dummy particles during NPT simulations. Once the density and porosity values reach reported ranges for kerogen, the dummy particles are removed from the bulk kerogen structure, creating spherical void volumes where the adsorption of gas molecules are likely to occur. Using molecular simulations, effects of temperature, pressure, and species bulk mole fraction on the adsorption isotherms and transport diffusion coefficients are studied.

A comparison of adsorption isotherms for alkanes in the two mixtures indicates that the alkanes with larger chain lengths have higher affinity to the pore walls than those with smaller chain lengths. Adsorption selectivity (a criterion used to assess the performance of a sorbent in preferentially adsorbing one species in fluid mixtures) for hexane (the heaviest component) over other gas components is larger than one for all pressures tested, which shows that hexane molecules have a higher tendency to be adsorbed to the pore walls compared to other components. It is also shown that as pressure and temperature increase, the adsorption selectivity of hexane over other components decreases. Based on the simulation results, the diffusion coefficients of hexane decrease as the thermal maturing increases. A comparison between the species transport diffusion coefficients showed that the transport coefficients are smaller for the heavier components (the alkanes with larger chain lengths) compared to lighter ones. Therefore, in shale, the heavier components may remain in the reservoir while the lighter components being extracted. As a result, the composition of the remaining fluid inside the pores becomes progressively heavier. This might be the reason why more than 95% of the extracted fluids from shale gas systems is methane. This work is one of the few studies on the transport phenomena of multicomponent gas mixtures in realistic kerogen models. The results of this study can be included in multiscale simulation models by incorporating the transport coefficients (mainly permeability) of the inorganic matrix and microfractures to predict the recovery rates from shale.

## **The Impact of the Photoacoustic Effect on Communication**

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### **Poster Presentation**

#### **ABSTRACT:**

The photoacoustic effect is a natural phenomenon in which the absorption of light in a material causes the formation of sound waves. Recently, researchers at MIT have used this effect to create a new form of targeted audio communication with lasers. One proposed application of this communication is for first responders in an active shooter situation to be able to relay messages and instructions to people in danger. Due to the targeted nature of the transmitting lasers, the messages would be undetected and inaudible to anyone other than the individuals meant to receive them. The purpose of this research will be to further explore the variables which determine the effectiveness of communication which utilizes the photoacoustic effect regarding distance and clarity of messages. The variables which will be tested are wavelength, intensity, and source of light, and speed in which the pulses of light need to be sent to the absorbing material. The wavelengths of light will be tested by using LEDs which emit light at various wavelengths along the electromagnetic spectrum, such as infrared light and different colors of visible light. Experiments regarding intensity of light will also be conducted by varying the amount of power sent to the light sources by using a Raspberry Pi microcontroller. The response variables of these experiments will be maximum distance of communication and perceived clarity of the audio recordings being transmitted.

## Molecular Simulation of Phase Behavior of Complex Petroleum Mixtures

Austin Gnesda, Jesse Hansel, William Briggs, Mohammed Kazemi, Athula Herat, Manuel Valera

Faculty Sponsor: Dr. Mohammed Kazemi

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### Oral Presentation

#### ABSTRACT:

As we embark on more complex Enhanced Oil Recovery (EOR) processes (e.g. miscible hydrocarbon/non-hydrocarbon, surfactant/polymer, smart water and combination of the three), complex phase equilibria, complicated rock/fluid interaction, and sophisticated transport through porous media will create a number of key technical challenges that must be addressed. The objective of this work is to investigate the phase behavior (vapor-liquid equilibria) of complex reservoir fluids and evaluate the performance of equations of state. Molecular Dynamics (MD) is proved to be a credible technique to examine the dynamics of atomic-level phenomena. In this study, the phase behavior of complex petroleum mixtures is investigated using MD simulations.

The mixture in this study consists of alkanes from methane ( $\text{CH}_4$ ) up to eicosane ( $\text{C}_{20}\text{H}_{42}$ ), aromatic components (such as Toluene), and light gases (such as nitrogen and carbon dioxide). Molecular simulations are performed at different pressures and temperatures and compared with experimental measurements found in the literature. It has been found that simulation results typically provide quantitative agreement with experimental data for the vapor-liquid equilibria of petroleum mixtures. In general, the performance of the Peng-Robinson and the SAFT EoS's deteriorates significantly for mixtures containing long alkane molecules. In this regard, the simulation approach is more consistent in that it provides the same level of agreement with experimental data for both, systems with short and with long alkanes. The use of a cubic EoS with a one-fluid mixing rule has been found suitable for the prediction of phase diagrams of the simple nonpolar systems studied here; as expected, however, the quality of the predictions begins to deteriorate as the size asymmetry of the components becomes larger. This work is one of the few in-depth investigations of the phase behavior of complex petroleum mixtures. Molecular dynamics simulations could be used as a powerful tool to study the thermodynamic properties of petroleum mixtures.

## Surface Diffusion Phenomena in the Organic Nanopores of Shale

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### Oral Presentation

#### ABSTRACT:

Adsorbed phase transport (also known as surface diffusion) has been reported to be one of the main transport mechanisms in organic nanopores of shale. Surface diffusion is a mechanism in which adsorbed molecules move over the surface by hopping between adjacent adsorption sites. From a molecular point of view, one of the main evidences for existence of this mechanism is the molecular simulation results of flow in graphite conduits with smooth structureless walls. The objective for this work is to fulfill the need for the investigation of the contribution of the adsorbed phase transport to the total mass flux of organic conduits with pore wall irregularities. In this study, adsorption and transport of methane are studied using molecular simulations in three-layered graphite nano-scale channels with different degrees of surface roughness. To simulate the surface roughness, a fraction of the carbon atoms are randomly removed from the surface. At each channel roughness level, velocity profiles and mass fluxes of methane are computed. The simulations are performed at different pressures, pressure gradients, channel widths (2 and 4 nanometers), and levels of roughness (level roughness is characterized by the percentage of the removed atoms from the graphite surface). For each roughness level, three realizations are considered (each realization with same percentage of removed atoms) and averaged for the results not to be realization-specific. A comparison between the results in this work with Regularized 13-moments (R13) and Knudsen diffusion model is also performed.

