**Poster Presentations**

**Promoting English Language Acquisition through an Online Learning Environment**  
Cori Agnoni  
Secondary English Education || School of Education  
Faculty Advisor: Dr. Sarah Wright

**Abstract:**  
Burnout is expected when students spend countless hours per week behind a screen. Curriculum developers are, as a result, discussing the challenges of digital classrooms during the COVID-19 pandemic. The stakes rise when the teacher is unfamiliar with learners due to a lack of face-to-face instruction. However, a myriad of creative writing strategies proved effective for elementary learners through an online platform. This research project identifies a series of techniques, such as grabbers, physical copies, and time management, that promote successful English Language Acquisition in an after-school setting. Although learning styles can (and do) vary across environments, the findings proved useful in the ACH Clear Pathways program assigned to me through English 446: Internship. The strategies welcomed varied levels of exposure for students who might be prone to high volumes of burnout due to continuous remote instruction with Pittsburgh Public Schools. My background in Education helped me to create a structure relevant for the after-school program, but demanded that I adapt my pedagogy to mirror age-appropriate instruction in this virtual environment.

**College, Catholicism, and Social Media**  
Rachel Anderson  
Music Therapy || Mary Pappert School of Music  
Faculty Advisor: Dr. James Purdy
ABSTRACT:
Social media, a concept specifically designed to bring people together, can easily be a source of negativity, especially in the lives of teens and college students. However, what are social media’s impacts when it used in the context of promoting positive content such as faith? According to my research, social media holds a great potential for benefitting Catholic college students’ faith lives, even amongst sources of negativity and toxicity that are found through these resources. I inquired how Catholic college students feel social media and the media positively and negatively impact their faith lives, and what is the potential for what social media can do to impact college students’ faith lives. I surveyed 27 Catholic College students at Duquesne University and interviewed Fr. Bill Christy, Director of Spiritan Campus Ministry and Chaplin at Duquesne University, and Debbie Kostosky, a campus minister at Duquesne University. In addition to the survey and interviews, I used non-scholarly and academic sources surrounding the topic of social media and Catholicism. Though the use of social media may have detrimental effects, I believe the findings of this project show that there is great potential for social media to be a place that strengthens and enhances its users’ faith lives.

Calibration of a homemade color-based detector for water contamination
Thomas Aumer & Devin O'Neill
Physics ‖ Bayer School of Natural and Environmental Sciences
Faculty Advisor: Theodore Corcovilos Ph.D

ABSTRACT:
One challenge to the maintenance of safe drinking water supplies, particularly in developing countries, is regular testing of the water for contaminants. We are developing a cost-effective handheld device that can be used to measure the concentrations of common water contaminants such as fluoride and lead. Our device works by measuring optical absorbance changes in samples of water with added appropriate chemical sensing agents. By measuring absorbance of six color bands simultaneously, our device has improved sensitivity and accuracy than existing single-color methods.

We present updated standards measurements of fluoride concentrations between 1 part per million (ppm), by weight, and 25 ppm. We use this data to calibrate our device using Markov Chain Monte Carlo optimization to incorporate a physical model of the measurement process into the Bayesian statistical model.

This work is a collaboration with Profs. David Kahler and Michael Van Stipdonk.

Analysis of stenosed region in artery with its association to velocity and pressure gradient
Durwash Badr & Jordan Houseworth
Biomedical engineering ‖ Biomedical Engineering
Faculty Advisor: Rana Zakerzadeh Ph.D.

ABSTRACT:
Stenosis of an artery which is narrowing of the large arteries usually results from a build-up of plaque within the arteries, a condition called atherosclerosis. Stenosis can worsen over time to completely block the artery which may lead to stroke. The purpose of our research is to study flow patterns of arteries in various shapes of symmetrical and asymmetrical stenosed arteries.

The blood is considered as a continuum and homogeneous and is modeled using the principle of conservation of momentum and mass. The governing equations for the blood flow in arteries are solved
numerically using finite volume method in ANSYS FLUENT Flow Modeling solver. Three geometries particularly 30%, 60%, and 90% stenosis severity are modelled. Furthermore, an artery with an asymmetrical stenosis in which only one half of the artery is blocked is observed. The velocity streamlines and the pressure contours are discussed and compared for each model.

The results show that the blockage disturbs the blood flow and properties of the flow will change as the blood passes through the stenosed region. Due to the sudden decreased area of the artery, the velocity increased in the stenosed region. It is also observed that as the severity of the stenosis increases, the stimulated pressure gradient and the velocity at the stenosed region are greatest. Moreover, the blockage is responsible for developing a turbulent flow regime for the severe stenosis of 90% blockage, which can have a damaging effect on the stenosed artery walls.

DNA Analysis Comparing Collection and Preservation of Semen Samples with the Commonwealth of Pennsylvania Sexual Assault Evidence Collection Kits and Gentueri Sexual Assault Evidence Collection Kits
Brooke Baker
Forensic Science & Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Pamela Marshall Ph.D.

ABSTRACT:
Preservation in sexual assault cases is crucial to yield quality DNA from DNA analysis performed on evidence from rape kits. Rape kits are a form of DNA evidence collection, storage, and preservation of samples from victims of sexual assault. This research studies the Commonwealth of Pennsylvania Sexual Assault Evidence Collection Kits, currently used by the Pennsylvania State Police, and the Gentueri Sexual Assault Evidence Collection Kits. It was hypothesized that there would be a significant difference between the two rape kits in terms of DNA recovery due to different evidence collection and preservation techniques. Several samples of semen were collected and stored, using both rape kits, for various lengths of time. Samples underwent DNA analysis through extraction, quantification, amplification, separation, and detection. The quantity and quality of DNA yielded by both kits were compared to determine which rape kit was more successful in preserving the collected DNA. The expected results are that the Gentueri rape kit will yield a larger quantity and better quality of DNA due to desiccants in the kit that will be more efficient at drying and preserving samples, and a faster packaging and storing process. Collecting and preserving DNA evidence to the best ability in rape kits and reducing the backlog of rape kits in forensic labs is important to aid in the DNA matching and identification of suspects and victims of sexual assaults. Evidence that the Gentueri rape kits provide better DNA results could impact which rape kit is used statewide in sexual assault cases.

Keywords
Sexual Assault, Rape Kits, Quantity and Quality of DNA, DNA Analysis, Preservation

Cultural Appropriation or Appropriate Inspiration? Exploring Claude Debussy's Encounter with the Javanese Gamelan
Alyssa Baljunas
Music Performance (cello) || Mary Pappert School of Music
Faculty Advisor: Paul Miller, Ph.D.

**A B S T R A C T:**
In my presentation, I will consider the possibility that French composer Claude Debussy (1862-1918) appropriated traditional Javanese gamelan music upon hearing it performed at the Paris 1889 World Exhibition. Though composers' integration of “exotic” musical elements for their compositions is frequently perceived as acceptable or even complimentary, it could, in some cases, represent the disrespectful adoption of ideas known as cultural appropriation. Therefore, I will discuss why the sounds of the gamelan appealed to Debussy so extensively as well as when his admiration for atypical musical elements truly originated. Coupled with this explanation, I will provide excerpts from some of Debussy’s own letters to further express his intentions. In order to emphasize the specific gamelan elements Debussy utilized, I will analyze the components of his piano composition "Pagodes". My overall goal is not only to discuss Debussy’s influence from the East in terms of cultural appropriation, but also to aid in developing a more knowledgeable approach to understanding and judging this frequent acculturation of music.

Information System Application
Isabel Bauer, Lexi Angelone, Luis Avila & Hannah Campbell
HMS and Information Systems || A.J. Palumbo School of Business Administration
Faculty Advisor: Karoly Bozan, Ph.D.

**A B S T R A C T:**
Our project comprises developing a software application for an oil company called Vallourec. They came to us students at Duquesne University looking for some potential solutions in some of their departments; one of them being their overhead crane operations. In this symposium, we solve an organizational challenge they have by creating an application that helps employees audit safety checks by using Agile project management skills. The application has a login/registration feature, a platform for employees to enter data regarding the operations of the crane, a submission feature, a code for managers to oversee the data, and a qualtrics survey where employees can give feedback on the usability of the new software. We receive feedback from our project sponsor and make adjustments necessary that suit the needs of our customer. We meet several times throughout the week as a team virtually to accomplish our deliverables using scrum methodologies. What is discussed in our meetings are what we have done since our last meeting, what we will do between now and our next meeting, how close we are to hitting our goal for the week, and any potential challenges we may face that impedes meeting our next goal. Flexibility and communication are the foundation of our teamwork that generates into the software application.

The evaluation of fitness costs on antiplasmodial strains of Asaia bogorensis in the Anopheles sp. mosquito midgut
Marissa Bennett
Biology || Bayer School of Natural and Environmental Sciences
Faculty Advisor: David Lampe, Ph.D
Additional Authors: Christina Grogan (graduate student), Dr. David Lampe, Ph.D (faculty)

**A B S T R A C T:**
Malaria is caused by parasites in the genus Plasmodium and is transmitted by Anopheles sp.
mosquitoes. Transgenic modification of symbiotic bacteria in the mosquito midgut can be used to change phenotypes of mosquitoes, a process called paratransgenesis. Asaia, a Gram-negative bacterium, is a potential bacterial candidate known to colonize in Anopheles sp. midguts, salivary glands, and ovaries. Asaia was previously successful at reducing Plasmodium infection of mosquitoes when engineered to secrete scorpine, an antiplasmodial effector protein. Production of these antiplasmodials, especially the effector scorpine, can have toxic effects on host bacterium, potentially leading to great fitness costs. Industrial applications for protein production overcome some of these problems through the use of fusion carrier proteins to help with folding and solubility of proteins, and possibly insulate the effects of proteins on the bacterium. We analyzed several different carrier proteins. The carrier proteins selected were glutathione-S-transferase (GST), 6xHis, thioredoxin (TrxA), maltose binding protein (MBP), and a small myc tag (Myc) were individually fused to the C-terminal end of the scorpine effector. To determine the fitness of Asaia strains carrying these constructs growth curves, in vitro competition assays, and in vivo colonization assays were performed. All strains showed a significant difference in maximum growth rates compared to the wild type. Three of the new strains, 6xHis, TrxA, and Myc, performed as well or better than a previous strain fused alakaline phosphatase to scorpine, while MBP performed significantly worse in two of the three assessments. Further implications will be tested using Plasmodium inhibition assays.

Study of Human Memory and an Analysis of the Effects When Erased
Ashley Berdel
Biochemistry || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Matthew Ussia Ph.D

ABSTRACT:
Neuroscientists with psychologists are exploring the mechanism within the brain that stores and makes memories. There are experiments being done to create a world where your memories can be erased all together. Memories are constantly revised with new information as when a memory is recalled it is susceptible to revision. It is unknown currently why there are different responses to traumatic experiences. Although our brains are very complex, scientists have been able to create a few theories on how our brain process’s fearful memories. Within their research they have discovered that electrical currents and well-timed pharmacology could lead to effective targeted psychotherapy in the future. Although this experiment did not work for those suffering with post-traumatic stress disorder, leading to worse symptoms. Currently researchers have been able to alter the memories in mice. Using mice, researchers could revise the negative memories in male mice to positive memories. Every time the mice ventured to a certain part of their enclosure the mice’s negative memory was reactivated and they learned to fear that area. Scientists were able to pinpoint the mouse’s negative memory of a shock to their foot. Psychologists have studied the effects of antibiotics D-cycloserine in helping with augment extinction in conjunction with cognitive behavioral therapy. This project will explore the effect of erasing memory.

Smartphone-Based 3D Printed Microscope
Benjamin Bernarding & Grace Ingram
Biomedical Engineering || Biomedical Engineering
Faculty Advisor: Bin Yang Ph.D
A B S T R A C T:
Conventional compound light microscopes found commonly in labs and high school science classes are
delicate, expensive, and sometimes pose a challenge when learning how to use one for the first time.
According to the Microscopy Society of America, schools would need about $1,000 to buy only about 10
microscopes. Therefore, most would need to acquire outside funding. In this project, we aim to improve
the accessibility of microscopy by leveraging the power of smartphones and 3D printing technology.

The microscope was modeled in Fusion 360, pre-processed using Ultimaker Cura slicing software, and
printed with a Creality Ender 3D printer. A flat LED light source was used to provide uniform illumination
for samples.

The 3D printed microscope is compact, robust, and user friendly. Two mirrors at 45-degree angles
significantly reduce the overall footprint. The microscope consists of one objective lens, one eyepiece,
and adjustable sample and smartphone stages. The objective lens is interchangeable. This 3D printed
microscope enables the user to easily procure specimen images and capture them on their mobile
devices with a lower learning curve than using a conventional compound light microscope. Because 3D
printing filament is inexpensive and robust, our 3D printed microscope is cheap to make and resistant to
drops and harsh use.

School districts and labs alike will now have the option to equip their labs and classrooms with this
cheaper, more robust, and easier to use 3D printed microscope. High-quality images of specimens can
then be shared and studied with other lab users and students.

Evaluating Concussion Nondisclosure in College Athletes using a Health Disparities Framework and
Appreciation for Social Determinants of Health
Neha Bhandari & Spencer DeMedal
Biology || Rangos School of Health Sciences
Faculty Advisor: Erica Beidler Ph.D., LAT, ATC

A B S T R A C T:
Context: There is limited research concerning concussion nondisclosure in college athletes and the
relationship between social determinants of health, including race, healthcare access, and
socioeconomic status (SES). Disparities were observed in high school athletes with Black athletes lacking
access to an athletic trainer (AT) having the poorest outcomes.

Objective: To investigate whether concussion nondisclosure disparities exist by race, SES, and sports
medicine (AT) healthcare access preceding college, and to understand the potential differential factors
in concussion reporting between Black and White college athletes.

Design: Cross-sectional

Setting: College athletics

Participants: 735 college athletes (84.6% White, 15.4% Black)

Main Outcome Measures: Participants completed a questionnaire assessing diagnosed concussion
history and concussion nondisclosure, including reasons for not reporting a suspected concussion.
Additional demographics were collected on race, SES, and AT access in high school.
Results: 15.6% and 17.7% of White and Black athletes respectively reported a history of concussion nondisclosure. No significant differences were found by race for history of concussion nondisclosure distributions (p=0.57). Reported reasons for nondisclosure displayed differences by race for: “At the time I did not think it was a concussion” (p=0.045) and “I thought my teammates would think I am weak” (p=0.03) with Black athletes reporting these more frequently than White athletes. FRL and HS AT access were not associated with concussion nondisclosure within White or Black athletes.

Conclusions: This data helps to understand race and its intersection with other social determinants of health potentially influencing concussion nondisclosure outcomes in college athletes.

Phillip II: Architect of a Superpower
Joseph Towell
History || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Jotham Parsons Ph.D

A B S T R A C T:
The Macedonian Empire is one of the most studied states of the ancient period, especially its time spent under Alexander the III also known as Alexander the Great. 25 years before Alexander the Great began his famous conquest from Greece to India the kingdom of Macedon was a weak backwater that was unable to defend even its own borders. What could have facilitated the Macedonians meteoric rise from a second- or third-rate power to the dominant military power of the known world? Through an in-depth look at primary and secondary sources as well as modern studies conducted by military historians and archaeologists, it is clear that Phillip II created the stable foundations for the Empire to be built on. Phillip II's upbringing in Macedon and Thebes created a capable and confident political leader and general. Using these skills gained throughout his childhood Phillip would at first use his cunning in diplomatic measures, giving Phillip the time that he needed to make the military and economic reforms on which his empire was to be built. Phillip then used this combination of diplomatic skill, military innovation, and a rejuvenated economy to explode out of the Macedonian mainland to conquer all of mainland Greece in a mere twenty-three year. Phillip II has largely been overshadowed by his more famous son, but Phillip II's victories prove that he was one of the most capable warrior kings to come of antiquity.

Eliminating Error in Science: An Analysis of the NAS Report and the Progression Towards Increased Credibility in the Forensic Science Community
Sydney Bivens
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Lyndsie Ferrara Ph.D

A B S T R A C T:
Forensic science bridges the gap between hard science and law. In most criminal cases, the scientific evidence being introduced was analyzed by a discipline under forensic science. However, as always, science is never perfect. In 2009 the National Academy of Sciences Committee released the “Strengthening Forensic Science in the United States” Report to identify what needed to be done in the forensic science community. This Report created a list of thirteen recommendations to improve the overall credibility and reliability of the forensic science field. Some of these recommendations included the removal of all public forensic laboratories from the control of law enforcement agencies and the
avoidance of bias and errors. My poster reviews the progress that has been made in the past twelve years since the report and discusses possibilities for continued improvement.

**Turning a Blind Eye: A Catholic Perspective on Justice**  
Kayce Boggess  
Forensic Science and Law || Bayer School of Natural and Environmental Sciences  
Faculty Advisor: Elisabeth Vasko Ph.D.

**Abstract:**  
Catholic teaching affirms a “right to life” that every life is sacred and equal in the eyes of God. However, in the 21st century, this conversation has focused almost entirely on abortion and euthanasia yet has given little attention to mass incarceration. Twenty-five percent of the world’s prison population is in the United States, the majority of whom are African American and Latino. This poster will explore the significance of Catholic teaching on human dignity for mass incarceration in the United States. By using articles from Bryan Massingale, Vincent Lloyd, Katheryn Getek Soltis, and others and combining them with information from organizations such as the Equal Justice Initiative, and those who work directly with criminal justice reform, this poster examines the problems with the modern justice system. This poster shows that a new conversation is needed about human dignity and the value of life to truly encompass what it means to have a “right to life.”

**Development of the Single Integrated Operational Plan and its effects**  
Matthew Bosack  
History || McAnulty College and Graduate School of Liberal Arts  
Faculty Advisor: Andrew Simpson Ph.D.

**Abstract:**  
American Nuclear Policy developed in a unique way in the early years of the Cold War. With the introduction of nuclear weapons, countries had to become acquainted with not only new tactics, but also with preparing for a new kind of war. For years, pressures from enemy nations forced American nuclear policy to evolve multiple times to meet certain expectations. New non-nuclear technology was also introduced at the time, but it played a great role in policy development. The American Single Integrated Operation Plan (SIOP) was one of the first integrated plans for nuclear war that considered multiple scenarios and options.

This paper will focus on the how American SIOP developed in the 1960’s and the threat it posed. It will look into the several strike options written into the plans, the types of weapons to be used, and the detrimental effects of a nuclear strike. The aggressive nature of the plan will also be mentioned along with the reactions from members of the U.S. government. I will also briefly discuss the ignorance for the after effect of some strike options that neglected foreign sovereignty. The first SIOP developed in the 1960’s sought to use America’s nuclear might to its fullest potential and can be seen as nuclear Blitzkrieg.

**Hamamatsu Multi-Anode Photomultiplier Tube Performance Estimation and Cataloguing**  
Aiden Boyer  
Physics || Bayer School of Natural and Environmental Sciences  
Faculty Advisor: Fatiha Benmokhtar Ph.D.  
Additional Author: Dr. Valery Kubarovsky, Ph.D. (Advisor, Jefferson Lab)
**Abstract:**
The Hamamatsu H12700 and H8500 Multi-Anode Photomultiplier Tubes (MAPMTs) are amplification devices that measure the intensity and spectrum of an emission of light. A collection of these MAPMTs are used in the two Ring Imaging Cherenkov Detectors (RICH) of the CLAS12 Spectrometer in Hall B at The Thomas Jefferson National Accelerator Facility. The two RICH detectors use the principle of Cherenkov radiation to distinguish kaons from pions and protons resulting from high energy electron scattering experiments. One RICH was installed in 2018 and the second one is under construction. Here I report on a performance estimation done for 612 MAPMTs across both RICH detectors. The devices will be analyzed based on their gains, dark currents for different operating voltages, luminosity sensitivities of the cathode and anode, and sensitivity to blue light. Recently, preliminary work has been done to prepare an online database to house all of the PMT information in a conveniently accessible place, the details of which will also be included with the analysis.

**Entry-Level Occupational Therapy Doctoral Student’s Self-Efficacy for the Doctoral Capstone Experience: A Qualitative Analysis**
Lindsey Brand & Haley Kabo
Occupational Therapy || Rangos School of Health Sciences
Faculty Advisor: Ann Cook OTD, OTR/L

**Abstract:**
Bandura (1977) describes self-efficacy as a person’s belief in his or her performance capabilities with respect to a specific task or situation. During clinical learning experiences, individuals often struggle with the ability to feel and exemplify confidence in their abilities as healthcare students. Students may particularly struggle with their confidence and self-efficacy as they shift from a highly supervised to a more self-directed experience as they advance in their education (Bandura, 1977). As such, clinical mentors during this experience have the potential to help students foster this confidence through feedback, verbal persuasion, and role modeling (Bandura, 1977). The purpose of this research study was to examine the self-efficacy of entry-level occupational therapy doctoral students during their Doctoral Capstone Experience (DCE). The participants in this study included 6 entry-level occupational therapy doctoral students who have recently completed their DCE at a private university. This research poster will highlight the qualitative data that was collected through the use of semi-structured phone interviews with the participants regarding their relationship with their Site Mentor during the DCE. The data collected from these interviews was synthesized into case studies and coded in order to obtain six themes surrounding factors that influenced the participant’s efficacy beliefs. This presentation will highlight the themes that arose from the interviews and will emphasize the implications the data has for future occupational therapy doctoral students and their capstone coordinators.


**Societal Pressures Women Have Faced Throughout the Centuries**
Braylyn Bruno
Strategic Public Relations and Advertising || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Laura Engel Ph.D.
A B S T R A C T:
The purpose of the project is to illustrate the social and political challenges women have faced throughout the centuries based on Lisa Loomer’s, “The Waiting Room”. Women have faced many societal pressures over the years in relation to beauty, and these pressures are shown through the lives of Forgiveness From Heaven, an eighteenth-century Chinese woman; Victoria, a nineteenth-century English woman; and Wanda, a modern woman from New Jersey.

All three of these women are from different time periods and seem to lead very different lives, but they are all connected by the pressures women face to be beautiful and act a specific way. The poster takes us through the journeys of each of the women and then aims to connect their stories and difficulties to one another.

The analysis of the play allows for a deeper understanding of the women created by Lisa Loomer and how these issues are still apparent in today’s society.

Thumb Brace for Injury Prevention in those with Distal Hyperextensibility
Madison Burchfield, Nina Dorfner, Brennon LeCave & Christian Sarro
Biomedical Engineering || Biomedical Engineering
Faculty Advisor: Michael Nilo MS

A B S T R A C T:
Distal hyperextensibility, commonly known as Hitchhiker’s Thumb, is classified as a joint hypermobility disorder where the thumb is able to bend backwards past the normal point of motion. The upper interphalangeal joint is a uniaxial hinge joint acting as the origin of thumb hyperextension. Distal hyperextensibility accounts for varying degrees of extension in the upper interphalangeal joint ranging from 0° to severe 90°. The increased mobility from this trait increases the chance of injury to the thumb, which is a large problem facing athletes.

In order to increase stability of the thumb in athletes with distal hyperextensibility, we designed a thumb brace that allows the thumb to function while preventing hyperextension. Existing orthopedic solutions restrict movement of the thumb joints and are typically used as acute injury treatment instead of prevention. User needs such as preserving grip strength, cost-effectiveness, comfortability, washability, and joint mobility are all considered in our design. The brace protects both the interphalangeal (IP) and the lower metacarpophalangeal (MCP) joint.

A minimum viable prototype was constructed out of recycled finger splints, Velcro straps, and hot glue. After evaluating challenges with the first prototype, the design was modified and modeled on Fusion360. The next prototype version will be 3D printed and undergo force tests as outlined in the device verification and validation plan. The final design will be made out of polypropylene, Velcro, and dry fast foam to provide athletes with hitchhiker’s thumb the stability they require for injury prevention during physical activity.

How does Dr. Suess Help English Language Learners
Lauren Byers
Secondary Education || School of Education
Faculty Advisor: Majerica Rainey
ABSTRACT:
Dr. Seuss’ books are an effective way to teach English Language Learners (ELLs) English because of his uses of phonemes, semantics, and repetition. But what are English Language Learners? They are students in the process of acquiring the English language. Phonemes are the tiniest units of sound that a language has. These are essentially what words are made of to combine to make morphemes. By using these techniques, along with repetition, students can better learn the English language by sounding out words over and over again that rhyme to become familiar with the language. Suess uses other semantic techniques to help young readers learn such as synonyms, antonyms, and polysemy. Without knowing it, readers learn semantics along with words to develop their language.

Frightfully Intriguing: Exploring Relationships Between Fear and Morbid Curiosity
Renne Cabacungan
Psychology || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Alex Kranjec Ph.D.

ABSTRACT:
Fear and curiosity are two basic driving forces behind human behavior. These two concepts may combine to create the blended concept of morbid curiosity, a relatively new construct in psychological research. Despite the growing research into people’s morbid interests, there has not been an investigation exploring the relationship between morbid curiosity and what people are afraid of. The current study assesses the relationship between people’s specific fears and their morbid curiosities using two scales. The first scale consists of scenarios describing different kinds of situations commonly perceived as fearful, asking participants to self-report how frightening they perceived each scenarios to be. Fears were chosen from the following five broad categories: death, mutilation, loss of autonomy, separation, and ego death. The second scale asks participants to self-report their agreement with statements regarding morbid fascinations. The results may lead to insights about what people fear the most and whether relations between certain types of fears and morbid curiosity exist in the general population.

The Religious Imagery of the Dove (and Other White Birds) in The Grimm Brothers’ Fairy Tales
Kaya Cammerata
English || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Mathew Scruggs

ABSTRACT:
The Grimm Brothers, the compilers of The Grimm Brothers’ Fairy Tales (1812), strived to maintain and spread the truths and customs of the German people. However, since many of the stories were developed and told in informal settings, they dealt with broader topics such as the moral values of “right and wrong” and the power struggle between “good and evil.” When documenting the narratives, Brothers Grimm maintained these thematic tools as common occurrences in many of their stories. They
did this specifically through the imagery of white birds, and how they interact with the characters that are either morally right or morally wrong.

Through documenting the actions of the white doves and other birds within the tales of Hansel and Gretel, Cinderella (Aschenputtel), The Three Languages (Die Drei Sprachen), and Little Snow White (Schneewittchen), it can be discerned that the Grimm Brothers maintained, and even altered, the religious themes within the tales which continue to influence readers and societies today.

**Prediction of Rupture Risk in Abdominal Aortic Aneurysm: The Role of Intraluminal Thrombus**

Burton Carbino, Alexis Throop, Alexander Guy & Nicole Bohatch

Biomedical Engineering || Rangos School of Health Sciences, Biomedical Engineering

Faculty Advisor: Rana Zakerzadeh Ph.D

**A B S T R A C T:**

The abdominal aortic aneurysm (AAA) is a localized dilation of the central aorta that asymptptomatically develops over long periods of time until sudden rupture. The majority of AAAs harbor an intraluminal thrombus (ILT). Thick thrombi may exacerbate hypoxic conditions in the arterial wall, which may contribute to altered collagen production and increased wall degradation. It is hypothesized that different ILT geometries can enhance wall strength while also inhibiting oxygen transport and inducing arterial wall degradation. The aim of this work is to simulate AAAs with variable ILT dimensions and analyze how ILT thickness and size influence AAA rupture.

A comparison between different ILT morphologies was performed. Geometric variations studied include the thickness, length, and degree of asymmetry of the ILT. Nine two-bulged, symmetrical AAAs were modeled with varying ILT thicknesses (0.1 cm, 0.2 cm, or 0.4 cm) and lengths (4 cm, 6 cm, or 8 cm) using CAD software. A Finite Element Method simulation of the Fluid-Solid Interactions (FSI) between arterial wall, ILT and blood was solved to assess the influence ILT geometry has on wall stress and oxygen concentration.

Results are presented for wall stress and deformation patterns, lumen pressure and velocity fields, and oxygen concentration within the ILT and arterial wall. While ILT geometries were found to reduce wall stress, our simulations demonstrated that thicker and longer ILTs reduced oxygen transport, leading to wall degradation. As expected, the maximum wall stress site was located near the hypoxic regions of the AAA wall. Thus, ILT geometry could influence AAA development and rupture.

**Export, Pennsylvania: Reinvention by Necessity**

Adam Farbarik

History & Secondary Education || McAnulty College and Graduate School of Liberal Arts

Faculty Advisor: Andrew Simpson Ph.D.

**A B S T R A C T:**

This research questions the declining population trend that Export, Pennsylvania has experienced since the 1920s. Furthermore, it locates Export in the larger story of western Pennsylvania’s development as a coal economy. The rise and decline of Export are traced by examining changes in population, housing, fortunes, and the education system over time. Census data is used to map the change of the population, the number of individuals who graduated high school, and the number of homes built in Export. Additionally, newspaper articles and artifacts are used to demonstrate the change in this community
Semen Identification Through the Detection of Fructose Levels

Emily Chadwick
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Pamela Marshall Ph.D.

ABSTRACT:
Body fluids such as semen, blood, saliva, urine, and vaginal fluid are commonly found at crime scenes and can give investigators insight into what occurred. In order to differentiate body fluids, detection and confirmatory tests have been developed and are used to determine the composition and identity of a body fluid. Currently, the acid phosphatase test is used to detect semen. However, vaginal fluid can also contain acid phosphatase which can lead to a false positive or negative test result causing problems in sexual assault cases. Although semen contains acid phosphatase, it also contains a high concentration of fructose. The purpose of this study is to determine if the fructose concentrations of these common body fluids can create a baseline fructose level. The goal is to determine if the concentration of fructose can be used as a detection method for semen, as it is believed semen has the highest fructose concentration. In this study, the concentration of fructose in semen, blood, saliva, urine, and vaginal fluid samples will be determined by identifying the amount of free fructose in each sample with the use a fluorometric assay. This fluorometric assay takes the free fructose in the samples and converts it enzymatically to β-glucose which determines the concentration of fructose present in the sample. Preliminary data will show that fructose is found in higher concentrations in semen. If this method of identifying semen is found to be viable it will benefit sexual assault cases.

Evidence-Based Guidelines for Milk Collection

Julia Ciotti & Kayla Devlin
Nursing || School of Nursing
Faculty Advisor: Alison Colbert Ph.D., PHCNS-BC, FAAN

ABSTRACT:
Research has shown that breast milk has numerous benefits, especially for fragile or vulnerable babies. When babies are hospitalized, the safe pumping, storage, and transportation of breastmilk is a vital component of successful health outcomes. For mothers who are incarcerated, breastfeeding has many obstacles. There is a commitment to try and increase breastfeeding at the local county jail, but there is not a comprehensive protocol in regard to breastmilk pumping, storage and transport to their infants in the NICU. To ensure that these vulnerable infants are able to receive these critical nutrients, we sought to develop evidence-based guidelines on milk collection and distribution. We reviewed the literature and collaborated with the nursing staff from West Penn Hospital, Allegheny County Jail, and Mid-
Atlantic Mother’s Milk Bank. The review of the literature found that incarcerated mothers are not able to successfully breastfeed, mostly because they are often separated from their newborns, leading to issues initiating breastfeeding and establishing a strong milk supply. The guidelines developed provide procedures supported by the literature, and tailored to the specific circumstances of the jail and hospital, for whom breastmilk is considered a form of medicine. For example, the policy includes specific recommendations about the bottles that can be accepted, and the labeling that is required. By enhancing education of nurse leaders on current best practices regarding breastfeeding and breastmilk handling, we can assist mothers who are incarcerated who want to breastfeed to work with ACJ and hospital staff to ensure their infants safely receive their milk.

Appreciation for self-deprecating humor and its link to anxiety and depression
Lauren Cocozza & Emma LaRocque
Psychology || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Alex Kranjec Ph.D

A B S T R A C T:
Many college students use social media to express themselves, as well as to share creative content, like memes. Memes come in many varieties on the internet, which include ones containing self-deprecating humor. Self-deprecating humor can sometimes be used as a form of coping, especially for people with mental health concerns. Since college students interact with memes on a daily basis, this study aims to find a relationship between participant’s appreciation of memes containing self-deprecating humor, and their mental health. College students will be presented a variety of memes, some that contain self-deprecating humor, and others that do not. Students will also be asked to rate each meme for its humor, relatability, “shareability” valance, and overall quality, in addition to questions pertaining to their mental health; including depression and anxiety. Appreciation for particular memes will be compared to individual differences in mental health attributes. This research will help us better understand how college students share emotions and create a sense of community over the internet, which has a large impact on their social lives, especially while COVID-19 has isolates students from in-person interactions.

An Approach to Time Clocks During COVID-19
Jenna Crouch, Abbigail Delmonte, Paa Kwabena Darko & Ryan Faust
Health Management Systems || Rangos School of Health Sciences
Faculty Advisor: Karoly Bozan Ph.D

A B S T R A C T:
The objective is to find a substitute for on-site time clock locations since this is where team members congregate at the beginning and end of their shifts. This puts employees at risk for contracting the COVID-19 virus. A possible solution to minimizing the risks of COVID-19 is to implement an application that can be downloaded on all of the worker’s phones. This will provide a virtual way for clocking in and out of their shifts. The app will contain multiple features such as location identification, biometric identification, sanitization schedule, plant map, and team chat. The various features allow employees to effectively clock their hours remotely. The plant map allows employees to see where people last logged onto the time clock service. This helps minimize employee face-to-face contact. The sanitization schedule allows employees to see when a common space has last been cleaned by sanitation staff members. Therefore, knowing if the common area is clean and safe to use. The biometric identification through the app will allow employees to log in quickly and easily. Finally, the location identification recognizes the location of the plant so that the employees can only access the time clock feature while at work. Our team worked well together through the use of zoom meetings, Slack discussions, and
Team Ghantt in order to effectively create this app safely and remotely. We were able to learn how to work well together and effectively manage projects each week through completion of weekly deliverables and assignments.

History of Re-Entry for Returning Citizens and The Barriers They Face
Kari Danser
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Lyndsie Ferrara Ph.D.

A B S T R A C T:
Returning citizens face a multitude of barriers upon re-entry. Some of these barriers include housing, employment, and having support systems. Resources such as parole, probation, halfway houses, and other programs are offered to ease the stressors of re-entry. These barriers can also be linked to higher recidivism rates. These barriers were previously studied to determine and identify re-entry barriers. A landscape study was used to identify re-entry barriers through previous published studies. The history of re-entry was also studied. These barriers were then observed to determine the most common barriers that returning citizens faced. The hypothesized result is that returning citizens face barriers upon their release that can impact their success. It is also expected that there are common barriers that returning citizens encounter upon re-entry. It is predicted that the history of re-entry shows that there have been and continue to be similar barriers. If these barriers are understood, programs can better assist returning citizens with their re-entry. Returning citizens may then overcome these barriers and have a lower chance of recidivism.

English Language Learners in the Elementary General Music Classroom
Nina Day
Music Education || Mary Pappert School of Music
Faculty Advisor: Rachel Whitcomb Ed.D.

A B S T R A C T:
Over the past few decades, the demographic and the number of students who are enrolled in English Language Learners (ELL) programs have dramatically shifted. Teachers and schools are responsible for helping ELL students to reach their fullest potential in all subjects. One unique benefit of the music classroom is that it does not require much verbal communication. From my background of being an ELL student, music was a discipline and therefore a classroom with no language barriers. Over the years, researchers have proven that language acquisition is much like music acquisition. My investigation focuses on how music and language acquisition is similar and, strategies to help ELL students succeed in the elementary general music classroom. These strategies not only benefit the ELL students but their general classroom peers. Along with strategies, I will present how to incorporate multiculturalism in the classroom to create an all-inclusive, diverse environment. The goal of this research is to help music teachers understand the importance of helping ELL students in the elementary general music classroom. Strategies that will be discussed include how to incorporate wait time, giving positive feedback, how to use visual aids, and how to help students especially in the current climate with online platforms.

ConsTemp: a remote, constant, temperature monitoring system
Adriana Del Pino Herrera, Karli Sutton, Jarrett Boyd & Rachel Rauh
Biomedical Engineering ‖ Biomedical Engineering
Faculty Advisor: Michael Nilo Ed.D

A B S T R A C T:
Within the medical industry, vital signs, such as temperature, are imperative for early diagnosis of a patient’s condition. Often, this will require nurses or physicians’ assistants to routinely monitor a patient’s temperature over a set time frame to observe any potential deterioration in their condition. One of the greatest problems with taking temperature vitals in hospitals is the use of surface temperature, which is less accurate and can be impacted by environmental factors, as compared to internal temperature. Another problem with the current method of taking a patient’s temperature is that there are multiple contacts between a nurse and a patient. In most of today’s cases, nurses are required to routinely enter a hospital room to take a patient’s temperature, which means a nurse will make contact with a patient several times. Therefore, we are developing a device whose goal is to provide a way for nurses to remotely monitor and access constant temperature measurements of bedridden patients in hospitals, to reduce the amount of patient contact when working with patients with infectious and highly contagious diseases such as COVID-19. We propose a non-obstructive, inner ear temperature sensor that will take continuous temperature measurements. The temperature sensor will have Bluetooth capabilities so that alerts can be sent to a physician’s mobile device and allows them to routinely check on all of their patient’s temperatures with ease and reduce the risk of exposure.

Collegiate Athletes’ Anxiety-related Concussion Perceptions
Abbigail Delmonte & Lauren Bell
Health Management Systems ‖ Rangos School of Health Sciences
Faculty Advisor: Erica Beidler Ph.D. M.Ed. B.S.

A B S T R A C T:
While previous literature has focused heavily on concussion knowledge and reporting, few studies have explored how collegiate athletes feel about this injury. The aim of this study was to determine anxiety-related concussion perceptions of collegiate athletes and investigate factors that may be associated with increased anxiety. We conducted a cross-sectional survey study of 303 male and 179 female National Collegiate Athletic Association athletes from 7 institutions in various sports. Participants voluntarily completed the survey. The outcome of interest, anxiety-related concussion perceptions, was assessed using the Perceptions of Concussion Inventory for Athletes (PCI-A) anxiety score. The questionnaire captured personal and sport demographics, self-reported diagnosed concussion history, mental health history, concussion knowledge, and sources of concussion information acquisition. Variables associated with higher anxiety-related concussion perception were identified using univariable logistic regressions and a backward stepwise multiple regression. Collegiate athletes displayed moderate anxiety-related concussion perceptions. The majority of participants reported that concussions are upsetting to them (60.7%), with a sizable proportion being worried (46.7%), fearful (40.7%), and anxious (25.0%) about sustaining a concussion. In the multivariable regression, higher perception that concussions have long-term effects (OR=2.72; 95% CI=1.79-4.12, P<.001), greater beliefs of internal control to influence concussion outcomes (OR=1.78; 95% CI=1.15-2.75, P=.01), and female sex (OR=1.77; CI=1.15-2.71, P=.009) were associated with higher anxiety-related concussion perceptions (R2=0.07; P<.001). The results of our study suggested that anxiety about concussions is prevalent in 60.7% of collegiate athletes. Addressing these perceptions at the individual-level may be critical for improving emotions related to concussion, particularly in female athletes.
The Consequences of Racial Invisibility on Asian-American Youth
Cassie DiBenedetti
Data Science || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Emad Mirmotahari Ph.D.

A B S T R A C T:
The Asian-American experience is comparatively less documented in the United States – in relation to racial strife and racial justice discourse. The relative “racial invisibility” of Asian-Americans has created adverse psychological experiences and challenges for the Asian-American community, and specifically for college-aged Asian-American youth. Existing research demonstrates that the discrimination and marginalization of Asian-American adolescents are linked to depressive symptoms. These behaviors against Asian-Americans are commonly inflected through the “model minority” myth and foreigner objectification. Since the appearance of COVID-19, racial tensions and hate acts against the Asian-American community in the United States have been on the rise, which is why this subject has become increasingly relevant.

Effect of Curcumin on Steroid Sulfatase Activity in the Rat Liver
Mia DiFrancesco
Biology || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Kyle Selcer Ph.D.
Additional Authors: Barathi Balasubramonian (graduate student), Kyle Selcer, Ph.D. (faculty)

A B S T R A C T:
Turmeric is a spice derived from the herb (Curcuma longa) used throughout Asia as a flavoring and coloring agent in food and as a medicinal herb. Turmeric is taken for depression, diabetes, inflammation, arthritis, cancers, and other conditions. Scientific study of turmeric is limited with mixed results. More research is needed to support the suggested roles of turmeric as an antioxidant, anti-inflammatory, antiarthritic, antimicrobial and anticancer agent. Among the bioactive compounds in turmeric, much emphasis has been on the polyphenol compound curcumin (1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione) and its analogs. These compounds comprise about 3% of turmeric. Our laboratory studies activity and regulation of the enzyme steroid sulfatase (STS), which is upregulated by inflammation in bone and liver cells. Our interest in curcumin stems from its reported anti-inflammatory activity. This paper examines the effect of curcumin on STS activity in rat liver, a tissue with high levels of STS and a model for metabolic inflammation. We measured STS activity in rat liver homogenates with and without curcumin (0.1, 1.0 and 10µM). The 10µM curcumin group showed slight but significant reduction in STS activity compared to control, while the 1.0 and 0.1µM groups were similar to control. A second experiment using 10 and 20µM curcumin showed significant reductions in STS activity in both treatment groups. Our data reveal that curcumin decreases STS activity in rat liver homogenates. The mechanism for the decrease is likely competitive interference with estrone sulfate, an STS substrate. Future experiments will explore whether curcumin can regulate and/or block STS activity.

The Need for Nature-Based Playgrounds: Design and Implementation
Adelina DiTullio
Early Childhood Education || School of Education
Faculty Advisor: Christopher Meidl Ph.D.
A B S T R A C T:
The impact of nature on childhood development is especially critical in a time when technology within the world continuously advances and expands. Nature offers the opportunity to fully experience life physically, emotionally, and spiritually, down to the deepest level of being. Children greatly benefit, and fully engage into the benefits of nature within life and learning. Allowing children the opportunity to be engrossed in nature-based learning provides a new perspective and meaning to the world and education for young minds. Outdoor learning among nature is as important as learning within a traditional setting. Providing outdoor, nature-based spaces that encourage exploration enhance childhood development.

The ABK Learning Center located in Pittsburgh, Pennsylvania implemented a fully functioning outdoor, nature-based playground center to bring traditional classroom learning outside into nature. The outdoor play space was created with multiple learning-based centers all made from and within nature. These centers incorporate standards traditional learning centers in a functioning nature center to bridge learning within nature. Each area of the playground was designed to support learning and childhood development. A curriculum was developed to further develop the relationship between education and nature, ensuring that children have the ability to learn and play simultaneously through nature. The curriculum, designed to support each area of the outdoor learning space, was aligned with NAEYC and state standards to further integrate learning in a nature-based setting. The purpose of this research is to examine the effectiveness of the nature-based playground and curriculum design, specifically after implementation.

Gamifying a Biomedical Engineering Course: Influences on Student Engagement
Nina Dorfner
Biomedical Engineering || Rangos School of Health Sciences, Biomedical Engineering
Faculty Advisor: Rana Zakerzadeh Ph.D.
Additional Author: Rana Zakerzadeh, Ph.D. (faculty)

A B S T R A C T:
Controlling the spread of COVID-19 and promoting safety within the pandemic has called for necessary remote education over the past year. In online learning environments, students have fewer opportunities to engage with their peers and instructors. In order to stimulate engagement in virtual learning, instructors should adapt their teaching practices, which will improve lecture engagement and motivation to learn among students. The incorporation of games is one potential solution to resolve these issues in remote course delivery.

In this work, we share some ideas and methods for the development, implementation, and evaluation of academic games in remote teaching. Various game ideas are suggested, and the key elements to execute games in an online environment are elaborated in detail. Moreover, the specific steps for implementation and evaluation of Bingo in a third-year biomedical engineering course teaching introductory biofluid mechanics and biological flow concepts, are provided.

The preparation of Bingo involves creating a list of keywords and using an online Bingo card generator to make and distribute the cards. The class then meets virtually on zoom to play Bingo in the implementation stage of gamification. Finally, the Bingo game success is assessed via a short survey where students rank their perception of engagement by responding to different statements. Our preliminary results show positive prospects to improve student engagement, which is much needed in the rapid adaptation of remote teaching. Challenges in implementing games in online biomedical engineering education and future improvements to our gamification approach are also considered.
The Role of Topoisomerase I in Herpes Simplex Virus Infection
Raegen Esenwein
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Faculty Advisor: Jill Dembowski Ph.D.
Additional Authors: Jill Dembowski, Ph.D., Jessica Packard

ABSTRACT:
Human topoisomerase I (Top1) is an enzyme necessary for normal growth and development. Cellular Top1 ensures that DNA transcription and replication occur properly by relieving the topological stress of supercoiled DNA. To do so, Top1 creates nicks in a single strand of DNA, allowing for relaxation of the DNA as replication occurs. When cells are infected with herpes simplex virus type 1 (HSV-1), most cellular processes, including replication, are shut down or altered to replicate the virus. Previous studies have found that Top1 interacts with viral DNA. Based on its role on cellular DNA, it is believed that Top1 may help regulate viral transcription and/or replication. It is hypothesized that if the activity of Top1 in HSV-1 infected cells is altered, there would be effects on viral transcription and replication. To test this hypothesis, we are utilizing two methods that alter the expression of Top1 in cells. The first method is to knockout the Top1 gene by engineering a plasmid with CRISPR/Cas9 capabilities to create a mutation in the Top1 gene leading to a halt in production of Top1 proteins. The second method is the utilization of commercial inhibitors of Top1. We recently made the novel observation that the inhibitor, camptothecin, reduced virus production in cells. These studies will lead to future conclusions on the effects and role of Top1 in HSV-1 infection including what specific steps in the virus life cycle are affected.