# Psychology

## **The Associations between Marijuana Use, Life Satisfaction, and Stress in College Students is Moderated by Gender**

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### **Poster Presentation**

#### **ABSTRACT:**

Marijuana abuse is an ongoing problem occurring in college students; current studies report that 46.6% of college students have used marijuana, and 19.4% report recent use within the last 30 days. Previous studies show that marijuana use in college students is associated with other drug use, infrequent church attendance, amount of monthly spending money, and high levels of sensation seeking. Marijuana can affect many factors that may influence quality of life including motivation, feelings about oneself, and stress. The purpose of this study was to examine the effect of marijuana use on life satisfaction and stress. In the 2016-17 academic year, an exercise and wellness survey was administered to 550 students at Slippery Rock University, a mid-sized school in Pennsylvania. For this study, students were assessed for their marijuana use in the past six months defined as any marijuana use that occurs less than weekly or more than weekly, life satisfaction defined as the total score on the Student Life Satisfaction Scale, a measure of global cognitive judgements of one's life, and stress defined as the total score on the College Undergraduate Stress Scale, a measure of stressful life events that may or may not occur in college students. In the original analysis there was a marginally significant association between marijuana use and stress ( $F(1,498)=3.75, p=0.05$ ), and a significant association between marijuana use and life satisfaction ( $F(1,582)=4.72, p=0.03$ ). Next, the dataset was split by gender and the ANOVA repeated. Results showed that the relation between marijuana use and stress ( $F(1,321)=10.81, p=0.001$ ) and life satisfaction ( $F(1,335)=10.26, p=0.001$ ) was significant for females but not for males. Thus, marijuana use in females was related to decreased life satisfaction and increased levels of stress. These results are important because they show that the association between marijuana use in college and outcomes known to affect academic performance are moderated by gender.

## **Depression Symptoms are Associated with Electroencephalography Alpha Power in College Students**

Amanda Brusceci, Morgan Sabatini, Jennifer Willford

Faculty Sponsor: Dr. Jennifer Willford

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### **Poster Presentation**

#### **ABSTRACT:**

College students, in general, are showing greater levels of anxiety, depression, eating disorders, addiction, and poor sleep patterns compared to the past. Research has shown frontal electroencephalography (EEG) asymmetry involvement in clinical depressive symptomatology. However, little research has been conducted investigating the relations between depressive symptoms and frontal EEG alpha asymmetry in non-clinical populations. The purpose of this study was to determine the association between alpha band power and depressive symptoms in frontal EEG in non-clinical college students. EEG is a non-invasive technology that is inexpensive, available at Slippery Rock University (SRU) and has received approval by the Institutional Review Board to use on SRU students. In this study, 27 college students from SRU psychology courses were recruited. To participate, they must not have been previously diagnosed with a psychiatric disorder. Using an EEG electrode cap, alpha band waves were recorded from bilateral electrodes to measure frontal cortex activity (F3, F4). A time series analysis was completed in which participants were asked to rest for 3 minutes with their eyes closed as EEG data was recorded. After data collection was complete, participants completed the Center for Epidemiological Studies-Depression (CES-D) scale. Scores of 16 or above are an indicator of vulnerability to clinical depression. Overall, the mean number of CES-D depressive symptoms in the sample was 15.04, and 37% of our participants had a CES-D score of a 16 or greater. As expected, results showed that the total CES-D score is inversely associated with alpha total power ( $r = -.44, p = .02$ ). Furthermore, the sample split, categorized by a CES-D score of 16 or above, showed significantly reduced alpha band pass waves ( $F(1,27) = 4.85, p = .04$ ). These results suggest a biological marker of depression symptoms, that is, more total alpha power linked to less frontal activation in a sample of students reporting depressive symptoms but who have not been diagnosed with depression.

## **What's in a Name or Pronoun? An Examination of the Effects of Gender Inclusive Pronouns on Memory**

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### **Poster Presentation**

#### **ABSTRACT:**

The present study compares perceptions of advertising materials between two groups of participants whose current gender identity exists within a gender binary (i.e. cisgender or transgender men). The central hypothesis is that pronoun type (gender inclusive vs. gender exclusive) will influence memory and perceptions of advertising materials. As seen in previous research (Crawford & English, 1984), when gender exclusive (he) pronouns were used generically to refer to both men and women, men recalled more information than women. Following the work of Stout and Dasgupta (2011), we also examine whether gender inclusive versus exclusive pronoun use affects perceived levels of ostracism, sexism, motivation, and identification. The current study extends this prior research by including a test of the singular use of “they/them,” which are gender inclusive pronouns. Thus, we examine the effect of gender exclusive (he) versus gender inclusive (s/he and they) pronouns on memory, perceived levels of ostracism, sexism, motivation, and identification. Based on previous research (Crawford & English, 1984; Stout and Dasgupta, 2011), we hypothesize that there will be a 2 (gender) X 3 (pronoun type) interaction on memory, levels of ostracism, sexism, motivation, and identification. Specifically, we predict for memory, motivation, and identification, compared to women, when the pronoun “He” is used, men will score significantly higher compared to when the pronouns ‘He/She’ or ‘They/Them’ are used. Inversely, for ostracism and sexism, we predict that compared to women, when “He” is used, men will score significantly lower and when “S/he” or “They/Them” are used they will score significantly higher. In order to test our hypotheses, participants were asked to read a description of a part-time job, which was adapted from Stout and Dasgupta’s study. Participants memory was then assessed, by using an instrument we developed, participants then completed Stout and Dasgupta’s assessments of ostracism, sexism, motivation, and identification.

## **Musculinity and Femininity: Testing Associations with Sex Segregation and Sexual Orientation**

Kourtney Kotvas, Emily Dodge, Celeste Tevis, Cassandra Oleksak, Autumn Strausbaugh

Faculty Sponsor: Dr. Emily Keener

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### **Poster Presentation**

#### **ABSTRACT:**

The purpose of the present study was to examine whether the association between college students' current and retrospective (i.e., middle school and high school) reports of sex-segregation or the proportion of same-sex friends and gender-typed traits (masculinity/instrumentality and femininity/expressivity) would vary depending on sexual orientation or identity as heterosexual men, heterosexual women, Lesbian/Bisexual/Questioning (LBQ) women, or Gay/Bisexual/Questioning men (GBQ) men. Sex-segregation is the tendency for people to have more same-sex friends than cross-sex friends (Maccoby, 1998). Research (Mehta, et al., 2017) on college-aged participants showed that sex-segregation was negatively associated with femininity for men, but not women. We hypothesized that for heterosexual men, sex-segregation would predict high masculinity and low femininity. For heterosexual women, we predicted that sex-segregation would be low on masculinity and high on femininity. Further, we examined whether this pattern would generalize to LGBTQ men and women because research has yet to examine this community. To test this hypothesis, 345 (36 GBQ men, 61 LBQ women, 75 heterosexual men, and 173 heterosexual women) college students (ages 18-24;  $M = 19.42$ ;  $SD = 2.22$ ) reported the name and gender of five friends retrospectively for 7<sup>th</sup> and 12<sup>th</sup> grade and currently for college. Participants also completed the Personal Attributes Questionnaire to assess gender-typed traits (Spence, Helmreich, & Stapp, 1974). Pearson's correlation coefficients were calculated separately based on gender and sexual orientation. In contrast to our hypothesis, associations between sex segregation and masculinity and femininity were not significant for GBQ men, heterosexual men, or heterosexual women. However, for LBQ women there was a significant negative association between sex-segregation and masculinity for 7<sup>th</sup> grade (-.32), 12<sup>th</sup> grade (-.29), but not for college. Additionally, there was a significant positive association between sex-segregation and femininity at 7<sup>th</sup> grade (.30), 12<sup>th</sup> grade (.28), and college (.37). Results will be interpreted in relation to gender-related characteristics of peer networks.

## Conditioning of a Novel Food in the Terrestrial Hermit Crab (*Coenobita clypeatus*)

Mia Radevski, Beth Ann Rice

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### Poster Presentation

#### ABSTRACT:

Terrestrial hermit crabs, (*Coenobita clypeatus*), are an invertebrate species that rely heavily on their olfactory system to differentiate between foods. Animals have behavior-systems for engaging in biologically relevant tasks. For example, the feeding-behavior-system is comprised of the general-search, the focal-search, and consummatory behaviors. When the feeding-behavior-system engages, an animal begins a general-search behavior where they are actively looking for potential sites that previously predicted food. Upon discovery of potential food sites, it shifts to a focal-search (i.e., looking for food) and once food is discovered the animal will participate in consummatory behaviors. Previous literature in intertidal hermit crabs, demonstrated that reinforcement of novel food facilitates a shift from general to focal-search behavior (Tran, 2015). To investigate the conservation of basic learning mechanisms across species, the current experiment examined the effects of reinforcement of a novel food in a terrestrial hermit crab. In the current experiment, subjects were conditioned to the placement of a novel food (shrimp and squid) over 8 conditioning trials, where food was located in the same area for each trial. Fifteen subjects were placed in either a reinforced (n=7) or unreinforced (n=8) group, where the reinforced group was given the opportunity to consume the novel food and the unreinforced group was not. This study hypothesized that those reinforced would show a shift from general to focal-search, measured as an increase in time spent where the food was located. There was a significant difference in time spent at the location of the food, for subjects that were reinforced (M=33.0, SEM=11.48) compared to subjects that were not (M=22.8, SEM=3.30),  $t(8)=-0.85$ ,  $p=0.019$ . The transition from general-search to focal-search appears to be facilitated by the reinforcement of novel food. These results are important because this study is the first to demonstrate that reinforcement facilitates the transition from general to focal-search of a novel food in a terrestrial hermit crab. This suggests that the basic learning mechanisms of reinforcement are conserved across species.

## The Prevalence of Depressive Symptoms in College Students

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### Poster Presentation

#### ABSTRACT:

According to the Association for University and College Counseling Center Directors Survey, depression (36.4%) is the second most pressing mental health concern amongst college students following anxiety (41.6%). Also, in an American College Health Association report, students claimed depression and anxiety as among the top reasons for a decline in academic performance. Common depressive symptoms include decreased mood, social withdrawal, and problems with sleep, trouble concentrating, hopelessness, suicidal thoughts, and digestive problems. The objective of this study was to characterize depression symptoms (not diagnosis) among college students. While data collection is ongoing, at the time of this report, participants included 27 undergraduate students (8 males and 19 females) attending Slippery Rock University. The Center for Epidemiological Studies Depression (CES-D) scale was used to measure depressive symptoms of the participants; a score of 16 or greater indicates an increased risk of depression. The scale was administered, individually, to students in a laboratory in Vincent Science Center. The total CES-D score, class level and gender were assessed. Preliminary results do not indicate differences in depression symptoms based on gender or class level. Overall, college students showed an average CES-D depression score of 15.04, and 37% of our participants showed symptoms at or above the cut-off score of 16. Several symptoms were endorsed frequently, including: restless sleep (36.9%), trouble keeping my mind on what I was doing (32.3%), everything is an effort (32.3%), and not feeling as good as others (25.8%). These results indicate that college students are experiencing sub-clinical symptoms of depression which may have an impact on academic performance as indicated in previous studies.

## **Frontal Brain Volume Asymmetry: A Neurobiological Marker or Prenatal Tobacco Exposure in Young Adults**

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### **Poster Presentation**

#### **ABSTRACT:**

Tobacco is used more frequently during pregnancy than any other drug. Prenatal tobacco exposure is associated with an increased risk for attention problems and a diagnosis of ADHD. Attention circuits in the brain rely on function and efficiency of frontal lobe brain regions. This study analyzed the structural changes found in the brains of young adults with (N=17) and without (N=25) prenatal tobacco exposure (PTE) while controlling for current smoking and other demographic and environmental factors. Forty-two participants were recruited from the Maternal Health Practices and Child Development Project, a longitudinal study of the effects of prenatal drug exposure on developmental outcomes. Magnetic resonance images were processed using the automated labeling pathway technique. Volume and asymmetry were calculated using voxel count for all brain regions (L-R/L+R). The PTE group showed significant ( $p < .05$ ) increases in asymmetry in frontal brain regions that were associated with reduced volume in the frontal lobes, overall, and reductions in the left hemisphere, specifically. No differences were found in the parietal, temporal, or occipital lobes suggesting that prenatal tobacco exposure may interfere with the normal development of the frontal lobe. Attention deficit symptoms were assessed using the Wender Utah Rating Scale and the Adult ADHD Self-Report Scale. There was a significant association between prenatal tobacco exposure and an increase in perceived ADHD symptoms as children as well as their current symptoms as adults. These results suggest that prenatal tobacco exposure related structural differences in the frontal lobe play a role in attention difficulties throughout the lifespan.

## **The Role of Gender, Sexual Orientation, and Relationship Context on Emerging Adults' Endorsement of Agentic Conflict-Management Strategies**

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### **Poster Presentation**

#### **ABSTRACT:**

In research (Keener & Strough, 2017) examining gender-typed (e.g., masculine/agentic) conflict-management strategies the focus was on gender differences and relationship context (friendship versus romantic partner). Results showed gender effects varied depending on the relationship context, reflecting gender-specific norms for relationship contexts. Addressing a gap in the research, we examined gender and sexual orientation differences in strategy endorsement (for conflicts involving same- and other-gender friends, and romantic partners.) We predicted heterosexual men's endorsement of agentic strategies would vary by relationship context, but that heterosexual women's would not. To test whether this pattern would generalize to Gay/Lesbian, Bisexual, and Questioning men and women we recruited 363 (181 heterosexual women, 82 heterosexual men, 61 lesbian/bi/questioning women, and 39 gay/bi/questioning men) college students, ages 18-24 ( $M = 19.62$ ;  $SD = 2.218$ ). They completed the Peer Conflict Questionnaire (Keener et al., 2012), which assessed conflict-management strategies in response to hypothetical conflict with same- and other-gender friends, and romantic partners. After each, participants rated two agentic strategies (e.g., "I would stand my ground and explain why I should get to decide ..."). Strategies were rated on a 1 (Strongly Disagree) to 4 (Strongly Agree) numerical scale. A mixed-model ANOVA was conducted. The main effect of relationship context was significant,  $F(2,358)=35.55$ ,  $p<.0001$ ,  $h^2p = .09$ . Overall, agentic strategies were endorsed more in same-gender friendships and other-gender friendships as compared to romantic relationships. The interaction between relationship and sexual orientation was significant,  $F(2, 6)=8.36$ ,  $p<.001$ ,  $h^2p = .07$ . As predicted, heterosexual men's endorsement of agentic strategies varied for each relationship context, whereas heterosexual women, strategy endorsement did not vary by relationship context. For L/GBQ women and men, agentic strategy endorsement did not vary depending on the gender of the friend. However, agentic strategy endorsement for romantic relationships was significantly different from strategy endorsement for both types of friendships.