Detection of CBD Product Components Under Different Storage Conditions
Jordyn Essinger
Forensic Science and Law Program || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Stephanie Wetzel, Ph.D.

ABSTRACT:
The use of marijuana for medical, pseudomedical, and religious purposes began as early as 5000 years ago. The purpose of this study was to identify and quantify the different components in a variety of cannabidiol oils and to analyze how these components degrade over time when stored under a variety of conditions. Since these products are primarily designed for use within 1-2 months, the effects of long-term storage conditions have not been extensively researched. Samples of each product were extracted using liquid-liquid extraction and tested using gas-chromatography to quantify the three main components: cannabidiol, cannabinol, and tetrahydrocannabinol. They were then stored under different light and temperature conditions for a period of one year, during which they were tested in the same manner at one-month intervals. The expected results are that oils stored under conditions of increased light and higher temperature will degrade faster than oils stored with less light and a lower temperature. Understanding how these oils may degrade over time will allow for the development of better testing methods and an easier identification during testing for these products.

Factors Associated with Increased Concussion Knowledge in Youth Athletes
Ashley Evans, Kaelin Agar & Priyanka Mitta
A B S T R A C T:

Concussion recognition and immediate removal from activity decisions commonly fall to athletes and parents at the youth sport level due to a lack of on-site sports medicine care. Previous studies have investigated concussion knowledge of youth athletes, but few have considered multiple factors across the socioecological model that may influence knowledge. The aim of this study was to investigate factors associated with increased concussion knowledge in youth athletes.

This was a cross-sectional survey study of 390 youth contact sport athletes ages 8-14 from Pennsylvania (62.8%) and Michigan (37.2%). The youth athlete survey included demographics and a previously used 47-item concussion knowledge assessment. A parent survey was also used to capture parent concussion education, parent concussion knowledge, and participant, sibling, and parent diagnosed concussion history. Univariate analyses informed multivariable linear regressions to identify if age, state, sport, multi-sport participation, concussion education, concussion history, sibling concussion history, parent concussion history, parent concussion education, or parent concussion knowledge were significantly associated with youth athlete concussion knowledge.

Youth athletes had a mean concussion knowledge score of 35.0±5.7 out of 47. Never receiving concussion education (P<.001), a history of diagnosed concussion(s) (P=.01), sport type (relative to girls’ ice hockey, P&lt;.001), older age (P&lt;.001), and parent concussion knowledge (P=.04) all accounted for significant variance in youth athlete concussion knowledge.

Youth athletes correctly answered only 74.5% of concussion knowledge items on average. There were a variety of factors that contributed to youth athlete concussion knowledge; however, an important modifiable factor that increased knowledge was previous concussion education.

A High Throughput Microfluidic Bacteriophage Plate Assay for Rapid Sepsis Diagnosis

Alexander Evans

Biomedical Engineering || Biomedical Engineering

Faculty Advisor: Melikhan Tanyeri Ph.D.

A B S T R A C T:

Sepsis is the body’s extreme response to an infection which can be a life-threatening medical emergency. Sepsis happens when an infection you already have triggers a chain reaction throughout your body. Without timely treatment, sepsis can rapidly lead to tissue damage, organ failure, and death. According to the CDC sepsis kills approximately 250,000 people in the US each year. Fortunately, bacteriophage therapies are being researched all over the world to provide relief to bacterial infections, including sepsis. However, phage therapies have not yet been approved in the US or Europe, currently making these treatment options unavailable or as a last resort experimental treatment option. The problems with the traditional agar plate are the risks of contamination, the laboriousness of the process, the amount of resources required to run each test and the time it takes for the culturing to be complete. Here, we present a microfluidic device, called MAPPA (Microfluidic Agar Plate Phage Assay), that performs a high throughput phage plate assay with fewer resources, low contamination risk, and faster response times. This means MAPPA could rapidly test the effectiveness of phage on different bacteria and could detect possible dangers posed by phage, assisting in phage therapy approval. Furthermore, it could determine, at an increased rate, what kind of infection a person has in their body and which kind
of phage should be used for treatment. MAPPA could further phage therapy research and could find the necessary treatments to prevent tissue and organ damage caused by sepsis.

**Nina Simone's "Mississippi Goddam" and its Relevance to Black Lives Matter**

Ryssa Ezykowsky  
Music Therapy || Mary Pappert School of Music  
Faculty Advisor: Nicole Vilkner Ph.D.

**ABSTRACT:**  
Nina Simone’s “Mississippi Goddam” was written as a response to the Birmingham Church bombing in 1963. Her song became an anthem for the civil rights movement and was the first of many civil rights songs she wrote. Simone was looked at as radical, angry, and unpredictable. At the time it was written, music was heavily censored. The fact that Nina Simone was not only a black female musician but was also using strong language in her lyrics was a great sacrifice, as Simone could have lost her career and her life for a song like “Mississippi Goddam.” Southern states banned her song from the radio, and the stations sent her records, broken in half, back to her. Simone’s manager and husband urged her to stop making protest music, as she was blacklisted from performing. Simone’s protest music paved the way for other artists at the time looking to make a change in the world. Looking further into the civil rights movement and analyzing “Mississippi Goddam” will show the impact this song had on the civil rights movement. “Mississippi Goddam” was a song that called attention to the problems facing the black community and was a call of action to gain more support for the civil rights movement. Analyzing the lyrics show the song’s relevancy and importance to the Black Lives Matter movement happening today.

**The Efficacy of Nuclear Fusion as a Source of Energy**  
A. Louise Ferris  
Physics and Spanish || Bayer School of Natural and Environmental Sciences  
Faculty Advisor: Michael Huster Ph.D.

**ABSTRACT:**  
Nuclear fusion is an appealing option as an alternative energy source. As of present, however, there are still scientific problems left to be solved to allow it to be a viable option. In this review, first the two common types of nuclear fusion, Inertial Confinement and Magnetic Confinement, will be discussed. The economic efficacy of this as an energy source, assuming the scientific discrepancies are solved, is discussed for each type. Then, the environmental impact of nuclear fusion in comparison to other non-renewable and renewable energy sources is discussed. Given that it is scientifically possible, this review will prove that nuclear fusion is not only a reliable energy source, but one which has great economic and environmental impacts should it be used more regularly.

**Sympathetic Ganglion Blocks for pain management in patients diagnosed with Complex Regional Pain Syndrome: A Critically Appraised Topic**  
Lauren Foote  
Athletic Training || Rangos School of Health Sciences  
Faculty Advisor: Sarah Manspeaker Ph.D., ATC  
Additional Authors: Sarah Manspeaker PhD, ATC (Faculty), Erica Beidler PhD, LAT, ATC (Faculty)
Abstract:
Clinical Context: Complex Regional Pain Syndrome (CRPS) is a secondary neurological condition that may occur following traumatic injury or surgery which can be treated using conventional (e.g. physical therapy) and unconventional (Sympathetic Ganglion Block) treatment. Sympathetic Ganglion Blockages (SGB) are a spinal nerve block that is used as adjunctive therapy to treat patients with CRPS who have not seen symptom relief from use of conventional treatments alone. Synthesis of Evidence: Effectiveness of SGB was analyzed by comparing perceived pain level pre and post-introduction of SGB. In one randomized control trial (de Oliveira Rocha, 2014) patients noted statistically significant decrease in pain on the NPSI scale with an average of 3.47 ± 3.5 and p-value less than .05. The second randomized control trial (Kim, 2019), patients documented decreased pain from 8.00±3.8 to 5.27±1.22 on the NRS scale. In the cohort study (Yucel, 2009) a decrease in pain on the VAS scale from 7.8±1.1 to 1.3±1.1 and p-value less than .001 was documented. Within first case series (Gungor, 2018) decreased pain was measured subjectively through patients’ ability to cease use of pain medication and achieve full participation in activities. In the final case series (Wei, 2014) patients reported an average of 63.2% reduction in spontaneous pain on the NRS scale with p-value of less than 0.001. Conclusion: Evidence suggests SGB, provides an effective form of pain relief among patients who failed to experience pain relief using conventional treatments alone. Level of Evidence: Level A indicating consistent, good-quality patient-oriented evidence.

The Possible Biological Mechanisms of Placental Inflammation as a Result of Ambient Air Pollution: A Literature Review
Isabella Galbo
Physician Assistant Studies || Rangos School of Health Sciences
Faculty Advisor: Bridget Calhoun Ph.D., PA-C

Abstract:
In 2019, air pollution moved from the fifth to the fourth leading cause of death in the world, accounting for 6.67 million deaths. An expanding amount of evidence suggests that mothers’ exposures to ambient air pollution during gestation may contribute to adverse health affects immediately after birth, including low birth weight and preterm birth. As air pollution exposure rates continue to grow alarmingly quick around the globe, scientists are examining not only the effects of air pollution on infant health, but the biological pathways through which such adverse effects occur. The purpose of this literature review is to examine the biological mechanisms of placental inflammation as a result of ambient air pollution. The prevalence of air pollution and the effects on infant health are also considered.

"The Use of Narrative Method in Julia Alvarez's In the Time of the Butterflies"
Geno Gallo
Biology || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Susan Howard Ph.D.
Additional Author: Susan Howard, Ph.D. (faculty)

Abstract:
In the Time of the Butterflies, written by Julia Alvarez, is a piece of historical fiction chronicling the lives of the Mirabel sisters, whose brazen opposition to the tyranny of dictator Rafael Trujillo served to
inspire a nation and bring about change in the Dominican Republic. Alvarez’s novel, a fictionalized retelling of the sisters’ lives, is told from four perspectives, with Minerva, Dede, Maria Teresa, and Patria each offering their own unique insight into the Dominican political and cultural landscape of the mid-1900s. Of particular interest are chapters attributed to Maria Teresa, whose story is told through a series of diary entries. In this poster, titled The Use of Narrative Method in Julia Alvarez’s In the Time of the Butterflies, the narrative method employed to transcribe Maria Teresa’s thoughts and experiences, and its effect on the story as a whole, is evaluated. Drawing upon the works of Steve Criniti and Manuel F. Medina, both of whom authored argumentative pieces on the novel, the impact of Alvarez’s utilization of a unique narrative technique is analyzed by considering its role in illustrating the development of Maria Teresa’s political opinions and character, as well as the extent to which her entries offer an expansive view of Dominican culture.

**Optimization Yield and Purity of Recombinant Primate Semenogelin Fragments**
William Gibbs, Taylor McClure & Clancy McIntyre
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Michael Seaman Ph.D

**A B S T R A C T:**
Proteins found in semen are among the most rapidly evolving in primates, due to intense forces of natural and sexual selection. Humans, chimpanzees, and gorillas utilize very different mating systems, and therefore experience varying levels of sexual selection. In order to understand the molecular basis of adaptation under these forces, we expressed recombinant fragments of the human and chimpanzee semenogelin proteins, which are the most abundant protein in primate seminal plasma. We expressed these proteins in an E. coli system under a variety of conditions in order to optimize yield and purity. These methods included using different protein fragments, different levels of protein induction, and different affinity chromatography approaches. Once these protein fragments are produced and purified, they will be used in enzymatic assays to quantify biochemical differences among human and chimpanzees, in an effort to understand how natural and sexual selection has shaped the evolution of reproductive proteins in response to different mating patterns.

**DNA Integrity and Fungal Contamination as a Function of Time in Freshwater Drowning Deaths**
Maeve Godshalk
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Jana Patton-Vogt Ph.D.

**A B S T R A C T:**
Drowning and drowning deaths are categorized as a public health issue. Fatal and potentially criminal drowning often results in the inability to process evidence. Tissue is subject to fungal contamination due to decomposition of the body and the nature of a freshwater environment. Materials for biological testing are expensive and it is not cost effective to process potentially contaminated samples. Many crime labs will choose not to process such samples due to assumed DNA degradation, mostly due to fungus. Candida albicans is an opportunistic, pathogenic fungus found in the human body. It lives on the skin and inside of the body, typically without any harm to the host. It is the primary organism to invade and contaminate the host in such environments. By inoculating tissue samples with a clinical wild-type strain of C. albicans in river water, optical density readings at different time points can be taken to determine the rate at which the fungus grows in relationship to the tissue. Tissue extraction,
amplification, and quantitation can be completed to determine the level of tissue degradation, and if that is positively or negatively correlated with the growth rate of the fungus. The results are expected to support the hypothesis that there is positive correlation between the two, with a rate of turnover to be determined. This work aims to give forensic laboratories a better understanding of tissue contamination as it relates to fungus, and improve decision-making in regard to processing such samples.

**Slow Control of Ring Imaging Cherenkov (RICH) Detector**

**Slow Control of Ring Imaging Cherenkov (RICH) Detector**

Joshua Goodwill

Physics || Bayer School of Natural and Environmental Sciences

Faculty Advisor: Fatiha Benmokhtar Ph.D.

Additional Author: Nathan Baltzell

**A B S T R A C T:**

A Ring Imaging Cherenkov Detector (RICH) has replaced a sector of the Low Threshold Cherenkov Counter (LTCC) in Hall B of Jefferson Lab. The photo matrix of the RICH detector consists of 391 multi-anode photomultipliers (MAPMTs) aligned in a trapezoid. Each MAPMT has 64 pixels which can detect Cherenkov photons. Cherenkov radiation is generated by particles moving faster the speed of light in a dielectric medium (aerogel tiles), resulting in photons being emitted in a forward conic direction. Proper safety precautions must be followed when experimenting with the detector. Each of the 25,024 pixels of the detector must adequately record data of certain variables, which is then displayed for viewing. The four main quantities needed to ensure accurate maintenance of the detector are temperature, high voltage, low voltage, and scalers. The data from the electronics are recorded through Experimental Physics and Industrial Control Systems (EPICS), resulting in real-time access to hardware performance. To efficiently filter the data for human consumption, it is displayed on a graphical user interface (GUI). The slow control monitor has been updated and implemented into the RICH detector's software. A scaler GUI has been generated to visualize the amount of photon hits per second on each pixel. Mapping of each MAPMT has allowed easy access to information about each component in the detector. An experimental run was simulated by utilizing a two-dimensional Gaussian function to display the expected color scheme. The slow control system is now operational, and the operators have necessary variables required for safety.

**Understanding Pharmacy Students' Attitudes and Knowledge of Medical Marijuana**

Olivia Goodwin

Pharmacy || School of Pharmacy and the Graduate School of Pharmaceutical Sciences

Faculty Advisor: Anita Zuberi Ph.D.

**A B S T R A C T:**

In the medical community, views on the efficacy and acceptability of medical marijuana have been evolving over the past five decades as more states have legalized medical marijuana. Currently, medical marijuana is legal in 33 of the 50 U.S. states, with the majority of these states enacting laws in 2010 or later. With the prevalence of medical marijuana growing, it is essential for students studying in the medical field to be informed and ready to face cases of medical marijuana prescription once they enter the workplace. The aim of this literature review is to explore pharmacy students' attitudes toward the legality of medical marijuana and their overall knowledge of the subject of medical marijuana. Multiple
studies are examined which assess pharmacy students in their knowledge of medical marijuana, including qualifying conditions and adverse effects, as well as their attitudes toward the incorporation of medical marijuana education in pharmacy curriculum. The results found in these studies are used to determine whether pharmacy students feel prepared to enter the workforce with their knowledge of medical marijuana or if they need further education on the topic.

Health Care Systems Response to COVID-19
Alexandra Gordon
Pharmacy || Rangos School of Health Sciences
Faculty Advisor: Andrew Simpson Ph.D.

ABSTRACT:
New Zealand's health care system has many features that are very different from the United States, allowing them to reduce disparities within their population especially during COVID-19, contrary to the U.S. The main difference between the two countries is that one has universal health care coverage with the option of private health insurance while the other is dominated by private insurance and they see gaps in their governmental insurance system. The presence of universal health care seems to help reduce the effects of COVID-19 on the underserved populations. I created this comparison by analyzing population statistics such as the percent of the population that has access to healthcare in addition to investigating how healthcare is related to government in each country. Comparing the two health care systems helps us further understand how New Zealand handled COVID-19 in such an organized and swift fashion, and how they reduced the effect of health disparities on the devastation of COVID-19. New Zealand began with an elimination approach, which is taking steps to slow the entry of the pandemic and prevent an initial spread and then apply measures to help avoid overwhelming health services. On the other hand, the United States followed more of a mitigation approach, which failed and then transitioned into a suppression strategy. The effectiveness of their healthcare systems decisions determine how devastating COVID-19 is on their country.

Extraction of CBD from gelatin edibles with analysis by PSI-MS
Cheyenne Granger
Forensic Science & Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Michael Van Stipdonk Ph.D.

ABSTRACT:
Recently the United States has observed a steady rise in the legalization and consumption of cannabis related products. With this observed increase, an influx in cannabis related evidence could likely cause significant disruption to evidence intake and analysis for many crime labs. Current methods of analysis for gelatin edibles, one of the most commonly consumed cannabis products, include HPLC (high performance liquid chromatography) or derivatization for GC-MS (gas chromatography mass spectrometry). While these methods are extremely useful, the use of PSI-MS (paper spray ionization mass spectrometry) may provide increased efficiency of identification and quantification of CBD content in gelatin edibles. By developing the technique called SIPSI-MS (silver impregnated PSI-MS), a more efficient identification of CBD extracted from a gelatin matrix was observed. Quantification of the extracted CBD from a gelatin matrix will likely have similar efficiency to that of the identification process. Overall, this research may demonstrate that there could be significant improvement to CBD gelatin edible analysis via SIPSI-MS, if the equipment can be widely available to crime labs. This will allow for crime labs to cut cost and time off of their current analysis of CBD from gelatin matrices and
may provide a significant solution to offset the setbacks observed by increased cannabis usage. This research may also be considered significant for the quality assurance and purity issues observed in cannabis edibles. Further research with SIPSI-MS for identification and quantification of THC from edibles, may further contribute to forensic analysis of these products.

The Effects of Bulimia Nervosa
Olivia Gray
Psychology || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Anna Knutson Ph.D.

Abstract:
According to Pediatrics and Child Health, eating disorders have continued to surface among adolescents at an alarming rate over the past thirty years (“Eating Disorders”, p. 1). They are the third most represented chronic illness among adolescent females with a five percent occurrence rate (“Eating Disorders”, p. 1). Bulimia nervosa, commonly known as bulimia, is a serious eating disorder in which the affected typically has episodes of binge eating and attempts to limit the effects of this binging by purging, excessive exercise, or fasting. This condition causes much damage to the body, and it can have detrimental or irreversible effects on the development of adolescents; it may become serious enough to lead to mortality. Therefore, it is important to be aware of potential adolescents that may be at high risk for the disorder and ensure that these types of issues do not arise. If they do, it is critical to pursue proper treatment immediately before it becomes a life-threatening issue. Details about the symptoms and their effects on development will follow.

Keywords: Eating Disorders, Bulimia, Effects, Development

Surgical Smoke
Kathryn Grieb, Hannah Poremba & Cara D'Angelo
Nursing || School of Nursing
Faculty Advisor: Alison Colbert Ph.D., PHCNS-BC, FAAN

Abstract:
Surgical smoke is produced as a byproduct of heat-generating devices that are used during the perioperative period and has numerous implications for the health of perioperative staff and patients. To help address the consequences of surgical smoke, the Association of periOperative Registered Nurses (AORN) has established the Go Clear award, a designation recognizing hospitals that have taken the necessary steps to mitigate the effects of surgical smoke. UPMC Magee-Women’s Hospital has recognized the implications of surgical smoke and expressed interest in attaining the Go Clear award. An informational survey was sent to all perioperative staff to determine the knowledge level and interest among staff, as a first step toward applying. The survey included three sections where staff reported their demographic information, and rated their level of knowledge about surgical smoke and interest in learning more about the Go Clear award. In preliminary analysis, a total of 65 people participated: 48 nurses, 3 physicians, and 10 surgical techs. The majority of participants demonstrated minimum understanding and knowledge of surgical smoke, as well as the AORN Go Clear award. The majority of the participants were willing to learn more about the consequences of surgical smoke and implement necessary changes in order to protect themselves. Results of this survey suggested that there is a lack of education on surgical smoke for perioperative staff. An education program should be developed.
including the harmful consequences of surgical smoke, the goals of the AORN Go Clear Award Program, and existing evidence-based solutions.

**Solid Phase Extraction Method Development of Synthetic Opioids from Oral Fluid**
Nicole Haase  
Forensic Science and Law | Bayer School of Natural and Environmental Sciences  
Faculty Advisor: Stephanie Wetzel Ph.D

**Abstract:**  
Synthetic opioids like fentanyl are great contributing factors to overdose cases in the United States today. Fentanyl is a highly potent synthetic opioid that is prescribed to relieve pain, and has a high potential for abuse and dependence. In this study, a solid phase extraction (SPE) method was developed for extracting fentanyl, fentanyl analogs, and other similar synthetic opioids from oral fluid. The following drugs were analyzed: fentanyl, acetyl fentanyl, acryl fentanyl, furanyl fentanyl, U-47700, and 4-ANPP. The obtained saliva samples were spiked with one of the aforementioned drugs, extracted out using a SPE method, and analyzed using the Agilent 6460 Liquid Chromatography-Triple Quadrupole-Mass Spectrometer (LC-QQQ-MS). Expected results include producing a method that adequately and efficiently extracts opioids from spiked saliva samples. Since drugs have a small detection window in oral fluid, blood or urine samples are often utilized in forensic labs instead, but the benefit of testing saliva is that it requires noninvasive sample collection and isn’t easily contaminated. Further research directions include the development of new drug detection methods and the improvement of already studied drug detection methods. In the forensics field, there is a constant need for the improvement of pre-existing techniques and the emergence of new methods through research that can then be adapted for use in forensic laboratories.