## **The Relationship Between Locus of Control, Social Support, and Mental Toughness on Perceptions of Sport Success**

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### **Poster Presentation**

#### **ABSTRACT:**

Success can be defined both subjectively and objectively in terms of desired outcome. Success in itself has many connotative meanings which vary based on the individual. The present study investigates the influence of (a) locus of control, (b) mental toughness, and (c) social support of sport participation on perceptions of performance success. The data will be collected and analyzed for presentation over a 7-week period concluding in early April. Participants will include undergraduates enrolled at Slippery Rock University (SRU) contingent on participation in sport (club and/or SRU) in high school and/or at SRU. Participants will complete a demographics questionnaire, the Multidimensional Locus of Control Scale (Levenson, 1979), the Mental Toughness Scale (Madrigal, Hamill, & Gill, 2013), a social support for sport measure (Rees & Hardy, 2004), and the Perception of Success Questionnaire (Liukkonen & Leskinen, 1999). In this study, we hypothesize that an individual's locus of control, mental toughness, and experienced social support in sports will be associated with their perception of performance success. A regression analysis will be completed to examine the variables of interest. Discussion will include the impact of personality and social support factors on perceived performance success in sport.

## **Does Feminism Look Good On Me?: An Examination of Types of Feminism, Body Image, and Disordered Eating**

Allison Williams, Chloe Dauer, Jennifer Sanftner McGraw, Emily Keener

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### **Poster Presentation**

#### **ABSTRACT:**

Approximately 64% of women are affected by body dissatisfaction and disordered eating nationally (NEDA, 2018). Previous research has shown the potentially protective qualities of feminist identification against body dissatisfaction (BD) and disordered eating (Murnen & Smolak, 2009). However, it is unclear whether the type of feminist identification matters in terms of protection from BD and disordered eating. The present study explores the relationship by examining associations between six feminist perspectives (conservative, liberal, radical, socialist, cultural, and women of color feminism) and BD and disordered eating in women. We hypothesized that women who self-identify as a feminist would report lower rates of BD and disordered eating. Additionally, women who hold views that closely align with Liberal, Radical, or Women of Color Feminism would have lower rates of BD and disordered eating. Participants ( $N = 220$ ) were undergraduate female students from a medium-sized university (88.6% European American; 3.8% African American; 7.6% "other" ethnicity). A range of majors and class levels were sampled, including those considered traditionally male- (e.g. Safety Management) and female-dominated (e.g. Psychology). The paper-and-pencil survey contained the Feminist Perspectives Scale (FPS-3) to measure six contrasting feminist perspectives (Henley et al., 1998). BD was measured using the Body Shape Questionnaire (Evans & Dolan, 1993). Disordered eating was evaluated with the Eating Attitudes Test (Garner et al., 1982). The Self-Identification as a Feminist scale (SIF) was used to measure feminist identification (Szymanski, 2004). Results demonstrated a significant positive relationship between SIF and BD. Contrary to predictions, significant positive associations were obtained between Radical and Women of Color feminism and BD in women. Higher levels of these types of feminism were associated with greater BD. These results will be discussed in terms of the current literature on the role of feminism in BD and disordered eating.

# Public Health and Social Work

## **Comparison of Dialectical Behavior Therapy (DBT) Skills Groups With and Without Animal-Assistance for Incarcerated Women with Histories of Self-Harm**

Christina DeAngelis, Alisha Zambroski

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### **Oral Presentation**

#### **ABSTRACT:**

Self-injury is a major safety and security concern in prisons today, for both correctional officers and the women who are incarcerated (Wakai, Sampl, Hilton & Ligon, 2014). Treatment to manage and decrease these dangerous impulses is essential to the welfare of both staff and clients. Dialectical behavior therapy (DBT) skills are an evidence-based treatment to help individuals better manage emotions and self-harm (Linehan, 1993).

This presentation will review a unique research and treatment intervention provided to 35 incarcerated females in a PA state prison. Student researchers provided four DBT skills training groups to inmates with a history of self-harm. Two of the four groups had therapy dogs and two did not. Assessments of self-harm and coping were obtained during the first and last sessions of group. Attendance was tracked. Qualitative feedback was also obtained from participants at the conclusion of the groups. There were many beneficial results discovered in this research. Participants in the groups with therapy dogs had a significant decrease in self-harm, better attendance and lower drop-out rates. The groups with therapy dogs also had significant decreases in four maladaptive coping strategies. Student presenters will:

- 1) Describe the basics of DBT skills training
- 2) Discuss research goals and assessment measures
- 3) Explain how DBT skill training was taught, including the integration of therapy dogs
- 4) Examine results from the groups with therapy dogs and the groups without therapy dogs
- 5) Summarize qualitative feedback from research participants.

## **Comparison of Grief Support Groups With and Without Animal-Assistance for Incarcerated Males**

Ana Soeder, Caitlin Chavez

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### **Oral Presentation**

#### **ABSTRACT:**

Losing a loved one can be one of the most difficult experiences in life. Imagine learning of this death by phone, being unable to express your feelings, or lacking the support or physical comfort from family or friends. This is an experience all too common for those who are incarcerated. Being unable to grieve may contribute to prolonged or unresolved grief. This presentation will describe a treatment and research intervention provided to incarcerated males in a PA state prison. Student researchers facilitated four grief support groups (two with therapy dogs and two without therapy dogs). This pre- and post-test methodology assessed aspects of grief and bereavement using the core bereavement items assessment and the prolonged grief disorder assessment. At the time of this proposal submission, the research is still ongoing.

Student researchers will:

- \*Describe various steps of implementing research in prisons
- \*Explain challenges around grief and loss for those who are incarcerated
- \*Share assessment measures
- \*Offer preliminary results and qualitative insights

# School of Business

## **Using the Theory of Reasoned Action to Understand First Generation College Students' Intent to Major in Accounting**

Nathan Endres, Cassidy Davis, Ralph Delio Jr., Zachary Gallahar

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### **Poster Presentation**

#### **ABSTRACT:**

According to the Association of International Certified Professional Accountants, the number of students intending to major in accounting remains strong (AICPA, 2017) and the Bureau of Labor Statistics reports accounting as one of the best careers for job stability and compensation. One global accounting firm estimates one-third of its U.S. employees were first-generation college students. This disclosure prompts us to ask whether first-generation students at Slippery Rock University view accounting as a viable career path.

Recruiting and retention of first generation students is important at SRU which recently welcomed its largest freshmen class ever at 1,635 and 43 percent are first-generation. Given the continued influx of first-generation students and their opportunity to choose a career path, our research question is: are there significant differences for why first-generation students choose accounting versus continuing generation? This question is important because students come from diverse backgrounds that may affect their awareness of professional career options.

We will use a mixed-methods approach by analyzing survey data in a path analysis using structural equation modeling. The variables of interest come from the Theory of Reasoned Action (TRA) (Djatej, A., Chen, Y., Eriksen, S., & Zhou, D., 2015) which argues that environmental factors and personal interests affect the decision to pursue a particular career. The TRA also includes the self-efficacy component of Social Cognitive Career Theory (Brown and Lent, 1994). Self-efficacy represents one's belief that they can competently perform certain work. We will also interview high school and college students to obtain information about environmental factors beyond the current TRA model that may influence interest in accounting.

# School of Physical Therapy

## **Do Cranial Synchondroses Influence Basicranial Angulation and Facial Orientation?**

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### **Poster Presentation**

#### **ABSTRACT:**

The floor of the skull (basicranium) in humans is highly "flexed" or angular, and the face is oriented below the anterior part of the basicranium. Previous researchers have attributed brain growth patterns to this gestalt, but some authors have speculated the midline cartilage joints (synchondroses) may grow distinctively in humans to influence basicranial form. In the present study, we investigated three basicranial synchondroses in newborn primates. We test the hypothesis that uneven growth of synchondroses or differently oriented directions of growth influences basicranial flexion and downwardly oriented faces in humans and in our closest primate relatives. Heads of the newborn primates that died in captivity were studied using paraffin histology (10  $\mu$ m thick serial sections, stained with various procedures). Synchondroses between basicranial bones (sphenooccipital synchondrosis, instrasphenoidal synchondrosis) or between the basicranium and face (prespheno-septal synchondrosis, PSept) were photographed using stereo and compound microscopes and compared among six primate species. Our observations reveal that, in all primates, both posterior synchondroses show evidence of longitudinal growth (e.g., columns of proliferating chondrocytes), although quantitative data are needed to determine if these synchondroses grow evenly throughout their ventrodorsal depth. The PSept is observed to grow radially in monkeys in contrast to a longitudinal orientation in lemurs and bushbabies. In some monkeys, PSept diverts ventrally from the rostral end of the basicranium, growing downward. We hypothesize this synchondrosis has a direct influence on facial orientation. As such, PSept may be positioned to promote anterior growth in primates with longer midfaces, presumably an ancestral condition. In monkeys, PSept is of greater height and more downwardly directed, producing taller and more inferiorly positioned faces. The novel growth patterns in monkeys may serve as a model for early growth in humans, which also have reduced midfaces.

# **Secondary Education/** **Foundations of** **Education**

## **Exploration and Literature Review: EV3 Designing and Programming for Elementary Classroom**

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### **Poster Presentation**

#### **ABSTRACT:**

As a professor protégé, the presenter was selected to participate in the Robotics Protégé Program at Slippery Rock University for the 2018-2019 academic year. LEGO EV3 has been adapted by public schools as a part of STEM education and is being widely used among grades K-8 (Leonard et al, 2016). Designing, programming, and testing robots facilitate creativity, critical thinking, computational thinking, and problem solving skills at the elementary and middle school levels, and it specifically influences self-efficacy. Within the Next Generation Science Standards (NGSS), a focus is incorporating the engineering design process into the teaching of science (Kaya, Newley, Deniz, Yeilyurt, & Newley, 2017).

Tasks within this program are to build and program different LEGO EV3 models and to conduct a literature review on STEM education in schools. Also, actions taken toward achieving these results were demonstrated with the creation of a blog.

Encountering issues, such as undesired results, can be seen as opportunities to develop and use critical thinking and problem solving skills rather than regarding these occurrences as failures. As indicated in the literature review above, educators can improve upon and gain knowledge about the use of technology, critical thinking skills, and troubleshooting which is applied to teaching.

Reflection and metacognitive processes are important for teacher development (Williams & Xu, 2018), which blogging about experiences has revealed. Throughout this program, a tolerance for the occurrence of problems has been built and confidence with the use of technology has been gained. As a result, there will be comfort with the use of technology in the classroom. This presentation will raise awareness that the use of robotics will integrate the educational experience for both students and teachers.

## **Preservice Teachers and Poverty Stereotypes**

Madeline McCleary

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### **Oral Presentation**

#### **ABSTRACT:**

This study examined the preconceived notions of preservice teachers toward those from poverty backgrounds at a medium-sized public university in Pennsylvania. The findings from the current study were compared to the findings of Cox et al. (2012) at the University of Tennessee at Martin to see if preservice teachers at similar higher-education institutions, separated by geographic boundaries, have consistent views related to poverty. The current study also aimed to see how the past experiences and beliefs of preservice teachers in western Pennsylvania influence their perceptions of individuals living in poverty. The current study makes use of a survey adapted from Cox et al. (2012) that includes 24 close-ended questions in which preservice teachers were asked about their perceptions of those who live in poverty. Questions from the survey are reflective of common stereotypes and biases related to poverty, and taken together, the researchers were able to determine to what degree these stereotypical views are reflected in the dispositions toward poverty held by these preservice teachers (Cox et al., 2012). The study included 316 preservice teachers who entered student teaching in a 1.5 year period of time and include the following majors: PK-4, PK-4/Special Education K-8, Middle Level (4-8), Secondary Education (7-12), Music, Physical Education, and Foreign Languages. Results of the study indicate that cultural stereotypes about those who are poor persist in preservice teachers in a traditional teacher preparation program, and that these views differ significantly based on when, how, and the ways in which preservice teachers interact with those from poverty backgrounds.

# Special Education

## The Need for Clean Water in the Dominican Republic

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### Poster Presentation

#### ABSTRACT:

Approximately 1,565,000 citizens of the Dominican Republic do not have access to clean water (WHO/UNICEF, 2015). Water can be infected with microbes and bacteria in numerous ways, from improper methods of disposing of human waste to natural disasters. When humans drink water with these microbes and bacteria, they become ill. In fact, 80% of illnesses in developing countries are due to the lack of water purification (UN, 2003). There have been 21,432 reported cases of Cholera in the Dominican Republic since 2010. The solution to this problem is education—how to clean and purify the water (Kramer, 2012). It is important Dominican citizens become aware of the causes of these illnesses so that they can be prevented and so that their quality of life is improved. One of the cheapest and most effective methods of purifying water is with ceramic water filters. Each filter costs around \$10 and lasts a family of 5 for 6-10 years.

I am an Early Ed/ Special Ed major. In February, I will be traveling to Samaná, Dominican Republic and Moca, DR with Steel City Mission Group and will be visiting schools to teach them how to purify their water with these ceramic water filters. We hope to distribute as many water filters as possible to schools and families. We will be conducting science lessons with microscopes to examine the bacteria that is present in their water and will explain to them how it is making them ill. We will also be having a construction team I will be working with to lay clean floors. As a dual education major, I am very grateful and excited for this opportunity and look forward to sharing my experience at the SRU Research Symposium.