Keywords: synthetic opioids, fentanyl, solid phase extraction (SPE), oral fluid

“Exploring Arousal Response using EyeLink 100 and PsychLab Galvanic Skin Conductance Device to Determine Influence Between Varying Levels of Auditory and Visual Stimuli”
Sydney Haedrich  
Psychology | McAnulty College and Graduate School of Liberal Arts  
Faculty Advisor: Alex Kranjec Ph.D

**Abstract:**  
There are several ways to measure arousal responses to different kinds of stimuli. Using visual stimuli, it has been shown that pupils dilate and the electrodermal activity of the skin increases during arousal. Auditory stimuli can also trigger the same arousal responses. Less is known about the combined effects of differentially valanced auditory and visual stimuli on skin conductance and pupil dilation. The current experiment will seek to determine the arousal response to paired stimuli of positive and negative images and positive and negative sounds. Utilizing EyeLink 1000 eye tracking software as well as a PsychLab galvanic skin conductance device, we will measure pupil dilation and skin conductance responses to a number of positively matched, negatively matched, or mismatched stimuli. It is hypothesized that mismatched pairs may elicit the largest arousal response. However, it is unknown how specific perceptual mismatches will influence arousal across measures. This research will thus explore how meaningful violations of basic valence pairs across perceptual modalities may differentially influence emotional responses as measured by distinct embodied responses to visual and auditory stimuli.
Counterfeit Medications and Their Impact on Global Health
Sydney Haedrich
Psychology || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Gerald Boodoo Ph.D

A B S T R A C T:
The mass manufacturing and selling of counterfeit medications has caused a wellbeing deficit on a global scale. Even your trusty acetaminophen and your moms’ herbal remedies are no strangers to being mass produced by countless underground and unregulated facilities that bring in billions of dollars a year, and that is only the tip of the iceberg. This study goes to show how harmful it can be to allow these uncontrolled productions to exist and how they lead to a reduction in global health and prevention of controllable disease. Formulated out of chalk, dirty water, and inactive ingredients, albeit unclean materials, these drugs are formulated to not be detected as fakes while providing no health-related support at all. These drugs are sold a lessened cost targeting lower income households and individuals who may not have adequate access to healthcare and are desperate for any kind of help. It also goes to show how some of the world’s largest countries overlook counterfeit drug production because of the profit they collect from it and how having minimized regulations helps these counterfeiters in the shadows. If there is no reform on these corrupt regulations and a drive to increase drug safety is not demanded we will continue to see an increase in preventable disease, healthcare disparities, and crime that is associated with them.

Direct Sampling and Identification of Illicit Substances Impregnated in Paper using Paper-Spray Ionization Mass Spectrometry
Kyra Hardenburg
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Michael Van Stipdonk Ph.D.

A B S T R A C T:
Illicit drugs continue to be significant threats to public health, law enforcement, and national security. In the United States, drug poisoning deaths are the leading cause of injury death, outnumbering deaths by firearms, motor vehicle crashes, suicide, and homicide. In many prisons around the United States there has been a major problem with illicit substances being brought into prisons through drug-soaked mail. As the number and potency of illicit drugs rise, the need for rapid, selective and sensitive analytical techniques increases as well. Paper spray ionization is a newly developed ambient source used to analyze solid or liquid compounds on the surface of a paper substrate. Paper spray ionization has been developed as a direct, fast and low-cost sampling and ionization method for mass spectrometric (MS) analysis of complex mixtures without the need for sample preparation or cleanup. Analyte ions are generated by applying a high voltage and a small volume of solvent onto a paper sample. This research aims to determine if paper spray ionization mass spectrometry is an effective method for direct sampling and identification of illicit substances impregnated in paper. This information can then be put towards reducing the threat illicit substances pose on society, specifically on prisons and jails. It is expected that the findings obtained from this research will confirm that this method is an effective test for identification of illicit substances impregnated in paper. After this method is proven to be effective, the number of drugs being smuggled into prisons could be lessened significantly.
Refining the lipid facing structure of the Human a1 Glycine Receptor (GlyR) in resting and desensitized states using phosphatidylcholine and crosslinking mass spectrometry (CXMS)
Regan Harmon & Adriana Duncan
Biology || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Michael Cascio Ph.D.

A B S T R A C T:
The glycine receptor (GlyR) is a transmembrane receptor that plays a key role in inhibitory responses via hyperpolarization of post-synaptic neurons. This pentameric ligand gated ion channel (pLGIC) has three allosteric states: resting, open, and desensitized. Understanding these various states will help to create a more accurate understanding of how GlyRs work. Interactions between the receptor and membrane lipids modulate allosteric changes that affect GlyR function. Phosphatidylcholine is a major component of the lipid bilayer that can be used to illustrate these protein-lipid interactions. Through the use of a phosphatidylcholine crosslinker paired with tandem mass spectrometry (MS/MS), the defined intermembrane region can be analyzed to determine the interaction between proteins and lipids. State-dependent crosslinking with phosphatidylcholine of lipids to purified, reconstituted wild type GlyR were performed in both the resting (no ligand) and desensitized (excess glycine) allosteric states of the receptor. The results of MS/MS are predicted to show cross-linking between phosphatidylcholine and amino acid residues on the transmembrane M4 helix due to its position and map outward facing regions in a state-dependent manner.

Identification of Counterfeit Alcohols in Cocktails by Electrospray Ionization-Mass Spectrometry
Derek Heacox
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Michael Van Stipdonk Ph.D

A B S T R A C T:
In May of 2020, as a result of SARS-CoV-2 virus, distilleries in Chiconautla, Mexico were labelled non-essential, resulting in an influx of counterfeit liquors by criminal organizations. 20 people in Chiconautla died as a result of consuming the counterfeit liquor. The consumption of counterfeit alcohol is a worldwide problem, developing a method to the legitimacy of alcohol consumed could save thousands of lives yearly. The purpose of the study is to determine if a counterfeit alcohol can be found in a cocktail-like solution using Electrospray Ionization- Mass Spectrometry (ESI-MS). Past literature predominantly focuses on the alcohol by itself, additionally, there are little to no resources that mention the addition of ingredients that could mask the methanol upon examination. Multiple alcohols were tested using ESI-MS to determine the baseline fingerprint of the spirit prior to addition of methanol. Synthetic spirits would then be created to be used as control and counterfeit alcohols. The results will show that in the cocktail-like solutions the counterfeit alcohols can be located and identified. Results of this study could be the basis to create a litmus test for a product that can be dipped in an alcoholic beverage to identify whether or not a counterfeit alcohol is present.

Generational Differences in How Women View Themselves in the Workforce
Mallory Hebert
Psychology, International Relations || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Elizabeth Fein Ph.D.

ABSTRACT:
This research aims to compare the identities of working women across generations to uncover how the intersectionality of gender and age has affected women in the workforce. In other words, the intersection of gender and age contributes directly to each generation of women’s notion of personhood, relational-roles, and capabilities at work. The relevancy of this research applies to women of all ages who have experienced some degree of discrimination at work, either because of their gender, age, or—in most cases—both. This research is important for highlighting the never-ending struggles of working women and producing a more equitable workforce. Indeed, the outcome of discrimination, invalidation, or belittlement in the workforce is, at the very least, missed talent. But, even more so, are the social-psychological issues that can arise as gender and work are instrumental in constructing identity. The methods for producing this research consisted of three interviews with women of different ages and working status. In each case, the women were asked to answer as honestly and freely as possible so as not to inflict any bias on their responses. It should be said that this project does not aim to pit women of different generations against each other. On the contrary, the point is to find the areas in which the wisdom and experiences of all women either overlap or diverge to strengthen camaraderie and mentorship. There are lessons to be learned in the stories of each generation of working women—this research honors those stories.

Persistent Organic Pollutants in Food Products using Stir-Bar Sorptive Extraction by GC-MS using Isotope Dilution Mass Spectrometry
Tiffany Hoke
Forensic Science & Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Howard Kingston Ph.D.

ABSTRACT:
The goal of this research is to analyze produce to see if it contains any persistent organic pollutants (POPs), which are harmful to humans when ingested. A method was developed and applied to quantify POPs including polycyclic aromatic hydrocarbons (PAHs) and chlorpyrifos in produce labeled “organic” and “non-organic” using stir-bar sorptive extraction (SBSE)-GC-MS-isotope dilution mass spectrometry (IDMS). This method facilitates accurate and precise quantification of organic and non-organic labeled consumables that are available. These POPs were simultaneously determined, but previously were analyzed separately. The method validation was conducted by isotopically spiking food samples such as homogenized lettuce with a known amount of POPs (PAHs and chlorpyrifos) at parts per billion (ppb) level and quantifying the spiked analytes using IDMS. Optimization included determination of solvents that provided the highest recovery of the analytes. Seven combinations of solvents were tested that included combinations of deionized water, methanol, and acetonitrile. The optimized solvent system consisted of 2mL acetonitrile and 8mL deionized water during extraction of food samples. The optimized method meets EPA criterion with 10% error and 8% relative standard deviation (RSD) at the lower concentration (1 ng/g) and a 9% error and 7% RSD at the higher concentration (8 ng/g). This research will impact the forensic science community by providing a method to test for certain toxins or pollutants in possibly contaminated or poisoned food. By developing a method for extraction of these pesticides, POPs can be quantified to see if the amount present is harmful.
The Juxtaposition of Singing to the Synthetic - Analyzing Vocaloid Music as a Moral and Aesthetic Matter
Thomas Houghton III
Music Education || Mary Pappert School of Music
Faculty Advisor: Nicole Vilkner, Ph.D.

A B S T R A C T:
Vocaloid music and vocaloid idols have just as much relevancy and legitimacy as physical musicians singing live music; therefore, they should be held to the same level of rigor and scrutiny regarding issues of ethics, discrimination, prejudice, and popular music aesthetic. With Yamaha’s V OCALOID, a vocal synthesizer program, becoming a commercial success, vocaloid producers and “idols” gained a cult following. The popularity of the vocaloid idol, a unique synthetic voice with an accompanying visual avatar, brings into question the legitimacy of vocaloid music when compared to Western musical ideals. Data regarding this topic is collected through 1) a literature review of existing scholarly analysis and 2) observation of Y uu yu's INDETERMINATE UNIVERSE performed with the Hatsune Miku sound bank with a live rendition sung by Arisa Kiyoto. This data is analyzed through thematic and content-based analysis. This compares the two INDETERMINATE UNIVERSE renditions and how they fit into current popular music expectations. An ethical conundrum regarding prejudice against electronic music and its alleged inferiority to live instruments will also be discussed. This analysis will conclude addressing the objectification of vocaloid idols such as Miku and a case demonstrating commercialization and potential for whitewashing regarding the vocaloid idol Ruby and her artist/voice actress, Misha. This ultimately leads to future study as technology is advancing so that live vocals and vocaloid music will one day be inseparable. As such, standard values of traditional Western music will be questioned, and their answers may be found in further study of vocaloid music.

The Book of Judith in the art of Caravaggio and Artemisia Gentileschi
Marley Howell
International Relations and Integrated Marketing Communication || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Elizabeth Lev Dottorato di Ricerca

A B S T R A C T:
The Book of Judith has fueled theological, scriptural, and artistic fires reflecting on universal themes of virtue versus vice, action versus contemplation, and male versus female authority for centuries. The epic tale of the Jewish widow Judith defeating the Assyrian general Holofernes by wits and wine has captured the imagination of artists across centuries. Baroque painters Michelangelo Merisi, better known as Caravaggio, and Artemisia Gentileschi, one of a handful of female artists created their own interpretations of the scene, depicting the brutal instant of Judith’s decapitation of Holofernes. This artistic choice resulted in the viewer experiencing different insights and emotions before either scene, mediated by each artist’s personal style. These two baroque Judith paintings have revolutionized the iconography of the heroic assassination, with their graphic and brutal depictions. Examining these works side by side will allow us to understand not only the gendered perspectives of the story, but also how the dramatic rendering of the event reflected their era at large and what each artist saw in her story.
Development of a Time Clock Application to Tackle COVID-19 in a High Traffic Factory Setting
Julianne Howley, Jeremy Haas, Colleen Higgins & Jayden Jackson
Accounting and Information Systems Management || A.J. Palumbo School of Business Administration
Faculty Advisor: Karloy Bozan, Ph.D.

ABSTRACT:
COVID-19 has the potential to be easily transmitted in factories due to the close proximity of workers and large amounts of employees using the same time clocks and similar devices. The creation of our application solves this problem for our client, Vallourec. We have developed a digital time clock tool for employees to access from personal devices when they are in the facility by verifying location. The application will be developed on the Bubble web-based collaborative programming tool, and the main functionality allows employees to accurately record time in a safe and inventive way. This application will allow Vallourec to advance in the digital age, as well as improve efficiency on the factory floor once the pandemic is over. Through the process of creating a solution to reduce congregation on the factory floors, we have learned to work on projects efficiently and effectively in a virtual environment. The group has developed strong teamwork skills by meeting regularly and establishing ground rules. Additionally, the use of Slack and TeamGantt applications has allowed the team to track and communicate the status of the project in an organized fashion. TeamGantt reinforces the principles of Scrum, as it helps us to strategize through prioritizing the features that are most critical to the completion of a functioning application for our client. Through the creation of this application and with the use of these applications, the team has learned how to excel as a high-performing virtual team which will serve us well in our future careers.

PCT as an Extraction Method of DNA From Charred Bone Remains
Kira Hurley
Forensic Science & Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Pamela Marshall Ph.D.
Additional Author: Lisa Ludvico, Ph.D. (Faculty)

ABSTRACT:
Charred bone remains that undergo DNA extraction and analysis can be used for the purposes of identification. The extraction of DNA from charred bones is particularly tricky and at higher temperatures DNA is scarcely found due to degradation by heat. Bone itself presents a complicated matrix to work with for extractions, the minerals present in the bone matrix can act as PCR inhibitors which creates issues in the analysis of the DNA. In this study the application of pressure cycling technology (PCT) is used to try and enhance the extraction of DNA from charred bone remains to increase yield. Bones burnt at different incremental set temperatures were extracted in the same manner with and without a PCT enhanced method to compare the yield of DNA and the quality of the profiles generated. The extraction was done by adapting a QIAamp DNA Mini Kit with a phenol chloroform and demineralizing extraction. DNA was quantified using a ThermoFisher QuantifilerTM kit on a QuantStudio 5, a ThermoFisher GlobalFilerTM PCR Amplification Kit amplified the DNA on a GeneAmpTM PCR System 9700 Thermocycler, capillary electrophoresis was with an Applied Biosystems SeqStudioTM Genetic Analyzer for HID, the chromatograms were analyzed with GeneMarker® HID. Pressure cycling should reduce the effect of inhibitors in the PCR process, generating cleaner profiles and higher yields from the extracted samples. Exploring methods to extract DNA from charred bone remains the identification process of bodies compromised by fire can be improved to give better results to analysts working in identification fields.
Cheating Across Cultures: An Investigation of "Jeitinho," "Pulling Strings," and "Cutting Through Red Tape" in Brazilian and American Populations  
Vitoria Ibias Flach & Gabriella Hatch  
Psychology || McAnulty College and Graduate School of Liberal Arts  
Faculty Advisor: Alexander Kranjec Ph.D.

**Abstract:**  
Cheating and breaking the rules are both universal, but how they are conceptualized across cultures may differ. Jeitinho is a concept used by most Brazilians in order to get around social inequalities. Literally “little way” there is no exact translation of "Jeitinho" in English, however “pulling strings” and “cutting through red tape” may be similar concepts. The present study uses a cross-cultural survey to interrogate the meanings of these different but related concepts across cultures. American participants will rate their agreement with statements such as, ‘pulling strings is wrong’ or ‘I feel guilty after cutting through red tape’ while Brazilian participants will rate matched statements for their attitudes concerning Jeitinho. Individual data about moral values will also be collected using the Moral Foundations Questionnaire (MFQ-30). Demographic data about race, class, and education will be collected. We hypothesize that Brazilian participants will have a more accepting view of Jeitinho as compared to American participants for similar concepts related to cheating. Differences in socioeconomic factors and cultural values are also expected to relate to how each kind of behavior is interpreted. Our hope is that this research will allow us to better understand both the common foundations and cultural differences around related moral concepts.

The performance of students with English as a second language at Duquesne University.  
Orlane Inono Murekatete  
Chemistry || Bayer School of Natural and Environmental Sciences  
Faculty Advisor: Kathleen Glenister Roberts Ph.D.

**Abstract:**  
The objective of my research was to learn more about the performance of students with English as their second language here at Duquesne University. The diversity here at Duquesne university is something the school takes pride in. However, regardless of the fact that most international students have English as their second language, they study in English and have the same expectations from their professors as American students. With a high school education system different from that of American students, I perceived this as challenging. To learn more, I interviewed various ESL professors and other faculty members to learn more of their experience with international students, their class participation, and their performance. I used their feedback to create an online survey examining the performance and studying environment of international students at Duquesne University. The survey was distributed to ISO members and other international students, and their responses was collected and examined.

Determining the Cause for Inconsistencies in the Detection of Naloxone in Drug Overdose Cases  
Brigham Karlik  
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
ABSTRACT: Irregularities regarding the testing of Narcan have recently been observed in drug overdose cases. When naloxone is tested for in the toxicology report following an autopsy, test results have shown an inconsistent detection for the medication. In drug overdose cases which Narcan has been administered, reports sometimes show it to be found as positive and other times as negative. Finding the cause for the discrepancy between positive and negative test results of naloxone was the goal for this research. A retrospective study of all drug overdose cases in which Narcan was administered from Westmoreland County Coroner in the year 2020 were examined. A prospective study was also conducted by testing blood or urine samples for the presence of naloxone from current drug overdose cases. Testing for the presence of naloxone was accomplished through the application of liquid chromatography tandem mass spectrometry to determine the concentration of naloxone within each sample. Results are expected to show a concentration which is close in value to each administered dose of naloxone from each respective case. This research is significant as National Medical Services Labs, the company that performs testing for drug overdose cases, only conducts qualitative analysis in their reports. Death due to drug overdose is a prevalent issue within the United States and research regarding this topic is needed to prevent any future inconsistencies or irregularities when testing for Narcan.

Keywords: Drug overdose, liquid chromatography, naloxone, Narcan, toxicology report

Deep Learning in Biomedical Engineering
Benjamin Kazimer
Biomedical Engineering || Biomedical Engineering
Faculty Advisor: Stacey Levine Ph.D

ABSTRACT: The use of Deep Learning (DL) algorithms has proven to be effective at solving a vast range of complex problems in science and engineering. This project is focused on utilizing DL models to solve image degradation problems in the field of biomedical engineering. One popular architecture used in image or video processing and analysis is a Convolution Neural Network (CNN). CNNs can be trained and optimized to restore degraded images while retaining fine details and enhancing the quality of images. This is particularly helpful for images that have been compressed or have been under sampled during image acquisition, often causing noise artifacts in the reconstructed image. We are specifically tackling the problems of image dependent noise removal in medical imaging data using CNNs that benefit from residual learning, considering issues such as the size of training sets, training time, and image quality metrics.

Dmitri Shostakovich: Composing in Cultural Rebellion
Noah Kilgus
Music Education || Mary Pappert School of Music
Faculty Advisor: Benjamin Binder Ph.D.

ABSTRACT: Dmitri Shostakovich and his musical compositions in the 20th century have been studied through many
cultural and political lenses, and this poster seeks to contribute an analysis of how he musically interacted with the Soviet Union and dictator Joseph Stalin. Throughout the 1930s and 40s, Stalin and the Communist Party strictly regulated any and all Soviet media, forcing Shostakovich to either comply with their nationalist policies to remain in good favor or undermine them to maintain his musical, moral, and political integrity. Through contextual analyses of excerpts from his symphonies, string quartets, and other musical works and the Stalinist regime’s critical responses to them, this poster will analyze how Shostakovich musically expressed his political opinions and how he sought to feign loyalty while dissenting through embedded anti-Stalin sentiment in his music.

Twentieth-Century Female Playwrights and the Shaping of Modern America
Emily Kizina
English || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Theodore Bergfelt MLS

A B S T R A C T:
When we think of great American playwrights from the Twentieth Century, our minds immediately tend to turn to men like Arthur Miller, Eugene O’Neill, and Tennessee Williams. Women playwrights of this era have largely fallen through the cracks. My research aims to fill in these cracks by spotlighting important women from this era and discussing how their shows broke barriers for American theater and carved a deserving path for women playwrights from their time to today. I argue that female playwrights of the twentieth-century helped shape modern America by incorporating themes of feminism, cultural identity, and social justice in their works. To complete this research, I utilized skills learned as the Gumberg Library Humanities Intern and as a student in Professor John Lane’s Twentieth Century Drama Course. In my former role, I built a library guide on popular twentieth-century playwrights, accounting for the lack of information easily found on these women. In the latter, I wrote a paper that discussed how the aforementioned themes allowed audiences to gain new perspectives and insights into topics they didn’t understand or had never been exposed to. For example, in Funny House of a Negro, Adrienne Kennedy birthed one of the most important African American narratives that no longer chased the White American Dream, creating a uniquely African American dream instead. Adrienne and other female playwrights of the twentieth century opened many doors for writers of the modern era. This project is an effort to give these women a little bit more of the recognition they deserve.

Workplace Environment and Personal Self-Care Habits in Relation to Oncology Nurse Burnout Rates: A Cross-Sectional Study
Meghan Knauf & Lindsey Kridlo
Nursing || School of Nursing
Faculty Advisor: Yvonne Weideman DNP, MBA, RN, CNE, CWOCN, CFCN

A B S T R A C T:
Oncology nursing is a profession that places nurses in an environment that is ridden with high pressure and stress. It is critically important that oncology nurses are supported while at work and in the home environment. Patient outcomes and nurse satisfaction could be affected when these two factors are not prioritized, as patients have reported poor satisfaction within care and nurses have reported low morale and high turnover rates. These factors could potentially lead to negative patient outcomes. The purpose of the study is to measure oncology nurse self-report of their work environment and personal self-care
habits, and burnout among oncology nurses in Western Pennsylvania. The aim is to gain a better understanding of the supportiveness of the nurses’ work environment, effectiveness of self-care practices, and feelings of burnout.

Participants will be Registered Nurses currently practicing in an oncology role in Western Pennsylvania. The study design is a cross-sectional study involving a one-time questionnaire via Qualtrics consisting of both quantitative and qualitative questions relating to demographics, burn-out, self-care, employer environment. Quantitative data will be analyzed using descriptive statistics and qualitative data by looking for recurrent themes. By understanding oncology nurses’ perceptions in these areas, opportunities for improvement may be identified which could lead to additional interventions to promote supportive work environments and self-care practices to decrease nursing burnout and to ultimately improve patient care and safety.

Capstone Project: Barcode Scanner
Grace Kohl & Amber Kerekes
Health Management Systems || Rangos School of Health Sciences
Faculty Advisor: Karoly Bozan Ph.D.