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# Classroom Research

# Art

## **When Art and Science Collide**

Alina Glath, Myah Merhaut, Jessica Giuliano, Kiera Thompson, Caitlyn Sweetland, Kaci Flora, Alyssa Edinger, Nicole McGuirk, Emily Geisheimer, Erikka Spaid, Lily Stuijzand, Amanda Lyon

Faculty Sponsor: Ms. Barbara Westman

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### **Exhibit**

#### **ABSTRACT:**

When students are challenged to bring two diverse areas of study together in a collaborative project, all of the students involved gain new and valuable knowledge. The Printmaking and Astronomy collaboration at Slippery Rock University brought together two groups of students from two colleges: art and science. The unusual interdisciplinary collaboration enlightened us about the importance of such undergraduate projects. During the course of this assignment, we learned about six specific astronomy topics, researched by the Astronomy students. This was a rather rare opportunity for the art students. The astronomy students were also able to learn about and attempt printmaking techniques. They also learned how artists develop their ideas for prints. In order for one discipline to understand the other, communication had to be adjusted. As printmaking students, we found new ways of seeing science, not as a requirement but as a rich supplement and source of inspiration for our artworks. The result of this collaboration was a series of six prints created by each student representing the six astronomy topics. There was a broad variety of interpretations and styles. This was one of our most successful projects for the year. Major benefits that were derived from this experience were learning unusual and new topics, improvement of communication, and a newly discovered inspiration in science. The concept of reciprocal learning encourages a partnership in educational processes.

# Computer Science

## **Implementing Multiple Clustering Techniques while Progressing Towards a Simpler Dynamic Routing Process in Vehicle Routing Problems**

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### **Poster Presentation**

#### **ABSTRACT:**

Dynamic Vehicle Routing Problems have been proven to have no real-time optimal solution. In this study, we implemented a methodology where a feasible solution can be obtained in near real-time. The solutions were obtained by applying multiple clustering algorithms individually to the routing problem. Each clustering algorithm provides a unique approach, different from the others, to the grouping of shipments in the routing problem. Clustering methodologies implemented were Partitioned, Grid-Based, Hierarchical, Density, and Probabilistic Clustering. Partitioned clustering creates rings of neighborhoods outward from the vehicle depot, modeling a city center and suburban areas moving outward. Grid-Based clustering divides the shipments into square city blocks. Hierarchical clustering creates a logical tree data structure of the locations which must be visited. Clustering based on density uncovers groups of shipments as well as outliers. Lastly, probabilistic clustering gives the probability of shipments belonging to the same truck. The various methods give multiple perspectives of the overall routing problem. These results from clustering were combined to populate a sparse matrix representing the strength of connectivity between two nodes. This matrix is used for routing trucks using the connectivity strength of the edges obtained using the multiple clustering algorithms in addition to allowing one to skip evaluation of edge connections that lead to infeasible solutions. The matrix additionally allows for near real-time rerouting when connections between nodes are broken at runtime. Thus eliminating the task of recomputing a single heuristic when a connection between nodes becomes unavailable at run time. The implemented algorithms were tested on a standard vehicle routing problem and is being expanded to test on other variations of vehicle routing problems such as vehicle routing problem with time windows and tour orienteering problems.

# Criminology and Criminal Justice

## **The Effectiveness of Mental Health Courts in the Criminal Justice System When Examined in Western Pennsylvania**

Austin Mora

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### **Poster Presentation**

#### **ABSTRACT:**

The overall purpose of this project is to evaluate mental health courts used in Western Pennsylvania. This project will try to answer two research questions. Research question one will try to answer: what is the extent of mental health courts (MHCs) in western Pennsylvania? Within western Pennsylvania which consists of all counties west of Center County it was determined that there are only seven counties with MHCs. These seven counties include: Cambria, Fayette, Washington, Allegheny, Butler, Lawrence, and Erie. An examination from three of these counties will be used to determine how effective they are in the parameters set forth by my research. And research question two will try to answer: where MHC's are used, do they implement known best practices? The literature indicates several factors are used to determine the overall best practice of MHCs which includes whether or not the court uses therapeutic jurisprudence on offenders, if they address the offender's criminogenic needs, and if their overall recidivism rates are low. And finally at the conclusion of this project possible recommendations will be made to help improve the overall best practice of these courts.

# Dance

## Creative Collaboration Between Choreographers and Company Dancers

Sarah-Korrin DeBaisi

Faculty Sponsor: Ms. Melissa Teodoro

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### Oral Presentation

#### ABSTRACT:

From *Pilobolus*, to *Wang Ramirez*, to *Denishawn*, collaboration between choreographers and dancers has become quite the phenomenon. Collaboration in dance has been around for many decades whether it is between choreographers, composers, dancers, technology specialists, or others. The process of collaborating in dance is fundamentally enriching for both the creators and spectators. Having different minds come together to create a piece of art can be extremely rewarding in the long run, but various factors such as differences in style, aesthetics, creative approach and methodology, can make the artistic process difficult. On the other hand, having more people involved in the creative process provides a more diverse perspective of the overall subject matter or concept explored. I also explore the background of Martha Graham as a solo choreographer and her pros and cons of creating as an individual. Studies show that working alone on a project, in general, is more efficient, quicker, and hardly has any conflicts (Aho 1). Working alone gives anyone the freedom to do whatever they want, whenever they want, and however they want. Deciding to collaborate with others in the field has many benefits, difficulties, and successes. However, collaborating with others is not for everyone and can lead to many hardships that may not work out in the long run. Regarding how a choreographer personally decides to create a new piece, I believe that collaboration should be attempted at least a few times before completely tossing the idea and concept away. Collaboration, in the end, has many benefits whether the piece obtains great success or fails. *Wang Ramirez*, *Pilobolus*, and *Denishawn* have all participated in collaboration in one way or another, each attaining great accomplishments during their careers.

# History

## **Suburbs and Scholarship: Women in Higher Education in Bellevue, Pennsylvania, 1904-1914**

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### **Poster Presentation**

#### **ABSTRACT:**

This study examines why the *Red Book* telephone directories of Bellevue, Pennsylvania, exhibit an increased number of female postsecondary students between 1904 and 1914. I argue the *Red Book* included more female students in 1914 compared to 1904 because the streetcar suburbanization movement led to more middle-class families living in suburbs, women gained increased educational opportunities through all-female educational establishments, and the women's suffrage movement generated new public interest in women and education. I use several types of sources, including the *Red Book* directories to characterize women who attended college, Bellevue maps to identify where the students lived, and census records and newspaper articles to observe trends in women's access to education. In 1904, the Pittsburgh suburb of Bellevue, Pennsylvania did not have any women listed as students in its directory, the *Red Book*. By 1914, however, the directory listed forty-five women out of the total 107 students, an increase of 42.1%. During the early twentieth century, technological advancements led to the expansion of streetcar routes, so suburbs like Bellevue experienced an expansion of middle-class families who commuted to work and could afford to send their daughters to school. The proliferation of all-female educational establishments, including seminaries and literary clubs, led to new opportunities for these middle-class women to pursue an education, and, in Pennsylvania, female students adopted an active role in the suffrage movement, bringing considerable attention to educated women as a population and warranting their increased inclusion in directories like the *Red Book*. With both increased access to postsecondary schooling and a heightened general interest in women's education, the women of Bellevue reflect a broader trend as middle-class women nationwide enrolled in institutions of higher education in unprecedented numbers.

# Physics and Engineering

## **Pore Size Distribution in Unconventional Reservoir Rock**

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### **Oral Presentation**

#### **ABSTRACT:**

In the research and production of unconventional reservoirs there has been a lack of complete understanding of the pore structure and pore size distribution existing in formations. Because shales have a pore structure predominantly associated with the clay minerals' orientation, it creates a complex matrix of micro and nanopores. This research is a survey of the studies in the Newark East Field in Texas and the Sichuan Basin in China. The variation in size of pores creates vastly different storage patterns as these pore structures vary greatly from formation to formation. Further work is needed in order to quantify the distribution of pore sizes throughout the reservoir rocks because each has different storage patterns and pore size distributions that are related to their clay content, organic content, mineral orientation, and relative make up. The traditional technique of mercury infusion used to study pores has its downfalls with unconventional shale because the tight pore structure requires extremely high pressures (>60,000 psi), and even then, the mercury does not access the entire matrix. Due to the significant amount of nanopores found within the grain structure a more sensitive measuring technique is needed. A more modern technique used for characterizing materials dominated by micro and nanopores is nitrogen gas-absorption. How this technique, however, fails is that the nitrogen gas-absorption process does not accurately measure large pores within the matrix. Therefore, a hybrid technique is used between the two methods in order to come to a more accurate conclusion. Not only is there the ability to compare results between both methods, but the data from this hybrid process can be used to show a multiscale pore structure, fine mesopores, and the correlation between compaction and decreasing pore size.

## **Gravitational Waves and the Expansion of the Universe**

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### **Poster Presentation**

#### **ABSTRACT:**

The purpose of gravitational wave research is to broaden the general understanding of their function in astronomy, what they can tell us about now, and how they can be used in the future to answer longtime questions about our universe. Gravitational waves are the 'ringing' produced by the collision of two black holes, and they were first detected in 2015 about 400 Megaparsecs away. This proves that black holes really do exist, when they were only theory in the past. In the future, observation of the waves could help us determine the validity of the current theories about the extreme physics of neutron stars, why stars explode, and the expansion of the universe. The ability to measure the expansion of the universe using the waves is an especially notable topic because it is extremely difficult to determine the distance of colliding celestial objects using current methods. With such a new discovery the possibilities are endless, especially as more waves of varying size and pitch continue to be detected. The main objective of this project is to investigate how we can use gravitational waves to determine the distances between galaxies and how those distances can be used to calculate how fast the universe is expanding. This will be done by analyzing works published in scientific journals such as the High Energy Astrophysics Journal and Nature, which discuss the observations of LIGO and VIRGO which are the two observatories that have detected gravitational waves so far.

## **Seismic Mapping of Oil and Natural Gas Reservoirs**

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### **Poster Presentation**

#### **ABSTRACT:**

Through the latest advancements in technology, seismic mapping has become more efficient and given more accurate results than ever before. The use of seismic mapping has given rise to new oil reservoirs and the ability to extract more hydrocarbon from previously drilled wells. I will be examining the techniques used both to find new reservoirs and collect more data from wells of potential reservoirs. I will also delve into how this data is processed by geophysicists and petroleum engineers to model reservoirs through the use of computer software. I will be reviewing articles from the Norwegian Journal of Geology, Terrestrial, Atmospheric & Oceanic Sciences, Society of Petroleum Engineers (SPE) journals, and a few more.

## **Observing Gravitational Redshift with Advanced Imaging from a VLT**

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### **Poster Presentation**

#### **ABSTRACT:**

In May 2018, a certain star named S2 passed within 10 million miles of the black hole at the center of the Milky Way galaxy, allowing scientists to observe an effect known as gravitational redshift. This effect, an increase in the wavelength of visible light from this star, was caused by the massive gravitational field generated by the mass of the black hole, which is approximately 4.6 million times the mass of the sun. Predicted by Einstein in his General Theory of Relativity in 1915, this effect was previously impossible to observe due to large amounts of dust and gas obscuring the center of our galaxy, but recent improvements in instrument precision have changed this. In this project, I will investigate how the gravitational redshift effect was observed using the improved instrumentation, and how this could aid future discoveries. I will do this using information published in the Astronomy and Astrophysics journal as well as sources from Nature and Science. This data was obtained at the European Southern Observatory using its Very Large Telescope (VLT) in conjunction with the specialized instruments NACO, SINFONI, and GRAVITY.

## **Chirped Pulse Amplification**

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### **Poster Presentation**

#### **ABSTRACT:**

Since the invention of the laser, there has been a demand for a laser with high intensity outputs. For a long time, no one was able to overcome the maximum energy output limitations caused by the way light was emitted in the laser. Physicists Gerard Mourou and Donna Strickland invented the method of Chirped Pulse Amplification (CPA), a new way to stimulate the light. The purpose of this research project is to use sources such as the IEEE Journal of Quantum Physics and Journal of Applied Optics to review how these physicists were able to increase the intensity output of lasers using CPA and the applications of this procedure. The power output of a CPA lasers is a thousand times stronger than previous continuous wave lasers. CPA lasers achieve these power levels by emitting a pulse only few femtoseconds long using a simple process to increase the energy output. This three-step process manipulates the light wave by stretching, amplifying, and compressing it. The compression step of the process allows the light wave to release an extremely large amount of energy. CPA is the standard process used in the production of modern lasers. The energy released by an ultra-short laser pulse is used for various purposes from high precision medical surgeries to astrophysics research and much more.

## **Globular Cluster Metallicity Impact on Galaxy Formation**

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### **Poster Presentation**

#### **ABSTRACT:**

The objective of this study is to investigate the importance of globular clusters (GCs) found within the galaxies. GCs are large, densely packed groups of stars. They are found within the Milky Way galaxy, more specifically in the galactic halo. They have recently been detected in the galactic bulge as well. Observations of globular clusters in other galaxies reveal that there are significant differences between the metal content of stars in GCs located in elliptical, spiral and dwarf galaxies. The metal content is related to the age of the cluster, for example a higher metallicity implies younger age. The halo GCs in the Milky Way have less metallicity than the bulge, which has implications for the formation of the Milky Way. By researching data from journals such as the Astronomy and Astrophysics as well as Nature, I will be determining how variations of metallicity influences the formation of galaxies and their evolution.