A B S T R A C T:
The purpose of our project is to create an app that can accurately scan the tools used by a steel production company. The barcode app will efficiently keep track of each tool. The barcode scanner allows the employee to login and log out of the app, scan the tools, locate missing tools which will show which employee has the tool, and keep the tools organized. The software we are using to create the app is Bubble.io and this has enhanced our knowledge in coding and creating advanced technology. The skills we have learned are time management, team work, communication, and leadership attributes. Since we are working as a team during a pandemic, we have needed to learn how to be flexible and learn new applications. Our team members have incorporated new apps such as Zoom and Slack to be able to efficiently communicate and have video meetings. We have learned about new project management softwares such as Kanban and Gantt. These applications help us to track our progress and the amount of work completed, it makes sure we are focusing on the highest priority task. The scrum meeting schedule helps us work together as a team and incorporate meetings discussing the overall goals of the project and impediments towards the completion of the project. We have learned how important project management is for achieving goals, meeting customers needs, and effectively allocating the organizations resources. Project management drives the organization’s strategic direction by helping implement the visions of the customers and stakeholders.

The Effects of Processing Fluency and Emotion on Moral Decision Making
Faith Manski & Shannon Williams
Psychology || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Alex Kranjec Ph.D.

A B S T R A C T:
A growing number of psychologists are beginning to think that aesthetic and moral decision-making share something basic in common. Just as we’re automatically disgusted by certain sights and flavors, or comforted by familiar or balanced patterns, several lines of research suggest that similar intuitions, emotions, and shallow biases can guide our appreciation for what’s morally right or wrong. The present
experiment tests hypotheses about how shallow visual features might influence emotion and processing fluency, along with moral decision-making. Text that is more demanding to process, like that written in a hard-to-read font, demands greater engagement. Similarly, features of writing like ink color and capitalization can modulate emotion. Decreased processing fluency might influence moral judgment, forcing participants to engage effortfully with the text, whereas using red ink and ALL CAPS may arouse participants and signal emotion. In the current study, participants are asked to make a decision in a utilitarian moral dilemma that requires indirectly or directly harming another person across (1) normal easy-to-read (2) difficult to read and (3) emotionally charged font conditions. We expect that increasing processing demands will increase the rate of utilitarian decisions while increasing emotional arousal will decrease utilitarian decisions. This current work brings to light the importance of how aesthetic experiences may influence moral judgments.

Exploring Gender Bias in Medical Research and How Pharmacogenomics Could Offer a Solution
Erin Lexner
Pharmacy || School of Pharmacy and the Graduate School of Pharmaceutical Sciences
Faculty Advisor: Bridget Calhoun Dr.P.H., M.M.S., B.S.

A B S T R A C T:
In the United States, and elsewhere, medication development disproportionately focuses on men. The medical literature has abundant examples of clinical trials that enroll more men than women. Such gender bias in medication development has consequences. Studying medication development outcomes in men and extrapolating those findings to women may or may not, be clinically appropriate. The pharmaceutical industry is one of the most lucrative industries in the country, however, repeating clinical trials to appropriately equalize participation by both males and females is not routinely performed. Newer technology that integrates the field of pharmacogenomics to improve research design moving forward is helpful, but not enough work in this field is being done yet to warrant many robust clinical guidelines. This lack of knowledge could lead to differences in efficacy for male and female patients. A movement towards the personalized medication that pharmacogenomics offers can help to close the gender bias gap that exists in pharmaceutical research by allowing for more accurate findings in clinical trials.

Levels of Kynurenine and Vascular Endothelial Growth Factor in Different Manners of Death
Sara Magoun
Forensic Science || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Stephanie Wetzel Ph.D.
Additional Author: Jennifer Hammers, M.D. (faculty)

A B S T R A C T:
Elevated levels of inflammatory markers have been linked to suicidal behaviors. Other research suggests that Kynurenine (KYN) and Vascular Endothelial Growth Factor (VEGF) are proinflammatory cytokines that are being linked to brain inflammation, major depressive disorder, and suicidal behavior. The purpose of this experiment was to determine if the levels of KYN and VEGF differ depending on the manner of death. Brain inflammation causing symptoms of mental illness is a new idea and has not been explored in depth. This is mainly because mental health research is generally considered to be several years behind physical body research. One hundred blood samples from autopsied cases were collected from the Westmoreland County Coroner’s Office. The samples were spun down into plasma and an internal standard was added to each of the samples. A Triple Quadrupole Liquid Chromatography Mass
Spectrometer and a calibration curve were used to measure the amounts of KYN and VEGF in the plasma samples. The results may suggest that in cases when the manner of death is suicide that the levels of KYN and VEGF are higher than those with another manner of death. This method could be used by forensic pathologists in the case when manner of death is not clear or is disputed.

The Use of Alcohol as a Coping Mechanism for Trauma in College Students
Callan Mulhern & Brooke Hutton
Psychology || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Alex Kranjec Ph.D.

ABSTRACT:
Despite trauma being a major subject area in clinical psychology research, few studies have been conducted on the use of alcohol as a coping mechanism for college students. While the prevalence of student binge drinking on college campuses is high, little is known about how students specifically use alcohol to cope with trauma. The current study uses a mixed-methods survey that asks questions about traumatic experiences, alcohol use, and general student habits - such as extracurricular activities. Categories of questions, such as prevalence of alcoholism within the family and serious accidents or experiences, were created to determine whether alcohol use is social or used for emotional coping. Qualitative and quantitative data from these categories will be interpreted to establish if traumatic events lead to greater alcohol abuse. We expect that the more traumatic events a student experiences, the more likely they are to use alcohol, including binge drinking, as a coping mechanism. Our results will help to identify unhealthy coping mechanisms, helping students receive proper care, such as counseling or medication. The ultimate goal of this study is to provide ways for students and college counselors to gain a better understanding of how alcohol relates to coping with trauma, with the hope that this may lead to improvement in particular coping skills.

Exploring the Benefits of Different Career Paths in Pharmacy
Noah McCall
Pharmacy || School of Pharmacy and the Graduate School of Pharmaceutical Sciences
Faculty Advisor: Kathleen Roberts Ph.D

ABSTRACT:
As a career with numerous possible paths, each with different focuses and responsibilities, pharmacy requires a lot of navigation before a decision can be made about a particular career path. The purpose of this report is to determine what factors influence a pharmacist to make decisions about which field of pharmacy they would like to pursue, and to analyze some of the positive and negative aspects of different fields in pharmacy. The method to be used is to conduct thorough interviews with faculty of the Duquesne University School of Pharmacy and to focus on the past educational and career experiences that have guided the faculty to this point in their careers. The scope of this report will focus on the educational and professional experiences of faculty members, as well as the positives and negatives of different pharmacy careers. This report will not examine the financial and locational aspects that may affect a pharmacist's career decision. The broad field of pharmacy can be viewed more easily from the perspective of those who have made these important decisions about their future careers.
Technology and Social Isolation in the Modern Age
Elle McGregor
Biology || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Matthew Ussia Ph.D.

Abstract:
Today, technology and social media are more prevalent in our lives than ever before. Devices such as cell phones and computers are convenient in our fast-paced lives. Consequently, too much reliance on technology as a main form of communication can lead to negative results. My project focuses on the direct relationship between social isolation and the increased usage of technology in today’s society, drawing on The Lonely American (Olds and Schwarts, 2009) and Alone Together (Turkle, 2011).

Interprofessional Research Experiences of Health Professional Students: Another Potential Avenue for Interprofessional Education
Molly McHugh & Jessica Riley
Occupational Therapy || Rangos School of Health Sciences
Faculty Advisor: Elena Donoso Brown Ph.D., OTR/L

Abstract:
The World Health Organization (2010) emphasizes that interprofessional education (IPE) will assist in alleviating the health workforce crisis and improve outcomes for patients. Evidence illustrates that IPE is vital for learning holistic patient care, however, the literature focuses on one-time workshops where the duration of exposure to interprofessional skills is limited (Kim et al, 2018). Less information exists about skills gained during interprofessional research opportunities as a part of clinical training. Engaging in longer interprofessional research experiences may cultivate deeper awareness of other professions, providing another avenue for IPE.

The purpose of the study is to understand students’ experiences who engaged in interprofessional collaboration during interprofessional research projects as part of clinical training.

Eight participants who graduated from a health science program 1-5 years prior to the study and spent at least 3 months as an interprofessional research assistant completed this study. The participants completed a demographic questionnaire and the Interprofessional Attitudes Scale (Norris et al., 2015) via Qualtrics®. Research team conducted individual qualitative semi-structured interviews via Zoom. Participants described their experiences through answering questions and sharing images. The interviews were transcribed and analyzed for themes surrounding benefits, challenges, and tips regarding respective interprofessional research projects.

Preliminary analysis from three initial interviews demonstrates that participants utilize skills gained during interprofessional research including: learning about professional roles, teaching others outside discipline, and developing personally through gaining confidence, directly impacting their current professional practice. This poster will exemplify their meaningful experiences through direct quotes emerging into themes that encompasses their interprofessional viewpoints.

The Effects CORT plays on Gut Development The Impacts Stressors Play on Gut Development Through Glucocorticoid Hormones
Madison Mellott
Biology || Bayer School of Natural and Environmental Sciences
Exposure to stressors during development can have adverse effects on growth and physiology. In some cases, the impacts of stressors are mediated through glucocorticoid hormones like corticosterone (CORT). Amphibians are excellent models to study developmental stress because they develop outside the maternal environment and are impacted by many natural and anthropogenic factors. A previous study found that Northern Leopard Frog tadpoles exposed to the pesticide chlorpyrifos (CPF) had elevated CORT and altered brain shape. Because CORT is a metabolic hormone involved in energy balance and gut development, I hypothesized that relative gut mass would be impacted by developmental exposure to CORT and CPF. I found that gut mass, after correcting for differences in body mass, was higher with CPF and lower with CORT compared to vehicle controls. Future studies will examine gut histology to better understand the impacts of CORT on vertebrate gut development.

Genetic Diversity in Water Snakes After Habitat Alterations
Alexa Michaels
Biology || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Jan Janecka Ph.D.
Additional Authors: Mary Janecka, Ph.D., Charles Criscione, Ph.D., Jan Janecka, Ph.D (faculty)

Reservoirs are manmade structures that vastly alter the natural environment, which can affect local species, such as water snakes. The O.H. Ivie Reservoir (OHIR), at the confluence of the Concho and Colorado rivers in Central Texas, prompted the USFWS to list the Concho water snake (Nerodia harteri paucimaculata) as Threatened in 1986, due to predicted reduction in core habitat. In 2011, surveys by the USFWS suggested that Concho water snake populations were stable and thus the species was delisted. However, population structure and genetic variation was not factored into this decision. In a previous study (2012), only two cytochrome b (MT-CYB) haplotypes (NpA and NpB) where observed in the Concho water snake. We sought to better understand impacts of the reservoir by examining if the extant populations retained mtDNA variation. Snake surveys were conducted from 2013-2015 at 19 sites along the Colorado and Concho rivers; no snakes were detected in the Concho. We sequenced MT-CYB in 61 snakes to determine the frequency of the haplotypes. We found both were still present, however, NpB was more common than NpA in contrast to the original study. Our results showed a significant shift in haplotype frequency (frequency = 0.77, n=61, p&lt;0.001), which is likely due to the small effective population size we previously estimated with microsatellites. The failure to observe snakes in the Concho river, suggests local extirpation. Our results raise concerns about the current status and population stability of the Concho water snakes.

Concussion Knowledge of Parents of Youth Athletes
Priyanka Mitta, Ashley Evans & Kaelin Agar
Biology || Rangos School of Health Sciences
Faculty Advisor: Erica Beidler Ph.D.

Parents are a primary source for health care decisions for children, which may be influenced by their
health literacy. In youth sport, on-site health care providers are rarely present, therefore, parents are responsible for identifying and making appropriate immediate care decisions regarding concussions. Previous studies have found parents have acceptable concussion knowledge, but there are mixed results regarding internal and external variables that promote higher levels of understanding. This investigation sought to identify factors associated with increased concussion knowledge in parents of youth contact sport athletes. This cross-sectional study included 466 parents of youth athletes and involved completing a survey that assessed concussion knowledge, including sign and symptom recognition and general questions about anatomy, loss of consciousness, and potential consequences of premature return to play and multiple concussions. In addition, personal and family demographic, sport, and diagnosed concussion history information was captured. It was found that parents correctly answered 83.6% of concussion knowledge items on average. While having a medical occupation and being older in age were significantly associated with greater concussion knowledge, the clinical relevance of these findings is small given that the final multivariate regression model accounted for less than 2.0% of variance. Additionally, more concussion awareness resources for parents are needed at the youth sport level as approximately only 4 in 10 parents reported receiving concussion education previously. Increasing parental knowledge and awareness of concussions in youth athletes is critical in reducing adverse outcomes involved with these sports injuries.

Expression of semenogelin 1 in humans and chimpanzees to study molecular evolution of reproductive proteins
Raahi Modi
Biology || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Michael Jensen-Seaman Ph.D.

ABSTRACT:
Reproductive proteins are among the most rapidly changing proteins in mammals, and therefore allow us to study molecular evolution, as even closely related organisms can vary tremendously in their sequence, structure, and function of these proteins. This variability can be the result of the difference in mating patterns between species, in this case chimpanzees and humans. One such gene, semenogelin 1 (SEMG1), codes for a protein that influences the coagulation of ejaculated semen in primate species. In order to understand the function of this protein, we cloned amplicons of varying lengths from SEMG1 into an E. coli expression vector, transformed these constructs into competent cells which are optimized for human protein expression, to then produce recombinant fusion proteins for further study in functional enzymatic assays. To express the protein, two different systems, Maltose-Binding Protein (MBP) Purification and IMPACT, will be utilized to maximize yield of expressed target protein.

Direct Isotope Dilution Mass Spectrometry Quantification of Dried Blood Spot Cards to Identify Drugs of Abuse
Caley Moore
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: H.M. "Skip" Kingston Ph.D.
Additional Authors: Logan Miller, Jeremiah Jamrom (Graduate Student), H.M. "Skip" Kingston, Ph.D. (Faculty)

ABSTRACT:
The current opioid epidemic warrants the need for an immediate drug detection technique which can identify illicit and prescribed substances consumed above the therapeutic level. The employment of
dried blood spot cards provides a minimally invasive, stable, and portable medium to collect blood samples via finger prick technology. Isotope Dilution Mass Spectrometry (IDMS) ensures accurate quantification in various matrices, such as blood, while eliminating inherent errors produced by traditional calibration curves.

In this study, IDMS was used to quantify twenty drugs of abuse in their natural and isotopically enriched states. An LC/MS method was developed which demonstrates optimized parameters, extensive MRM transitions, and detection limits as low as parts per billion (ppb). Drug viability was demonstrated on dried formats via manual extraction of spiked dried blood spot cards and further extraction will be performed with spiked bovine blood to identify drugs of abuse in a biological matrix. Developed methods will facilitate future applications in immediate drug detection for law enforcement personnel to improve public health and safety.

Keywords:
Isotope Dilution Mass Spectrometry (IDMS), Drugs of Abuse, Forensics, Dried Blood Spot Cards, Quantification

**Socioeconomic Status Effects on Glycemic Control in Type 1 Diabetes**

Julianna Morgan  
Nursing || School of Nursing  
Faculty Advisor: Mayra Toney DNP, RN

**A B S T R A C T:**
The purpose of this poster presentation is to identify the relationship between socioeconomic status (SES) and glycemic control in individuals living with Type 1 diabetes (T1D). Poor blood glucose regulation can often lead to various lasting complications such as chronic kidney disease (CKD), loss of eyesight, infection, and even death. The complications resulting from the lack of strict glucose regulation are a significant problem currently facing healthcare and disproportionately affecting low-income patients. Using CINAHL, research studies about the relationship between type 1 diabetes control and socioeconomic status were analyzed to identify why low-income is associated with poor diabetes outcomes, and how nurses can best assist lower socioeconomic patients to minimize the negative effects

**LGBT Families: A Social Science Literature Review**

Michael Murphy  
Theater Arts and Women's and Gender Studies || McAnulty College and Graduate School of Liberal Arts  
Faculty Advisor: Cathleen Appelt Ph.D.

**A B S T R A C T:**
LGBT acceptance has increased significantly over the past decade. With this comes the opportunity for new research into potentially-affected areas of LGBT life. This research seeks to examine the breadth and depth of existing social science research on LGBT families (LGBT). By searching social science research databases provided by the Gumberg Library for "((LGBT) AND (family))" and "((transgender) AND (family)," this scientific literature review has to date compiled 30 sources from three databases from between 2010-2021 concerning (LGBT). Eleven sources examine the structural composition or experiences of (LGBT), six of the sources focus on LGBT youth and their familial relationships, and five
sources study transgender individuals’ relationships to their families of origin. Additional sub-topics include discrimination against (LGBT), health care and end-of-life concerns for (LGBT) with a focus on cisgender gay men, and transgender adults’ relationships with their partners and children. None of these sources examined families with transgender adults and their experiences with health care or end of life concerns, or the experiences of (LGBT) without children, apart from literature regarding the partners of transgender people. This suggests a strong focus within the literature on children as essential to the study of the family, as well as an emphasis on LGBT youth. This research implies further research into how discrimination affects adult partners in (LGBT), how (LGBT) navigate the effects of discrimination in daily life, and the health care needs of transgender adults will deepen the social science research.

For Abstract Art, Bullshit Titles Are All the Same
Mariana Palou & Katherine Patrizi
Psychology || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Alexander Kranjec Ph.D

ABSTRACT:
Previous work showed that artificially created pseudo-profound bullshit titles increased the perceived profundity of abstract art works. The present study extends this line of research in two important ways. First, testing peoples’ sensitivity to the meaningful relationship between real abstract art pieces and their actual but opaque titles, and second the extent to which knowing the actual title effects art appreciation, or how much people like a painting. In Study 1, participants were asked to match titles to abstract art images, and rate how much they liked the painting. We were interested in the extent to which people could accurately perform this task, and whether the accurate matching of a real title and painting increased participants’ appreciation for the artwork. Each painting appeared with the real and correct title, a computer-generated pseudo-profound bullshit title, and a real but incorrect title. In study 2, paintings were each paired with their correct title. We asked participants to rate the titles’ emotional, objective, and meaningful qualities in relation to the painting’s appearance. Across both studies, we found no significant relationship between the painting, the title, and the extent to which participants liked a painting. While some paintings were more frequently matched correctly with their titles, correct matching and liking were not related for these nonrepresentational artworks. This research suggests that bullshit titles, real or artificial, matched or mismatched, are similar in how they (don’t) relate to abstract works of art.

The Failures of Entertainment Media on Mental Health
Abigail Noll
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Pamela Marshall Ph.D

ABSTRACT:
Mental health has always been burdened by stigmatization. It was only until recently that entertainment media has opened a positive conversation regarding mental illness and other psychological disorders to bring awareness to the never-ending campaign. While entertainment corporations and celebrities have good intentions in the use of their platforms, the information and material they are providing may be more detrimental than helpful to mental health survivors and those who continue to suffer as they
depict a romanticized version of a crippling experience many wish not to have. By examining cinematography in particular, this project wishes to shed light onto the negative consequences of poor, inaccurate mental health representation that is openly broadcasted around the United States. Furthermore, by pointing out the flaws of the over-industrializing of psychiatric health, appropriate alternatives and adjustments can be made for future attempts at safely and accurately recognizing and representing mental illness in entertainment media.

The Use of Streptomyces Spores as a Vaccine Vehicle for Bordetella pertussis via the Adenylate Cyclase Repeat-in-Toxin (RTX) Epitope
Jessica Orgovan
Biology || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Joseph McCormick Ph.D.
Additional Author: Joseph McCormick, Ph.D. (faculty)

A B S T R A C T:
Whooping cough is a severe upper respiratory infection caused by the bacterial pathogen Bordetella pertussis. The current acellular vaccine does not always provide life-long immunity. This study aims to develop an alternative method of vaccine delivery using spores of Streptomyces coelicolor. The spores will act as a vehicle to carry an epitope of a virulence factor for B. pertussis as a passenger protein. Streptomyces are Gram positive, soil-dwelling, filamentous bacteria that are known for their ability to produce many important antibiotics. S. coelicolor has a complex life cycle that involves formation of exospores. S. coelicolor has spore-associated proteins that are secreted and localized to the spore surface; this study utilizes spore-associated protein A. The major goal of this project is to create a protein fusion between the C-terminus of the SapA protein and repeats II-III of the repeat-in-toxin (RTX) domain of adenylate cyclase, a virulence factor for B. pertussis. To begin constructing this fusion, a gene encoding RTXII-III was fused to the apramycin-resistance gene utilizing PCR. Subsequently, this mutagenic PCR fragment will be added to sapA by an in vivo recombination technique. Finally, a strain expressing the fusion will be isolated. Spore-associated proteins will be analyzed using various methods such as: SDS-PAGE and Western blot analysis using a monoclonal antibody to RTXII-III. If the SapA-RTXII-III fusion is synthesized, secreted and localized to the surface of the spore, the recombinant spores will be tested in a mouse model to see if they can provide protection against B. pertussis.

Exploring Context Effects for Emotional Engagement and Aesthetic Appreciation in the Social Media World
Antonio Pugliano & Britainy Geiger
Psychology || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Alex Kranjec Ph.D.

A B S T R A C T:
Social media has changed the world and the people who use it. Social media can be both an escape and a way for people to express themselves. To understand the emotional effects of social media, we focus on two popular platforms Instagram, and Facebook. The demographics of these two platforms differ, as does the look each brand cultivates to appeal to its users. The kind of content typically shared across these platforms also differs. The current study explores how the mere association with a particular social media platform might provide a unique context for aesthetic appreciation. Participants will view an
image that is presented as if it were appearing on either Instagram or Facebook. Images will consist of humans, objects, and landscapes. Between subjects, each image will be presented only once in either platform/condition. That is, the only thing that will differ between conditions is the context: Instagram or Facebook. Participants will be asked to rate each image according to how it makes them feel along several emotional dimensions (hope, joy, love, sadness, anxious, esteem, or fear). We expect that Instagram and Facebook provide different contexts for different kinds of emotional engagement. These findings will reveal how social media context modulates aesthetic appreciation and emotional engagement for different kinds of images.