## **The Mystery of the Corona**

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### **Poster Presentation**

#### **ABSTRACT:**

We do not know much for certain about the Sun's Corona, but here is what we do know. The Corona is the Sun's atmosphere that contains particles, plasma, and little to no oxygen. We also know that the Sun's core is around 15 million degrees Celsius and the Sun's Photospheric temperature is around 5,600 degrees Celsius, but the Corona is somehow around one million degrees Celsius. The Scientific Community expected the temperature would reduce as one moves away from the core, but the temperature that was decreasing with greater distance from the center spikes when one reaches the Corona. Scientists first discovered this mystery in the 1860s when they thought they discovered a new element called Coronium. In the 1940s, scientists realized Coronium was a rare form of iron that had lost 13 electrons; only a great amount of heat could have pulled those electrons off the iron atom. One possible reason for the Corona mystery could be that the motion of the Sun's interior shakes magnetic field lines thus producing waves that collect energy and leave it in the form of heat in the Corona. Other theories revolve around the magnetic field lines becoming tangled, snapping, and heating the gas in the Corona, or plasma jets heating the Corona. The objective of my research is to find the best explanation or combination of explanations for this problem from scientific articles published by scientists working with NASA's Parker Solar Probe and Solar Dynamics Observatory as well as the Daniel K. Inouye Solar Telescope, which will all be continuously monitoring the Sun.

## **The Search for Dark Matter**

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### **Poster Presentation**

#### **ABSTRACT:**

Dark matter is one of the most elusive substances that we know of in the universe and on the forefront of the search for its detection are some of the most sophisticated experiments going on in the world today. I have compared two facilities, each using very different methods for detection of this elusive particle and have reviewed these methods and assessed the effectiveness of the projects by reviewing scientific journals published by the scientists working at these facilities. The Large Hadron Collider at CERN in Geneva, Switzerland is attempting to detect dark matter by creating it instead of detecting a particle passing by. They are doing this by colliding protons which have been accelerated to velocities near the speed of light. The super collider has many layers of ultra-sensitive detectors. These detectors measure the energy outputs of the various regular particles when the protons collide, and in doing this a dark matter particle will be indirectly detected if one is created. Another experiment in South Dakota is using super cooled xenon to detect a dark matter particle. Located at the Sanford Underground Research Facility, LUX-ZEPLIN is the device which will detect a dark matter particle passing through Earth. The principal idea is that if a dark matter particle were to pass through the detector it will interact with the xenon particles and give off both a photon and an electron. Photomultiplier tubes will detect the emitted photon, and an electric field will pull the electron into the gaseous xenon which will then create more luminescence. Currently neither of these detectors have been successful in detecting a dark matter particle, but the hunt continues.

## **How Termite Mounds Can Improve Engineering Research**

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### **Poster Presentation**

#### **ABSTRACT:**

In this project, I am studying termite nests, also known as mounds, to understand how engineers can improve some aspects of their knowledge; such as ventilation systems that maintain a constant temperature without using air conditioner or heater. This research will examine the interior of the mound to see what part plays a significant role in the survivability of the colony and how the termite defends that part from harsh climate like drought, rain, and snow.

## **First Stars**

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### **Poster Presentation**

#### **ABSTRACT:**

For my project I have been researching the first stars in our universe that were created shortly after the Big Bang. These first stars were unlike the others that came after because they contained almost no metal elements, made almost entirely of hydrogen and helium. They are also believed to be hundreds of times larger than the sun and much brighter. Relatively recent observations are believed to have found signals from these stars which would be the first such finding of the first generation of stars. These signals could help us reach further into the past than ever before and begin trying to answer many others questions we have about the origin of our universe. My plan is to specifically research how scientists were able to find these signals using the EDGES telescope in Western Australia. These findings could also help answer other questions about our universe, possibly even the question of what dark matter is made of. For my research I will be reading articles from Scientific American, Nature, Science, and the Astrophysics Journal.

# Psychology

## **Suicidal Thoughts, Insomnia, and Social Support Predict Depression in PTSD in Young Adults**

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### **Poster Presentation**

#### **ABSTRACT:**

Post-traumatic Stress Disorder (PTSD) has previously been associated with comorbid anxiety disorders, sleep disorders, and altered social relationships (Wamser-Nanney, Howell, Schwartz, & Hasselle, 2018). The purpose of this study was to evaluate the association between depression and sleep disturbances, suicidal thoughts, and maintenance of social relationships in young adults with a diagnosis of PTSD. Participants from this study included 161 young adults aged 24-32 who took part in Wave IV of the National Longitudinal Study of Adolescent to Adult Health (AddHealth). This study was a secondary analysis of the AddHealth dataset that examined sleep disturbance (presence of insomnia), social support (feelings of isolation and number of close friends), and suicidal thoughts (past year) in relation to depression in young adults with PTSD. The results showed a significant relationship between depression, insomnia symptoms, and feelings of isolation where sex (male/female) acted as a moderator in some of these relations. Logistic regression was used to evaluate significant predictors of depression. The model contained five independent variables including thoughts of suicide, the number of close friends, ever received emotional counseling, insomnia symptoms, and how often experience feelings of isolation. The full model containing all predictors was statistically significant. Significant predictors included thoughts of suicide, isolation, and insomnia. Participants with thoughts of suicide were 6.77 times more likely to report depression. Depression was also more likely if participants reported feelings of isolation (3.25x) and presence of insomnia (3.3x). The information discovered in the study is important because it deepens our understanding of Posttraumatic Stress Disorder in a general population of young adults.

## **Observation of Collaborative Learning in a Museum Setting**

Kandis Shamblin, Cherice Jackson, Megan Kausmeyer, Cassie Oleksak, Sydney Kresconko,  
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### **Poster Presentation**

#### **ABSTRACT:**

Developmental psychologists are increasingly interested in examining how children learn in a variety of social contexts. Museum exhibits are often designed to promote interaction with materials and prompt conversations to support learning. Such exhibits support a variety of informal interactions between parents and children (or even between children) that may affect what children learn from the exhibit. In order to gain scientific observational skills, students will observe such interactions at the Carnegie Natural History Museum in Pittsburgh and code aspects (e.g., frequencies) of the interactions. This poster describes a project conducted as part of a non-credit seminar (DeVenture – Developmental Enrichment Venture) for students in the Psychology Developmental Concentration. Students are learning naturalistic observation skills through the process of operationalizing variables and developing a coding scheme and instrument related to parent-child interactions at the Museum. Students conducted three 2 ½ hour observation periods at the Carnegie Museum in February, 2019. Each student selected an exhibit to observe and used the standard coding sheet we created to record several aspects of interactions: the type of exhibit (highly interactive vs. strictly visual display), the apparent gender and estimated age of the child, whether an adult views or interacts with the exhibit together with the child or child interacts alone, whether an adult is present with multiple children, and the extent to which engagement with the exhibit involves playful (e.g., running, rapidly moving between exhibits) or educational actions (child asking questions, close to the exhibit, pointing to specific elements of the exhibit). No observations will involve direct interaction with parents or children and no identifying information about observed individuals will be recorded. The observations from multiple visits to the museum will be analyzed to provide a description of common interaction patterns.

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