Estimating Sex Based on Small Bone Metrics Combinations
Annie Panageas
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Anne Burrows Ph.D.
Additional Authors: Pamela Marshall Ph.D. (faculty), Lisa Ludvico Ph.D. (faculty), Michael Jensen-Seaman Ph.D. (faculty), Anne Burrows Ph.D. (faculty), Bobbie Leeper Ph.D. (external faculty, Seton Hill)

Abstract:
In the human body, the pelvis and the skull always give 100% accuracy in determining sex. At crime scenes these bones are almost never present and forensic personnel are left with small bones that are not very useful in identification due to a lack of knowledge on the differences between males and females. Small bones are discounted due to the lack of information on their importance. This difference is especially under-researched in the geriatric population, which suffers from domestic abuse at a high rate, and it usually goes unreported. Due to how little it is talked about there is very little research being done. By looking at a series of small bone metrics in a geriatric population and pairing them together, an accuracy can be determined that is close to the perfect accuracy of the pelvis and the skull. This study harvested small bones from a geriatric sample of 27 cadavers from both Duquesne and Slippery Rock Universities with an outlier cadaver of age 35 that served as a baseline for the “average adult”. These bones were taken from the extremities, the neck, and the knee. The bones were cleaned in a sodium bicarbonate solution and boiling water, scrapped clean, labeled, and then various measurements on size were taken. At this point in time there are no significant results to report but, a significant combination is the desired result. This research will impact the geriatric population who are victims of violent abuse and death without other means of identification.

Global Food Security and COVID-19
Sheridyn Pawcio
Health Science || Rangos School of Health Sciences
Faculty Advisor: Bridget Calhoun Ph.D.
Additional Author: Bridget Calhoun Ph.D.

Abstract:
Globally, food insecurity is a serious issue. The COVID-19 pandemic continues to negatively affect incomes and supply chains and therefore, many people are experiencing greater need. Not only do socioeconomic conditions, natural disasters, climate change, and pests affect rates of acute and chronic hunger, we now appreciate how rampant infectious diseases can amplify the problem. Food insecurity hit a peak worldwide in 2020 and global food prices have increased 20% from January 2020 to January
The highest risk of global food insecurity is at the country level. Higher retail prices and reduced incomes affect many households and limit the quality and quantity of food available to families. While the pandemic is still raging, many countries are still experiencing food price inflation, compromised supply distributions, social distancing, and currency devaluations. Collectively, these issues disproportionately affect the poorest of the poor. The current pandemic greatly influences people in low- and middle-income countries where impoverished people spend a larger proportion of their income on food, as compared to high-income countries. Currently, most of the global food security issues are not driven by food shortages or limited distribution in agriculture, but rather high prices. Sadly, hunger was on the rise prior to COVID-19 and it has continued to worsen. The United Nations Food and Agriculture Organization now estimates that the number of malnourished has increased from 624 million people in 2014 to 688 million in 2019. COVID-19 has dramatically increased the number of people facing acute food insecurity.

Comprehensive-Contemporary-Clinical Education in Speech-Language Pathology: Exploring Students’ Self-Efficacy, Attitudes, and Experiences
Catherine Pickard, Abigail Bloom & Carlee Papi
Speech-Language Pathology || Rangos School of Health Sciences
Faculty Advisor: Heather Rusiewicz Ph.D., CCC-SLP

Abstract:
Beginning in 2013, up to 20% of student clinical contact hours could be comprised of “alternative” learning experiences (e.g., simulated experiences, standardized patients, role-play activities). In response to the COVID-19 pandemic, these learning experiences as well as increased use of technology via telepractice services were implemented in greater frequency to supplement the education of graduate speech-language pathology (SLP) students.

This study aimed to explore this emerging model comprehensive, contemporary, clinical education (CCCE) that includes didactic, blended, and virtual learning experiences. The purpose of this mixed methods investigation was to examine student perceptions, experiences, and self-efficacy related to clinical education experiences as professional phase (i.e., graduate) students in a SLP program to inform more effective and comprehensive clinical learning experiences.

Forty-three Duquesne University students in the professional phase of the SLP program completed a survey questionnaire using Qualtrics software. The students reported their level of confidence with aspects of national clinical competence standards, the overall management of individuals from different age groups, and the “big nine” areas of our profession. The questionnaire also gathered data about the students’ perceptions about the impact of CCCE on their professional/clinical growth.

Preliminary data analysis revealed emerging themes such as the impact of clinical instructors (CI) on professional growth, the importance of debriefing with a CI, and the effect of applying prior knowledge to clinical interactions.

These data support the continued development and empirical study of students' perceptions and experiences regarding the multiple modalities of clinical education.

Vocal Music and Foreign Language Education
D.J. Pickell
Music Education || Mary Pappert School of Music
Faculty Advisor: Rachel Whitcomb Ed.D

A B S T R A C T:
Can singing in foreign languages be used to work towards proficiency in those languages? The intersection between music and language is an important area for educators from both fields to explore. The purpose of this investigation is to determine if there is a relationship between performing music in foreign languages and language comprehension. Music students were asked to sing in a foreign language and translate the language within the music. Participants then took a comprehension test that included short sentences containing the language similar to that within the music. With this method, we can begin to learn if there is a relationship between performing music in foreign languages and comprehending similar, but not identical text in those languages.

Alex Plyler
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Michael Van Stipdonk Ph.D.

A B S T R A C T:
Insects have the ability to reflect the chemical environment that they have developed in. Thus, necrogenous insects could reflect the chemical environment of cadavers they have fed on. Forensic scientists can potentially utilize insect larvae as an alternate biological matrix to detect the presence of drugs in cadavers that are skeletonized, burned, or otherwise badly damaged. Additionally, traditional sample preparation techniques for drug detection by methods such as GC-MS are often lengthy, use expensive reagents, and are destructive to cadaver tissues. Analysis of insects using paper spray ionization mass spectrometry (PSI-MS), an analytical method requiring little to no sample preparation, could provide a solution to all three of these issues. The goal of this project is focused on exploring PSI-MS with insects as a rapid, cost-effective, and non-destructive way for crime labs to detect the presence of drugs in damaged cadavers. Several different rapid and cheap extraction techniques for drug detection in the model insect T. molitor were explored, including methanol extraction, QuEChERS extraction, and a novel “bug-spray” technique. By feeding spiked substrate to mealworms, employing each extraction method, and analyzing the insect samples using PSI-MS with collision induced dissociation (CID), the most time-efficient, cost-effective, and scientifically sound extraction method was developed. The successful implementation of PSI-MS to study the chemical content of an insect’s environment could have significant potential not only in forensic science, but in conservation studies and the environmental sciences as well.

How the Controversy and Misconceptions of Vaccines have Affected American Society and Views
Alexis Pozzuto
Biology || Bayer School of Natural and Environmental Sciences
Faculty Advisor: David Lampe Ph.D.

A B S T R A C T:
In recent years, there has been an ongoing controversy surrounding the safety and effectiveness of vaccines. There are two sides at play, one being those who support vaccines and encourage their
administration, the other being those who oppose vaccines and encourage alternative routes of protection against various diseases. This research explores both sides of the controversy and whether the controversy has an effect on the thoughts and actions of the general American public. The study that was conducted attempts to answer the question of, “Does the vaccine controversy affect the actions and attitudes of the general American public?” The study conducted analyzes students’ views on vaccines and dives into the background of why they hold those viewpoints. Based on student answers and reasonings, the degree to which vaccine controversies and misconceptions have affected their choices of whether to be vaccinated or not. It is clear that the American public, especially those who do not know the facts about vaccines, are swayed by the vaccine controversy. In order to make sure that Americans are making the best decisions for themselves and their families, there needs to be better awareness of the facts surrounding vaccines, as well as clarity of the myths that have been spread. Better education means a healthier and happier America.

Refugees, Exiles, and Citizenship in the Late Republic to Early Roman Empire
Julia Cardinal
Latin and History || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Sarah Miller Ph.D.

A B S T R A C T:
Using primary sources ranging from political speeches, histories, epic poems, and letters from exiles, this project examines what it meant to be a refugee, exile, and citizen in Ancient Rome from the Late Republic into the Early Empire. There is lexical, political, and historical analysis of the Latin words profugus and exul and their contexts within their respective works through the course of this period. From 100 BCE - 100 CE, there were enormous geographic expansions and governmental changes in Rome after long periods of civil war and unrest. Thus, there were changes in attitudes towards citizenship both legally and socially. Because of Rome’s expanding borders and citizenship regulations, the roles of refugees and exiles had to be used and shaped by Augustan Age literature to maintain rule of the princeps. The way these ideas about social and political categories transformed in the empire was a result of a shift so that they could be used as propaganda pieces, like the ideas presented in Ab Urbe Condita and the Aeneid, to support Augustus. Even Ovid’s exile works were received as a cautionary tale to not be exiled and provided reasoning to further Romanize “barbaric” territories on Roman borders and beyond. The change in what it meant to be a refugee, exile, or citizen was a gateway to intense Roman imperialism and control under the guise of furthering Pax Romana.

Characterization of RarA, a membrane porin from Sulfurospirillum barnesii SES-3
Lauren Rebel
Biology || Bayer School of Natural and Environmental Sciences
Faculty Advisor: John Stolz Ph.D.
Additional Author: Narthana Jeganathar Kanmanii (Graduate Student)

A B S T R A C T:
Arsenic contamination of soil and groundwater is a public health threat faced by millions of people around the world. Recurring contact can lead to respiratory distress, cardiac events, and cancer. While arsenic is toxic, arsenate can function as an electron donor (As(III)) or acceptor (As(V)) in the anaerobic respiration of certain microorganisms. Among these is our bacterium of interest, Sulfurospirillum barnesii SES-3. SES-3 is a gram-negative, vibrioid strain of epsilon-proteobacteria isolated from selenate-contaminated sediments. This project focuses on SES-3’s unique protein, RarA. RarA is a porin with the ability to reduce a variety of substrates, including arsenate, selenate, nitrite, and thiosulfate. Through this transformation, RarA has the potential to be valuable in the bioremediation of contaminated water.
Computational protein modeling has been utilized to predict RarA’s three-dimensional structure. Predicted models allow us to hypothesize that it is a monomeric, 18-strand antiparallel β-barrel porin. 

RarA has also been found to be homologous with a variety of Occ porins belonging to the OccD and OccK subfamilies. These porins are highly dynamic and vary significantly in both substrate preference and conformation. The purpose of this project is to further our understanding of RarA’s unique functionality and structure. Native RarA has been purified using anion exchange chromatography. Enzymatic activity assays using reduced methyl viologen as an electron donor have shown affinity for various substrates, including As(V) and Se(VI). While computational studies have been of great assistance, we aim to confirm key mechanistic features of RarA’s constriction region using x-ray crystallography.

The Effects of Water Submersion on the Recovery of DNA from Firearms
Michael Rebholz
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Pamela Marshall Ph.D.

Abstract:
Firearms are by far the most common murder weapon used in the United States. They are often discarded into bodies of water as a forensic counter measure after being handled. Often DNA is not recovered from those firearms as a result of being submerged in water for various reasons. Through studies it is known that DNA can be obtained from firearms, though there have been few studies on the effects of environmental factors such as water on this process. This study aims to determine the impact of water submersion on the recovery of DNA from firearms with the goal of obtaining amplifiable quantities of DNA. The research focused on recovering and extracting both touch DNA as well as DNA from blood. Promega DNA IQ and Qiagen QIAamp extraction protocols will be employed for the touch DNA and the blood samples. DNA quantities recovered by each of the kits will be compared using Real-PCR. Initially each trial of the planned six trials will be conducted for 7 days. DNA obtained from a firearm after it was discarded into a body of water, could serve as a crucial piece of evidence that could provide an investigative lead for law enforcement.

Extracting mtDNA from Co-mingled, Burned Bone Samples
Sydney Reed
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Pamela Marshall Ph.D.

Abstract:
Mass disasters involving an element of arson, such as 9/11, present a large number of complications for DNA identification of victims in comparison to a single victim identification. Many victims have yet to be identified, even 19 years later, and a common issue is the co-mingling of remaining bone samples which can cause the mtDNA extracting and analysis process to become more complicated. Commonly used extraction methods have not yielded enough mtDNA for analysis, in so the purpose of this research was to develop a technique to extract an adequate amount of the co-mingled, degraded mtDNA from the sample. In this research, metacarpals were overlapped and burned at 550±C to mimic the process of comingling. The bones were then ground into a powder using the SPEX SamplePrep Freezer Mill to prepare them for the extraction process. The extraction used was the QIAamp Investigator Kit then a thermocycler, the GeneAmp PCR System 9700 with an AFDIL primer was utilized. These methods were able to produce an appropriate amount of mtDNA for analysis of the hypervariable regions, HV1 and HV2, using the ThermoFisher SeqStudio Genetic Analyzer. This research was designed to create a
protocol for identifying victims of mass disasters when the samples have been co-mingled and highly degraded with heat.

### Anabaptists and End of Life Decision Making

Meghan Reith  
Nursing || School of Nursing  
Faculty Advisor: Adele Flaherty Ph.D (c)

**ABSTRACT:**
This poster explores the Anabaptist faith and the implications it has in the healthcare settings, specifically end of life decision making for neonates in the ICU. It is important to explore this topic as Anabaptist patients are quite often seen in the health care setting and their religious beliefs should be respected whenever possible. Additionally, it is important for doctors and nurses to understand that even though they may not agree with the decisions being made, ethical issues or conflicts can be avoided. Research was conducted and outlined in the poster on the Anabaptist religion and end of life decision making.

### Sex Differences in the Infiltration of Immune Cells in a Chronic Nerve Injury in Rats Identified with COX-2 Inhibiting Nanomedicine

Laura Reynolds  
Biology || Bayer School of Natural and Environmental Sciences  
Faculty Advisor: John Pollock Ph.D.  
Additional Authors: Brooke Deal (Graduate Student), Jelena Janjic Ph.D. (Faculty), John A. Pollock Ph.D. (Faculty)

**ABSTRACT:**
Currently, there is a poor understanding of the molecular basis of the development of neuropathic pain in females as males have historically been the sole sex utilized. However, recent studies show a key difference in the development of pain; where males use cellular responses of the innate immune system such as macrophages and females use adaptive cells such as T-cells. In order to study this, the neuroinflammatory model, chronic constriction injury (CCI), was performed on the sciatic nerve of male and female rats. Here, to investigate aspects of the inflammatory process, we examine the presence of macrophages, mast cells, and CD8-positive cells in males and females at day 12 post-surgery using immunofluorescence. We also examined the ability of a novel macrophage targeted cyclooxygenase-2 (COX-2) inhibiting nanomedicine to decrease this inflammation at day 12. We have found that the presence of macrophages in males are significantly reduced by the COX-2 inhibiting nanomedicine (Janjic et al, JNI 2018). We are currently investigating the effect that the nanomedicine has on macrophages in the injured sciatic nerve of females. We are also investigating the effect that nanomedicine has on CD8-positive cells and mast cells in males and females at day 12. Because macrophages provide signals that recruit other immune cells and that the nanomedicine decreases the number of macrophages present, we will explore whether there is a decrease in the infiltration of CD8-positive cells and mast cells into the site of injury in both sexes.
**Pittsburgh’s Homeless Population Suffers During the Ongoing Pandemic**
Elsie Wanamaker
Psychology || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Anita Zuberi

**A B S T R A C T:**
Many have suffered during the continuous Covid-19 pandemic, finding ourselves focused on the health and well beings of ourselves and family members. But there seems as if there are people who have been forgotten, the homeless. About 0.2% of the United States is homeless, leaving 65% of them to live in shelters and the other 35% on the streets (PolicyAdvice 2021). As a Pittsburgh resident I decided to focus on the concern of the 887 homeless men, women, and children who have suffered and struggled with being homeless during a pandemic. Covid-19 has caused the loss of around 30 million jobs, leaving families to fend for themselves. Due to this unfortunate event, it has caused many people to become at risk of homeless due to eviction filings. In the world of survival and tragedy, we should focus on developing a sustainable solution for those who suffer from being homeless. There are many ways to make a simple yet meaningful difference such as donating food, personal hygiene items, clothing and even giving guidance to those who are homeless. Pittsburgh had announced in August 2020, that they are building a five-story homeless action housing complex. This would provide opportunity and sustainability to help people get back on their feet. But what about those who are struggling now? Those who stay in homeless shelters for homelessness are at higher risk of contacting Covid-19. Together we can make a difference NOW, during this pandemic because, what if this was you?

**Unraveling the mysteries of dandruff and Malassezia restricta, the dominant fungus of human scalp**
Talia Roth
Biology || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Wook Kim Ph.D.
Additional Authors: Wook Kim, Ph.D. (faculty), Ava Santoro, Mingyang Yuan, William Mazza

**A B S T R A C T:**
Malassezia restricta (Mr) is a fungus found naturally on the human skin, which numerically dominates over other fungal species particularly in the scalp. Similarly, two bacterial species, Cutibacterium acnes (Ca) and Staphylococcus epidermis (Se), dominate over all other bacteria in the scalp. Such remarkable dominance predicts that these three microbes are highly adapted to the human scalp and their symbiosis effectively displaces other competing microbes. Interestingly, scalps that suffer from dandruff consistently exhibit a conserved shift in the relative frequencies of the three dominant microbes without the appearance of a “new” pathogen. Moreover, Mr still overpowers the dandruff scalp, which contrasts with the general notion that dandruff is simply a manifestation of fungal infection, and instead predicts the disruption of Mr-Ca-Se symbiosis as the root cause. Surprisingly, little to nothing is known about Mr in general and interactions among the three microbes. Here, we combine a deep interrogation of the literature with interpretation of our recent experimental data to develop a new model for the symbiotic interactions and assess new therapeutic strategies to treat and prevent dandruff.

**The Role of Juror Bias Relating to Sexual Assault Cases**
Noelle Sadaka
FORENSIC SCIENCE AND LAW || BAYER SCHOOL OF NATURAL AND ENVIRONMENTAL SCIENCES

FACULTY ADVISOR: Lyndsie Ferrara Ph.D.

ABSTRACT:
Upon evaluation of sexual assault cases, there is a large amount of bias present in jurors. Outcomes of these cases are subsequently affected, and victims often lose their chance for justice. The purpose of this study was to examine if juror bias related to sexual assault cases can be identified and if so, what biases are present. Subsequently, this study may be used to determine how the juror biases affect sentencing outcomes. A survey was created using Qualtrics survey software. It was first distributed to Duquesne University students and then more widely spread. Included in this survey were mock scenarios depicting sexual assault cases. Multiple versions of the scenarios were administered with changing contextual elements. The versions received by each participant were randomized. Questions following the scenarios served to assess the participants interpretation of the case therefore providing insight to biases that were present. The factors analyzed were response changes based on the plaintiff’s age, respectability, relationship to the perpetrator, sexual orientation, and the environment of the incident. Statistical analysis was performed on the data collected to determine if the variation of responses between scenarios was significant. It is hypothesized that various forms of bias will be largely evident, including age bias, gender bias, environmental bias, and situational bias. Furthermore, it is expected that the severity of the bias will vary with the age of the participants. The most prevalent biases that affect the justice of victims will be determined and jury selection procedures may then be reformed for mitigation.

CREATING AN APP FOR EMPLOYEES IN CLOCK IN AND OUT SAFELY DURING COVID-19

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FACULTY ADVISOR: Karoly Bozan Ph.D.

ABSTRACT:
The purpose of our Capstone Project is to create a mobile application for employees at Vallourec to clock in and out safely in order not to contract COVID-19. The first priority at Vallourec is its employees, so implementing this app will largely decrease the risk of contracting this virus. There were many skills that we as a team developed over the course of this project. The most important were proper communication to eliminate confusion and promote understanding in order to create the best project and keeping a healthy environment with our teammates. In regards to project management, we learned that it is a genuine team effort that creates a great project, not just the project leader or project sponsors. Project management requires every team member to come up with ideas and innovations. The project leader must encourage this throughout the whole process of the project. They must create a democratic environment so every team member can feel that their ideas are worth being considered. The use of Scrum in our project helped us utilize agile project management tools and ideas because our project has been developing and advancing over time, all in a collaborative effort. We created features for our app that we thought would be the most useful for the employees. Lastly, the software solutions that respond to the organizational strategy and project priority include a Gantt Chart that we use to keep track of who is doing what and when things are due. We also used a Kanban board to prioritize the features and give a brief description about them.
Characterization of Multianode Photomultiplier Tubes.
Alyssa Gadsby
Physics ‖ Bayer School of Natural and Environmental Sciences
Faculty Advisor: Fatiha Benmokhtar Ph.D

ABSTRACT:
The Ring Imaging Cherenkov (RICH) Detector aids in the particle identification of hadrons and is a necessary part of the CLAS12 Spectrometer in Hall B of Jefferson Lab. A main component of this detector is the photon detector which contains 391 Hamamatsu multianode photomultiplier tubes (MaPMTs) arranged in a trapezoid, also called the photomatrix. The purpose of this photomatrix is to efficiently detect a single photoelectron (SPE) signal. A SPE spectra gives us important information about each MaPMT including its gain and reveals how well the MaPMT is performing. A single Hamamatsu flat-panel H12700 MaPMT has an 8x8 array of 6x6 mm² pixels over a compact active area of 5x5 cm² and with high packing fractions, 89%. Each of the 391 MaPMTs that are employed by the RICH detector must be characterized before their placement in the photomatrix. Characterization allows for review of the SPE spectra of each pixel of each MaPMT. In order to characterize these MaPMTs, a laser stand was constructed with both high and low voltage power supplies. This setup includes a laser head, a wheel with six filters, a laser beam profiler, motors, and a circuit board for six PMTs inside a black box. Once measurements were taken, several output files are created containing data. In order to analyze the data, I created a program called txtAnalysislog.C, using C++, to read a text file containing data taken from a specific MaPMT. The data contained within this text file included the identification of each MaPMT, pixel numbers (64), and dark current rate for each pixel. The program produced six histograms that plotted dark current rate versus each pixel of the MaPMT. Once the histograms were created, they were compared to MaPMTs previously ready for placement and showed a satisfactory state for the current six MaPMTs. This revealed state showed a limited amount of noise, which was part of the expected outcome. It also showed a good standing for the MaPMT being analyzed. Since this MaPMT is in good standing, it is ready for placement inside of the photomatrix. The program created will allow for a more efficient process of characterization of the remaining MaPMTs.

Exploring the functional divergence of bacterial Rsm homologs
Raziel Santos
Biology ‖ Bayer School of Natural and Environmental Sciences
Faculty Advisor: Wook Kim Ph.D.
Additional Authors: Amber Delprince, Anton Evans (graduate student), Collin Kessler (graduate student), Wook Kim, Ph.D. (faculty)

ABSTRACT:
The Rsm family of proteins function as a regulator of diverse bacterial phenotypes, including metabolism, intercellular communication, motility, and biofilm formation. Rsm homologs repress the translation of specific mRNA and are present broadly across bacterial species. Certain bacterial lineages possess multiple paralogs that are generalized to be functionally redundant due to high similarities in both primary sequence and predicted secondary structures. However, our recent studies in Pseudomonas fluorescens strongly suggest that Rsm paralogs possess unique functions, where RsmE exclusively regulates the production of extracellular secretions that synergistically function to create space within densely structured communities. We thus hypothesize that Rsm homologs possess a broad
spectrum of activities that commonly and uniquely manifest across and within individual species. To address this, we performed multiple bioinformatics analyses to explore the evolutionary history of Rsm homologs to discern structural rearrangements and identify common and unique motifs. Our results suggest that the functional overlap between homologs manifests through highly conserved sequences that represent most of the protein, but unique functions reside within specific motifs of the C-terminus. This allows us to now categorize Rsm homologs by potentially unique functions and empirically test how the unique motifs confer specificity.

How Arthur Miller addresses toxic masculinity in his play Death of a Salesman and how these traits forbid the main characters from achieving their idea of the American Dream.
Dori Shearer
Pharmacy || School of Pharmacy and the Graduate School of Pharmaceutical Sciences
Faculty Advisor: Kathy Glass Ph.D.

A B S T R A C T:
Toxic masculinity has been rooted into our cultural norms under the guise of being the correct way for men to act. This poster explores how the playwright Arthur Miller addresses his characters’ toxic masculinity in his play Death of a Salesman in order to reveal how non-toxic traits can lead to a more successful life. The poster compares Willy Loman to his sons, Biff and Happy, and it contrasts their behavior to their other family members, Charlie and Bernard. The poster uses Miller’s play as a primary source for quotations and character analysis, and it uses literary analysis from Basourakos; Gleitman; and Vanderwerken along with psychological reports on male gender conflict theory by Sipes and Huffman et al to support claims. This poster explores how men’s beliefs about gender are products of how their fathers instruct them and how mental health can be affected by gender beliefs.

Determination of Death by Suicide or Homicide through Hyoid Bone Fracture Patterns
Roger Sherman
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Pamela Marshall Ph.D.

A B S T R A C T:
Distinguishing between a true suicidal hanging and a homicidal strangulation with subsequent simulated hanging is difficult even for highly trained professionals. A possible way to distinguish between the two modes of death is through examination and comparison of the neck structures, particularly the hyoid bone and noticeable fractures. Not much work has been done on identifying differences in fracture patterns, as most investigators search for obvious and less inconspicuous signs that indicate the mode of death. Hyoid bone models were created using clinical cone beam CT imaging on real hyoids from both sexes, which generated STL files to print using FibreTuff material with 3D printing. The models were crushed at various angles using a hydraulic press to determine the amount of force required to fracture the bones at each tested angle. They were placed inside ballistic gel neck models to simulate suicidal hangings and homicidal strangulations. Various ligatures were tested to determine their influence, and fractures were compared between simulations. It is expected that there will be slight differences in fractures during the simulations, particularly around the greater horns, which would require less force to fracture. The information gathered about hyoid bone fracture patterns could allow for better detection of staged suicides and provide more resources to investigators to determine the mode of death.
First-Person Narrative of a Music Therapy Student’s Experience in a Drum Circle
Bethany Smith
Music Therapy || Mary Pappert School of Music
Faculty Advisor: Noah Potvin Ph.D., LPC, MT-BC

A B S T R A C T:
Drum circles are musical gatherings where people come together to play percussion instruments with a focus on encouraging creative expression and building a sense of community. This first-person research project explores my experience as a student, participant, and facilitator of community drum circles as part of my training to become a music therapist. Data were collected from logs, journal entries, and an interview to capture and articulate my drum circle experiences. Data were analyzed using inductive latent thematic analysis that was data-driven and interpretive. The resulting themes provide insight for music therapy students and educators about the role drum circles can play in music therapy training.

Distribution of Drugs on Paper via the Soak and Spray Method
Hannah Spitzer
Forensic Science & Law Program || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Stephanie Wetzel, Ph.D.

A B S T R A C T:
The drug epidemic has been a prominent issue within the United States and continues to grow at alarming rates. This problem directly correlates to the increase of trafficking and use of illicit substances in correctional facilities. Individuals have used the “soak and spray method” in attempt to smuggle illicit substances through the mail into correctional facilities. This method entails soaking mail in a mixture of a household solvent such as nail polish remover with the desired drug making detection of the drug difficult, posing a risk to those who come in contact with the paper. The purpose of this research is to observe distribution patterns of various drugs on paper using the soak and spray method. Samples are created mimicking this method while changing a number of variables such as number of dips or sprays, type of paper, and location on the paper. Samples are created using a mixture of HPLC grade acetone and the desired drug with a concentration of 3.33mg/mL. Samples are extracted using methanol solution, syringe filtered, and analyzed via the Agilent 6460 Triple Quadrupole Liquid Chromatography Mass Spectrometer. Observing distribution methods of drugs on paper will allow for subsequent testing to assess variability of detection of these methods. This research hopes to assist in creating a reduction of illicit substances trafficked into correctional facilities.

The Issues of Biased School Dress Codes
Olivia Solomon
Secondary Mathematics Education || School of Education
Faculty Advisor: Patricia Sheahan Ed.D.

A B S T R A C T:
The purpose of this research was to examine the underlying issues behind inflexible and outdated public school dress code policies in the United States, and provide some insight into how these schools can
improve them. Dress codes in public school districts began to rise in popularity in the 1920’s, and their rules and procedures haven’t changed much in accordance with current times. Dress codes have often been labeled as diminishing to student expression and free speech, and are disproportionately enforced on female students. These regulations are heavily biased against young women, black students, and those who abide by religious dress. Through a conducted survey of 100 Duquesne University students who attended public schools, the majority reported their alma mater’s dress code being unfair towards girls. It was also reported by the majority that either they or someone they knew were wrongly singled out for dress code violations. Included in this study is an example of a school district who implemented an inclusive dress code policy meant to be body-positive and unbiased: Evanston Township High School.

Funding for Music Education
Natalie St. Hill
Music Education || Mary Pappert School of Music
Faculty Advisor: Paul Miller Ph.D.

A B S T R A C T:
When it comes to music education and its finances in the United States public education system, the majority of the general population is unaware of how it is funded other than a prevailing belief that programs are being cut left and right. This project will investigate where funding for music education comes from, including property taxes, boosters, and other sources. Additionally, this research analyzes how the federal government’s Elementary and Secondary Act, No Child Left Behind Act, and Every Child Succeeds Act has impacted and continues to impact music education and its funding. Finally, this research compares the United States’ approach to music education to structures in England and Germany. Based on these findings, it is concluded that music education funding in the United States is considerably impacted by advocacy, from the federal to local levels. This underscores how important it is for individuals to support this crucial part of public education, while simultaneously bringing awareness to issues within the public school system including equity and funding.

Method Development for Detection and Quantitation of Methamphetamine and Metabolites in Vitreous Fluid
Jordan Stancil
Forensic Science || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Stephanie Wetzel Ph.D.
Additional Author: Stephanie Wetzel, Ph.D. (faculty advisor)

A B S T R A C T:
Forensic toxicological tests are routinely performed on blood and urine samples. Because extensive research has been done involving these biological matrices, countless methods have been developed to analyze substances of abuse, such as amphetamines, in blood and urine. In constant pursuit of the most reliable testing procedures, much of the contemporary research in the field of postmortem toxicology has focused on the use alternative toxicological matrices, such as vitreous fluid. Because of its sequestration in the eye, vitreous fluid often resists postmortem degradation better than other bodily fluids. Based on a collection of the current literature, however, a method has not been developed to detect methamphetamine (MA) in a vitreous fluid matrix. The present study sought to bridge this gap by establishing a Liquid Chromatography–Triple Quadrupole Mass Spectrometry (LC-QQQ-MS) method
for detecting this compound in vitreous fluid. The first objective of the research involved selecting a liquid chromatography column that provided the best separation of MA, and its primary metabolites, amphetamine (AP) and para-hydroxymethamphetamine (p-OHMA). Subsequent work centered around optimizing parameters on the Agilent 6460 LC-QQQ-MS instrument to accurately detect and quantify each compound. This research provides a dependable LC-QQQ-MS method for identification and quantitation of MA, AP, and p-OHMA, which can then be applied to future work with these compounds in a vitreous fluid matrix. The results of this study advance the field of postmortem toxicology by providing another reliable method for toxicological tests in circumstances where the common biological matrices are not available.

Key Words: postmortem toxicology; methamphetamine; vitreous fluid; Agilent 6460

An empirical study on the shift in students’ motivation to overcome barriers in the Hyflex learning model during the COVID 19 pandemic in a college setting
Claire Stoner
Accounting || A.J. Palumbo School of Business Administration
Faculty Advisor: Karoly Bozan Ph.D.

A B S T R A C T:
Students’ motivation to succeed in an academic setting is impacted by their social environment. Due to the COVID-19 pandemic, this environment has changed overnight as the social and peer influence have faded to a virtual and dissociated relatedness. Drawing on the self-determination theory and self-regulated learning, we empirically investigated the impact of the Hyflex/online learning model on students’ motivation to deal with the emerging challenges and their impact on academic performance. Increased technological dependence and the resulting frustration has emerged while students are distanced from their accustomed social influence. Analyzing the completed survey responses of 192 predominantly lower classmen, we found that autonomy and competence coupled with grit will enhance motivation and drive to overcome barriers. We also found that competence and grit indirectly impact academic performance via overcoming barriers. We highlight that self-determined motivation in the Hyflex/online learning departs from the commonly understood pillars of the self-determination theory and the vanishing effect of relatedness is replaced with individual characteristics. This result adds to the novice literature of students’ motivation to inherent growth in the Hyflex/online learning environment. In addition to contributing to the literature and expanding the theory, we discuss our results and their implications on the student, teacher, and school administrations.

Forensic Science Education for Lawyers
Savannah Stout
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Faculty Advisor: Lyndsie Ferrara Ph.D.
Additional Authors: Pamela Marshall, Ph.D. (faculty), Lyndsie Ferrara, Ph.D. (faculty), Ashley London, J.D. (faculty), Bobbi Jo Wagner, J.D. (faculty)

A B S T R A C T:
Forensic science education in the United States often includes training on the law and investigation processes, focusing on how faulty forensic science has tremendous consequences. However legal education, specifically criminal legal education, does not contain any type of training on forensic science.
Legal education focuses primarily on the principles, practices, and theory of law. Often in court cases, lawyers are the ones representing the forensic evidence and presenting it and judges are the ‘gatekeepers’ of evidence in the courtroom. While experts are usually called to testify, attorneys and judges often do not understand the significance of the evidence or how it was obtained and tested. By providing law students with foundational knowledge in forensic science, it may allow attorneys to better understand the forensic techniques and evidence that is commonly presented in criminal court cases. In this study, the knowledge of a sample of law students was examined by presenting them with a series of educational seminars related to forensic science. The results of the study were evaluated using comparative analysis of pre- and post-test scores and may indicate that law students pursuing criminal law would benefit from forensic science education within their legal education. The primary goal of this research is the implementation of mandatory forensic science education for criminal attorneys within law schools. This research would benefit both the forensic science and legal communities by decreasing the gap between forensic science and law.

The Whitewashing of Sea Shanties- A Complex History

Henry Strobel
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Faculty Advisor: Nicole Vilkner Ph.D

ABSTRACT:
Sea shanties are often considered to be one of the only forms of authentic “white” music due to their assumed roots in British sailing culture, however many of their actual origins can be traced as a form of technology and coordination of labor back to Africa and the Americas. I will be examining the whitewashing of the history of sea shanties through collectors of folk repertoire such as Cecil B. Sharp, and how the etymology of songs that were derived from slave and minstrel songs were purposely omitted in efforts to further British nationalism. Chanties such as “Haul Away Joe” have direct roots in minstrelsy, while others were acquired aurally in a more colloquial fashion, via routes like the Atlantic Slave Trade that began to cause cultural blending leading up to the advent of the British “chanty” tune. Regardless, many of these tunes that are widely considered to be British in origin were likely appropriated by writers like Sharp who wanted to evoke pride in sailing culture; an image that for them was European and white. Ultimately, I will be using a combination of original scores and folk song collections from the early to mid 19th century and first hand sailor accounts as well as scholarly literature examining the similarities between these songs and 16th-19th century work songs in order to shed light on how this history had remained largely unrecorded.

The Study of Friendship and Aphasia

Isabella Talamo, Meg Powell & Hailey Hawkins
Speech-Language Pathology || Rangos School of Health Sciences
Faculty Advisor: Sarah Wallace Ph.D

ABSTRACT:
Aphasia is a language impairment due to acquired brain damage that affects speaking, listening, reading, and writing. Aphasia has several consequences including challenges with maintaining past or establishing new friendships. Often, people with aphasia will find themselves isolating from social situations because they feel overwhelmed and they may not be able to keep up with social activities.
According to Azios et al., (2021) the risk of social isolation and minimized friendship network is high for people living with aphasia. Studying friendship will help clinicians and researchers determine how aphasia affects a person’s daily life and help develop future highly relevant interventions. The purpose of this study is to explore the development and maintenance of friendships in people with aphasia.

We used quantitative and qualitative methods to identify trends for friendship in aphasia in relation to level of language impairment and perceived participation as well as the lived experience of people with aphasia related to friendship. As part of this multisite study, we plan to collect data from 25 people, thus far two people have participated. This presentation will highlight these two cases in a case study format.

Two participants with chronic aphasia completed the Comprehensive Aphasia Test and Communicative Participation Item Bank as well as a 2-hour friendship questionnaire and interview across two individual sessions. The Comprehensive Aphasia Test, Language Battery, measures language skills across multiple modalities and their impact. The Communicative Participation Item Bank measures participant perception of Aphasia during everyday scenarios. Finally, the friendship questionnaire and interview allowed participants to share how their friendships have changed from before and after Aphasia, after, and surrounding the COVID-19 pandemic. Analysis is underway. Findings will have implications for the development of socially relevant interventions and future research examining the efficacy of these interventions.

Demystifying the Unusual Structures, Vibrations, and Energies of Urea

Lindsay Moskal
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Faculty Advisor: Jeffrey D. Evanseck Ph. D.
Additional Authors: Serina Tressler, Alex Cocolas (Graduate Student), Angel Tamez (Graduate Student), Thomas D. Montgomery, Ph.D. (faculty), Jeffrey D. Evanseck, Ph.D. (faculty)

A B S T R A C T:
Precious transition metals, like palladium, platinum, and rhodium, are expensive, environmentally destructive, and harmful to human health. Such compounds are frequently used as catalysts to synthesize organic and natural products of pharmaceutical and industrial importance on a large scale. Hence, there is a need for more affordable, greener, and safer catalysts to drive these organic reactions. In fact, within the past few decades, more biologically and environmentally friendly dual-hydrogen-bond-donor (DHBD) organocatalysts, which are commonly based upon smaller, simpler molecules like urea and thiourea, have been well-characterized and explored. Yet, experiments and computations on the structures, vibrations, and relative stabilities of unsubstituted ureas and thioureas are not in agreement. Consequently, a fundamental understanding of DHBD catalysis cannot be achieved due to current scientific conflict on urea and thiourea, the core motif of many DHBDs. Our work, therefore, defines the structure, energy, and vibrations of urea using state-of-the-art quantum chemistry. Ureas were found to adopt two stable conformations: an anti-conformation with NH2 hydrogens pyramidalized on opposite sides of the molecule and a less stable syn-conformation with the hydrogens pyramidalized on the same side. We have found that the anti-conformation is the more stable of the two conformations and provides the dominant vibration, resolving the experimental controversy. Our findings have furthered our understanding of the unusual structure, vibrations, and energies of
unsubstituted ureas that can be applied to thioureas and other substituted DHBDs to design more efficient catalysts for organic reactions that produce many pharmaceutics and industrial products.

**Squaramide Structure and Interactions with Benzene**
Serina Tressler  
Chemistry || Bayer School of Natural and Environmental Sciences  
Faculty Advisor: Thomas Montgomery Ph.D.  
Jeffrey Evanseck, Ph.D. (faculty)

**Abstract:**
The chemical industry’s continued reliance on expensive and toxic metal catalysts has driven the search for greener and more sustainable alternatives. One such option is hydrogen bonding organocatalysts, a group of inexpensive compounds made from renewable feedstocks. However, the interactions of these compounds with aryl groups is not currently understood, limiting their overall effectiveness. Dual hydrogen bond donors such as squaramide and thiourea have been a focus of study for some time, but the structure and interactions of unsubstituted squaramide have not been thoroughly reported and present an unknown in catalyst design. This study seeks to understand the structure of squaramide and how it interacts with aryl systems, specifically benzene. We used the Truhlar M06-2X functional with Dunning’s aug-cc-pV[D,T]Z basis sets and MP2 with Dunning’s aug-cc-pV[D,T]Z basis sets for geometry optimization and energy evaluation. Additionally, we employed the Boys and Bernardi counterpoise method to account for basis set superposition error (BSSE) for use in comparison to uncorrected values. From these calculations, it was apparent that squaramide possesses multiple available geometries that may be interchangeable with a considerable impact of BSSE. Additionally, there are several ways that squaramide can interact with benzene, and these interactions have been compared to the better studied benzene dimer, comparing both with their BSSE corrected structures and energies. This work provides valuable insight into how squaramide-based catalysts may interact with aryl groups, how squaramide’s structure changes based on those interactions, and the potential effects of BSSE on both.

**Gifted Students and TikTok: A Look into Their Brains**
Madysn Tusick  
Finance and Economics || A.J. Palumbo School of Business Administration  
Faculty Advisor: James Purdy Ph.D.

**Abstract:**
Through the eyes of Gifted and Talented Education Students, we can learn so much. By conducting research on around 100 Gifted Students, I have discovered something that has not been studied yet: How the Gifted Student interacts with TikTok. This study brings to light some dangers that face today's Gifted Students in this increasingly digital world. A social media like TikTok can be dangerous to those with higher-functioning brains. This study includes references to brain scans and studies regarding the way the Gifted Student's brain works in comparison to the average student’s brain and on how TikTok affects our brains. I have discovered that TikTok is more addicting for those with higher-functioning brains, and this happens because of the short videos that quickly stimulate the brain. My study seeks to make more people aware of the potential effects of TikTok on the Gifted and Talented brain.
Visualizing central nervous system cells in developing amphibians exposed to stressors.
Madison Uhrin
Biology || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Sarah Woodley Ph.D.

A B S T R A C T:
Exposure to stressors during development can result in increased levels of glucocorticoid hormones in both animals and humans, which can have lasting effects on behavior and physiology. Previously, using tadpoles as a model system, we found that tadpoles exposed to the glucocorticoid hormone corticosterone (CORT) experienced morphological changes in brain shape. To test whether changes in brain shape correspond to differences in the number of brain cells, I am adapting the method of isotopic fractionation to quantify neuronal and nonneuronal brain cells. Isotropic fractionation uses immunocytochemistry to identify neuronal cells using antibodies for neuronal nuclear antigen (NeuN) and DAPI to quantify total cell number. Here, I describe my research testing whether the antibody for NeuN that works in rats also works in tadpoles. I found that immunoreactivity for NeuN was present in both tadpole brains and rat sciatic nerves (positive control). My results indicate that this method can be adapted for use in tadpoles. In the future, I will use isotopic fractionation to count the relative numbers of neurons in the brains of tadpoles to better understand the effects of glucocorticoid hormones on vertebrate neural development.

Comparison of Pion and Kaon Distributions in Data and Monte-Carlo for CLAS12
Michael Veltre
Physics || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Fatiha Benmokhtar Ph.D.
Additional Authors: Fatiha Benmokhtar, Ph.D. (faculty), Harut Avakian, Ph.D. (mentor)

A B S T R A C T:
Protons and neutrons are made from constituents called quarks and gluons, which give substructure to these particles. Additionally, when a particle is composed of two or more quarks, while also being held together by the strong nuclear force, it is referred to as a hadron. Through semi-inclusive deep inelastic scattering (SIDIS) of electrons off proton and deuteron targets in Hall B at Jefferson Lab, hadrons are emitted at various angles and momenta. After being produced in the hadronization of quarks, these hadrons are detected by the CEBAF Large Acceptance Spectrometer (CLAS12). Through the analysis from the CLAS12 detector, Hall B of Jefferson Lab can distinguish between hadrons, particularly pions and kaons. The goal of this project is to make measurements and comparisons of the momentum and angular distributions of pions and kaons using various data sets. This will be achieved with analysis of pions and kaons resulting from the SIDIS data and comparing the results to two different Monte-Carlo (MC) simulation data sets with different relative contributions from pions and kaons. I will show the momentum and angular distributions of pions and kaons and the comparisons between the SIDIS data and the MC data sets with different relative contributions from pions and kaons. By getting MC as close as possible to the low luminosity data, MC can be used for efficiency studies. Moreover, realistic MC can be used to better understand the response of such a complex detector as CLAS12.

Assessing the needs and recommendations for early childhood mental health consultation in transitioning back to in-person schooling
A B S T R A C T:
School-based mental health consultation recognizes and understands the importance of children’s emotional and behavioral needs in conjunction with educator/caregiver competencies. In early childhood classrooms, mental health consultation utilizes a problem-solving approach, creating collaborative relationships with educators to build their skills and expertise (Duran et al., 2009). Early Childhood Mental Health Consultation (ECMHC) works to maximize the social-emotional skills of all children while minimizing the vulnerabilities of children experiencing behavioral difficulties (Low & Shepard, 2010). As emotional and behavioral challenges are increasing in early childhood settings, it is evident that mental health consultation is becoming increasingly necessary and beneficial (Green et al., 2006). With the ongoing nature of the coronavirus (COVID-19) pandemic, concerns regarding the mental health of children are continuing to increase. As transitions to in-person learning are beginning, the need for mental health consultation services will continue to increase. The following information will examine recommendations for consultants in addressing mental and behavioral health and social-emotional learning for the return to in-person schooling.

Production of Recombinant Seminal Proteins for the Improved Antibody-based Detection of Body Fluids
Thomas Washington
Forensic Science || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Michael Jensen-Seaman Ph.D.

A B S T R A C T:
The purpose of the study is to produce recombinant human seminal proteins, specifically semenogelins, so that antibodies can be generated against these proteins, and an improved forensic semen identification test can be developed. The study seeks to discover how semenogelin proteins can be produced in E. coli. To do so, genes encoding seminal proteins of interest are inserted into expression plasmids; E. coli cells are transformed by these plasmids. Growth conditions of the transformed bacteria—including growth time, growth temperature, the quantity of substance added to induce gene expression, and the co-expression of the expression plasmid and a chaperone plasmid—are altered. Protein assays are carried-out to determine if semenogelin was produced, and in what quantity. To date, this study has only produced small quantities of semenogelin: not enough to generate antibodies against. Forensic semen identification tests have shown flaws, including false positives and false negatives. The specificity of antibodies, and the use of a semen-specific protein target, can help greatly reduce the potential for false positives. Although a similar test already exists, RSID-Semen, there is still room for improvement. If a test can be developed that specifically targets a section of a human seminal protein that has little variation between individuals, it will provide less room for false negatives: increasing the potential to solve more sexual assault cases.

Keywords: semen identification, semenogelin, recombinant proteins
Defining Femininity in Alvarez's "In the Time of the Butterflies"
Rachel Westley
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Kathy Glass Ph.D

**Abstract:**
What is modern feminism? In general, many mean this to believe that women should be completely independent and self-sufficient and reject the roles of traditional femininity. While this is certainly an aspect of modern feminism, this view can be toxic and short-sighted to many women hoping to be a part of this movement. A more inclusive femininity was supported through the Mirabal sisters as depicted through Julia Alvarez in her novel In the Time of the Butterflies. Throughout the novel, Alvarez uses each of the four sisters to display how they both exhibited and rejected traditional feminine roles. In order to understand this new feminine ideal, each sister was studied in their actions and relationships. For example, each sister's childhood played a large part in understanding their growth into adulthood as they joined the revolution against Trujillo. This development is explored and articulated throughout this project.

Impact of Different Soil Matrices on Human DNA Leaching From Tissue
Kaylee White
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Lisa Ludvico Ph.D.

**Abstract:**
When bodies undergo the process of decomposition, the DNA leaches into the surrounding environment, usually soil. In most studies, soil as an environment is categorized into a broad category despite the differences in soil composition around the United States. The purpose of this study is to research and understand the specific interactions between DNA and different types of soil. In this research, small pieces of tissue were allowed to decompose in the following types of soil: loam soil, sand, sandy soil, clay, and agricultural soil. DNA extraction was performed on each soil type, and the extracted samples were then quantified to determine the amount of DNA absorbed into the soil. It is expected that there will be a smaller quantity of DNA in sand and sand-based soil and a higher quantity of DNA in clay due to the structure of the sand and clay particles. The findings from this study aim to provide specific information on the different absorption and retention rates of DNA in different mediums of soil. This knowledge can then be utilized to aid in the recovery of human remains.

Elucidating the Necessity of Cellular PCNA Protein in HSV-1 Infections
Maya Williams
Biology || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Jill Dembowski Ph.D.
Additional Authors: Dr. Dembowski (faculty), Jessica Packard (graduate)

**Abstract:**
PCNA, proliferating cell nuclear antigen, is a cellular protein that stabilizes DNA polymerases during cellular DNA replication and was found to associate with herpes simplex virus type 1 (HSV-1) DNA. To determine the role of PCNA in viral infection, CRISPR/Cas9 will be used to knockout PCNA. A plasmid
with a guide RNA that specifically targets the PCNA gene including information on how to make the Cas9 protein was created. The guide RNA finds the segment of the genes that codes for PCNA and the Cas9 protein cuts the DNA at this location. Cutting the PCNA gene disrupts PCNA protein expression. Sanger sequencing and gel electrophoresis were used to confirm successful cloning of 3 different plasmids, which code for guide RNAs that target different locations on the PCNA gene. Furthermore, instead of a complete knockout with CRISPR/Cas9 technology, inhibitors can also block protein function. Two inhibitors of interest, PCNA-I1 and T2AA, block PCNA DNA binding and protein-protein interactions, respectively. Either inhibitor was incorporated into cells before viral infection to inhibit PCNA functions. We found that PCNA-I1 had a greater effect in decreasing viral yield than T2AA through plaque assays. In future steps, we will incorporate the successful plasmids into cells to carry out the CRISPR/Cas9 knockout of PCNA along with infection of HSV-1. Using two complementary approaches (knockout and inhibitors), we will then determine which step in the virus life cycle depends on PCNA function to pinpoint the specific role of this cellular protein in viral infection.

Julia Alvarez’s Personal Connection to In the Time of the Butterflies
Anna Witte
Chemistry || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Matthew Ussia Ph.D.

ABSTRACT:
Julia Alvarez’s novel In the Time of the Butterflies is known for sharing the story of the Mirabal sisters' rebellion against the Trujillo regime. However, the novel is more than just a historical novel; it is an expression of the emotions and struggles of not only the Mirabal sisters, but also Alvarez and all of the people of the Dominican Republic who experienced the Trujillo regime. This project examines how the events of Alvarez's life inspired and motivated her to write the novel, and how she has a personal connection to it. Facts and information gathered from biographies and past interviews Alvarez has done reveal that Alvarez and her family’s experiences while living in the Trujillo regime sparked her interest in the Mirabal sisters and influenced the ways in which she chose to express their story. Through the examination of Alvarez’s personal experiences, it is better understood why Alvarez chose to write her novel in a way that not only teaches about history of the Dominican Republic, but also brings attention to and captures the raw emotions and hardships of those who lived under the Trujillo regime.

Developing a TimeClock to Mitigate the Spread of COVID-19 in the Workplace
Francesca Yanosick, Yohanan Worku, Zoe Zilcosky & Yan Jin Tan
Health Management Systems, Information Systems, Accounting || Rangos School of Health Sciences
Faculty Advisor: Karoly Bozan Ph.D.

ABSTRACT:
Our group's overall purpose is to create an app for a TimeClock for employees to use. Due to the high concerns regarding Covid-19, this project will create a digital tool that will allow employees on the shop floor to clock in and out of work without having to report to a physical time clock. This project should take around 3 months. The digital time clock will meet our goal of mitigating the spread of coronavirus due to the clock not being publicly shared that will decrease germs spread by touch or face-to-face interaction. The digital tool will be an application that employees will be able to access from their phones. Each employee will have their own unique username and passcode to login into the application.
Once logged in, they will be able to clock in and out of work. The application will also require the employee’s location to confirm that they are on-site when clocking in and out of work. For week two, Yan Jin Tan created the google doc for the second assignment. From there, the team split up tasks on our own and worked on the areas that were not yet complete. Since each question was worth 5 points, we all took a question to complete, and Yan Jin Tan completed two. Our communication is primarily through a group text. We notify each other when we complete our tasks and if we have any questions. For the next assignment, we are looking to utilize slack as a major communication tool for our team and update more of our progress on TeamGantt. Then for week three, our group started to discuss and create the different features of the app through Bubble. We each created two features that we felt were important to contribute to the app. One team member Zoe, created the link, Vallourectimeclock (bubbleapps.io) so everyone in the group could utilize it. We created a list of twelve unique features that can make the app work better and be easier for the company to use when clocking in or clocking out by reminders, logins, security features, employee identification verification, etc. All of the tools will ensure that any personal company information is not hacked and personal information stays secured. We also created the user stories based off of the information we learned in class from the guest speaker. The columns were created and completed in TeamGantt. We made three columns Backlog, In Development, and Completed. This will allow the team to see the progress of the different, unique eight features that each member created in the app and what still needs to be completed. Lastly, I created the User Stories to explain and describe the app’s features as how the user would view them.

Live Oral Presenters
(Also poster session participants)

A Novel Telehealth Device
Garett Craig, Alex Evans, Amanda Pellegrino, Ben Bernarding & Justin Cook
Biomedical Engineering / Nursing Dual Major || Biomedical Engineering
Faculty Advisor: Michael Nilo

A B S T R A C T:
Telehealth is a vital resource for medical professionals and patients with non-emergent medical needs because it utilizes a virtual format to provide patients with healthcare services in their home setting. This type of healthcare is an attractive option for chronically ill patients, such as patients with Chronic Obstructive Pulmonary Disease (COPD), because they may be immunosuppressed, have decreased mobility, experience fatigue, and need oxygen assistance. During a telehealth appointment, however, the healthcare provider (HCP) is unable to assess the patient’s physiological condition, which can lead to inaccurate diagnoses and unnecessary diagnostic testing. The physiological condition of COPD patients is an important aspect because they experience altered lung sounds, a decrease in SpO2, shortness of breath, and have an increased risk for airway infections. To assess one’s physiological condition, a patient would need to possess reliable diagnostic devices but purchasing these separately can be expensive and an unreasonable expenditure for a low-income family.

Our goal is to develop a low-cost, user-friendly way in which a layperson outside of the clinical setting can effectively obtain vital signs (Heart Rate, Blood Oxygen Saturation, Body Temperature) and capture lung sounds to provide their HCP with real-time physiological indicators during a telehealth appointment. We demonstrate that our device can accurately measure heart rate, SpO2, and body temperature and capture and amplify lung sounds. This device improves the diagnostic power of the HCP by providing real-time physiological monitoring of vital signs and provides patients with an all-in-one device for at-home telehealth appointments.
**Bioprinting Alginate Structures using the FRESH Method**

Amanda Pellegrino  
Biomedical Engineering and Nursing || Biomedical Engineering  
Faculty Advisor: Kimberly Williams, Ph.D. and Bin Yang, Ph.D.

**ABSTRACT:**  
Three-dimensional bioprinting is a tissue engineering and regenerative medicine technique that utilizes biomaterials to print clinically relevant scaffolds. These scaffolds are used for tissue repair and to treat disease, such as end-organ failure. The main problem with 3D bioprinting is its inability to print soft biomaterials, which collapse due to gravitational forces. In addition, the materials that can be used do not mimic native tissue’s mechanical properties and texture. To combat this, researchers at Carnegie Mellon University developed the freeform reversible embedding of suspended hydrogels (FRESH) method. The FRESH method allows for soft biomaterials to be supported in a gelatin bath during printing and then crosslinked for stability.

The goal of this study was to adapt and apply FRESH method to print 3D alginate structures on an Allevi 1 bioprinter. Alginate is a natural, biocompatible polymer that has a similar structure to living tissue extracellular matrix. It currently is used in multiple biomedical applications including tissue engineering, wound healing, and drug delivery. Alginate, however, is a soft biomaterial and needs to be crosslinked with divalent cations to form stable structures. With the FRESH method, we successfully printed lattice and cylindrical structures using alginate. We demonstrated that the FRESH method on Allevi 1 is reliable and robust and can be used as part of a teaching laboratory in the Department of Engineering to introduce students to bioprinting. A future direction we are pursuing is to incorporate bioprinting into research using other biomaterials, such as collagen.

**Measuring and Understanding the Experience of Post-Traumatic Growth in Aphasia**

Lindsay Harvey & Mikolaj Bandosz  
Speech-Language Pathology || Rangos School of Health Sciences  
Faculty Advisor: Sarah Wallace Ph.D. CCC-SLP, ASHA-F

**ABSTRACT:**  
Aphasia affects language production and comprehension and is typically caused by stroke. Post-traumatic growth (PTG) is a positive change which occurs from struggle with a life crisis (Calhoun et al., 2000). Understanding PTG helps determine the potential for positive change and develop related interventions. PTG researchers often omit people with aphasia (PWA) due to their limited communicative abilities. The study’s purpose was to explore administration of an aphasia-friendly PTG tool (i.e., the Post-Traumatic Growth Inventory-Aphasia; PTGI-A) and how PWA experience PTG.

For the current case presentation, we selected two PWA from a larger study. Participants virtually completed the following assessments during a single 2-hour session: PTGI-A, Quick Aphasia Battery, Modified Perceived Stress Scale, Successfully Living with Aphasia Rating Scale, Stroke Aphasia Quality of Life Scale-39, Basic Psychological Need Satisfaction and Frustration Scale, and Patient Health Questionnaire Depression Scale. P8, a 53-year-old female who was 42 months post stroke, had moderate aphasia. She reported a depression diagnosis, lived with family, and was not working. Her PTGI-A responses indicated that in some areas she experienced positive and negative growth simultaneously since her aphasia diagnosis while other areas remained the same. P9, a 46-year-old male who was 163 months post stroke, had moderate aphasia. He did not report a depression or anxiety diagnosis, lived alone, and was not working. His PTGI-A responses indicated several areas of his life
remained the same since his aphasia diagnosis. We will compare and contrast the cases across all measures and highlight implications and future research.

**Characterizing Coqui Frogs in Phipps Conservatory and Botanical Gardens**
Haley Moore  
Biology || Bayer School of Natural and Environmental Sciences  
Faculty Advisor: Sarah Woodley Dr.  
Additional Authors: Kim Bischof, Sara McClelland, Maria Wheeler, Sarah States, Peter Freeman

**ABSTRACT:**
Billions of pounds of chemicals are used annually to control pests, despite concerns for human, wildlife, and ecosystem health. However, public gardens have long been champions of non-chemical pest control methods. In 2008, 18 male and female Coqui Frogs (Eleutherodactylus coqui) were introduced to Phipps Conservatory and Botanical Gardens as a means of pest control. Coqui Frogs are small terrestrial frogs from the neotropics that breed year-round in suitable conditions. To determine the viability of this captive population, we analyzed population size and reproductive activity using exhaustive captures and male calling, an indicator of mating. Environmental parameters and frog morphology were also recorded. Since their initial introduction into a single room, the Coqui Frogs have expanded to 3 additional rooms. Using data from exhaustive captures, and assuming a 1:1 male to female ratio, there are at least 50 adult Coqui Frogs currently in Phipps, indicating population growth. We observed calling year-round with a positive relationship between calling and outside temperature and humidity. This study provides new insights into the breeding patterns and expansion of an unmanaged, captive population of frogs, opening opportunities of mark recapture studies using VIE tagging.

**Christianity and COVID: Conservative Authoritarianism**
Brooke Kimet & Claire Shipley  
Psychology || McAnulty College and Graduate School of Liberal Arts  
Faculty Advisor: Alexander Kranjec Ph. D

**ABSTRACT:**
Since the COVID-19 outbreak in the United States, the CDC has implemented guidelines to help reduce its spread. Despite some efforts, people often do not follow these guidelines, leaving many questions about why so many deviate. The current research examines the connection between religious belief, observance, and the mistrust of scientific findings in relation to adherence to CDC COVID guidelines. We created a survey measuring peoples’ religious beliefs, trust and mistrust of sources, and COVID-19 practices in a population of Christians. Analyses examined correlations between religious variables and pandemic-related behavior. One hypothesis suggests that, generally speaking, higher Christian religiosity will predict less adherence to COVID-19 guidelines. We found a correlation between specific religious beliefs and COVID related behavior. Namely, within a Christian population, more authoritative and absolute ways of thinking predicted less adherence to COVID-19 guidelines; specifically, those guidelines limiting socialization. These findings show how particular aspects of religiosity relate to deviance in adherence to COVID-19 guidelines, moving beyond simple explanations that view religious groups monolithically. A better understanding of relationships between religiosity, trust in science, and COVID-
19 practices may suggest ways that best practices might be encouraged within different religious groups.

**Decellularization of Spinach Leaves as an Outreach Initiative for introducing Tissue Engineering to Elementary School Students**

Clare Flanagan  
Biomedical Engineering || Biomedical Engineering  
Faculty Advisor: Kimberly Williams Ph.D.

**ABSTRACT:**  
Tissue engineering is a focus area in biomedical engineering with the potential to revolutionize clinical medicine. Removal of cells from existing tissues including plants has emerged as one possible vehicle for the development of new tissues. This project investigates the optimal conditions under which spinach leaves are decellularized using physical (freezing) and chemical treatment (10% Sodium dodecyl-sulfate (10% SDS)). This was done as part of an outreach initiative to create a multilayered scientific protocol accessible to elementary school children to introduce them to tissue engineering. Several variables were tested to determine the ideal conditions that result in optimal decellularization of the leaf, including fresh versus frozen leaves, length of time, kale versus spinach, and several combinations of these. Each experiment compared two petri dishes with one leaf each, one submerged in deionized water and the other submerged in 10% SDS. The best results occur when spinach leaves are frozen for one week, then submerged in 10% SDS for one additional week. This optimization was determined by comparing the color of the spinach from the beginning to the end of the experiment, evidenced by a stark change in color from green to translucent. We conclude that the decellularization experiments culminate in a simple but effective protocol, which includes scientific concepts interwoven with the experiment, and is accessible to elementary school children. The outreach component of the project is accomplished with a virtual presentation accompanied by individual lab kits sent to schools to accommodate a remote teaching experience.

**Deep Learning based Image Restoration: Balancing performance and theoretical guarantees**

Ryan Cecil  
Mathematics || McAnulty College and Graduate School of Liberal Arts  
Faculty Advisor: Stacey Levine Ph.D.

**ABSTRACT:**  
Image restoration is the process of estimating uncorrupted images from observations that have undergone degradations such as noise or blur. Recently, image restoration models have been proposed using the deep learning framework of convolutional neural networks (CNNs). These data-driven approaches show state of the art results with respect to performance but lack theoretical foundations, making them impractical for real-world problems where mistakes are not allowed, such as medical imaging or autonomous vehicles. In addition, previous results have shown that denoising image geometry, such as level line curvature data, and then reconstructing an image estimate with the denoised curvature data yields more accurate results than denoising the image directly. This mathematically sound approach shows promise, but still lags behind CNNs with respect to performance. Furthermore, existing denoisers for natural image data do not necessarily translate to denoisers for image geometry, and this approach could benefit both from learning denoisers for image geometry as
well as learning the most productive image geometries itself. In this work, we propose and analyze multiple CNNs whose architectures mimic that of mathematically sound models for learning new higher-order geometrically motivated image features that can be used for various image restoration tasks, including denoising, deblurring, and super-resolution. The goal of this work is to use these CNNs to formulate mathematically sound models for image restoration whose performances rival CNN based approaches.

Developing a Multimedia Interface and Framework for Electrical Biosignal Interpretation
Christopher Cox
Trumpet Performance || Mary Pappert School of Music
Faculty Advisor: Paul Miller Ph.D.

A B S T R A C T:
In the last ten years, a great deal of interest has been generated around the practice of using plants’ electrical signals to create sound or music. In order to render biosignals capable of producing sound electronically, some kind of interface is necessary that converts a plant’s natural electrical signals into data that a computer can understand. Existing commercial interfaces cost at minimum $300. Worse yet, two popular off-the-shelf interfaces conform their output signals to stereotypical human notions of what a plant might “sound like”.

In this project we fabricated a simple but high-performance interface for less than $5 in parts. The interface sends electrical biodata to MAX/MSP, a powerful industry-standard software application ubiquitous among music composers, video artists and an enormous community of creative designers for decades. The minimally altered biosignals can then be harnessed to generate sound, video, light or movement.

While many have approached this growing field cautiously, a great deal of misinformation has taken root in certain communities, sometimes attributing human qualities to plants. By using a simple, low-cost and minimally intrusive interface, we hope to provide a way to dispel unfortunate fictions, without demeaning the impressive abilities of plants to sense their environment and respond to stimuli. Our interface provides a means towards fostering more conscientious inter-species collaborations.

Our presentation includes technical hardware specifications, circuit diagrams, and several MAX/MSP patches that produce musical notes or trigger pre-recorded sound samples in response to plants’ idiosyncratic electrical signals.

Effects of Mechanical Institutionalization on Veteran Post-Service Re-Entry
Deidra Hubay
Political Science & Sociology || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Sarah MacMillen Ph.D

A B S T R A C T:
Channeling the concepts of Emile Durkheim, this research will seek to explore the causes of veteran anomic dysfunction such as suicide, substance abuse, homelessness, connection to community, etc. It will preliminarily explore the ways in which identity reconstruction, resulting from military basic training, transitions recruits from a modern society of organic solidarity into a traditional society operating under
mechanical solidarity which prioritizes the collective consciousness above all else. During this process of, what I will refer to as, mechanical institutionalization, an individual’s prior-service identity is replaced with a group identity. This process occurs on a spectrum pursuant to psychological, environmental, cultural, and historical factors individuals may have experienced before entering the service. As a result, without the norms and values the veteran previously relied on, veterans struggle to adapt to modern, “civilian” society’s values and norms as are no longer personally relevant. Just as Durkheim theorized that mechanical ties within (traditional) society would crash when introduced to organic solidarity within modern society, so too do individuals.

Understanding the causes and depth behind veteran difficulties during their post-service re-entry process will give us the necessary tools for: (1) providing more inclusive campus practices that welcome and support Duquesne’s thriving veteran population and (2) addressing the need for more effective and efficient policy solution for the alarming US domestic veteran suicide rate, and highlight skills for transitional support relating to behavioral and social health, to aid veteran assimilation into mainstream society.

**Engineered Extracellular vesicles for the delivery of brain-derived neurotrophic factor to ischemic brain endothelial cells**
Gina Joy
Doctorate of Pharmacy || School of Pharmacy and the Graduate School of Pharmaceutical Sciences
Faculty Advisor: Devika Manickam Ph.D.
Additional Author: Anisha D’Souza

**A B S T R A C T:**
Extracellular vesicles (EVs) are naturally secreted by different cells in the body and play a key role in intercellular communication. EVs are membrane-bound and contain a variety of lipids, proteins, and nucleic acids. Recent reports have suggested the presence of functional mitochondria and mitochondrial DNA in EVs to support cell survival. In an ischemic stroke, the blood-brain barrier (BBB) suffers damage leading to cell death. This presents as an emerging target for therapies that can increase endothelial cell survival. The endothelial cells lining the BBB are a critical component whose recovery post-stroke can restore its inherent protective functions and limit further damage to brain tissue. Ischemic endothelial cells express low levels of brain-derived neurotropic factor (BDNF) and is associated with poor functional outcomes post-stroke. Our goal is to engineer endothelial cell-derived EVs to deliver BDNF protein to brain endothelial cells in order to encourage survival post-ischemia. We will harness the potential of the mitochondrial load in these EVs and deliver BDNF to the endothelial cells. The cationic charge of the BDNF protein limits its entry into cells and therefore, we propose to engineer BDNF-EVs to facilitate its delivery into the cells. We will treat hCMEC/D3 monolayers exposed to oxygen-glucose deprivation (an in vitro model of stroke) using BDNF-EVs and measure their cell viability post-treatment. We will also measure the levels of secreted BDNF protein. Through these findings, we hope to advance the preclinical testing of EVs for endothelial protection to further the progression towards improving patient outcomes in stroke therapies.

**Gender differences may influence how caregivers handle burden**
Kayla Graver & Kiele Fullerton
Nursing || School of Nursing
Faculty Advisor: Pamela Spigelmyer Ph.D., RN, CNS, CSN
ABSTRACT:
Gender differences impact burden as each gender has a different way of thinking and reacting (Arbel et al., 2018). Gender differences among caregivers have been briefly analyzed with a few studies identifying that female caregivers have a greater burden than males (Arbel et al., 2018; Schrank et al., 2016; Xiong et al., 2020). Purpose: This project determined if there were differences in mindfulness self-compassion, ways of coping, and perceptions of stress related to caregiver gender. Method A secondary analysis was done using gender data from Spigelmyer et al., (2021). Results: Four males and 20 females completed 80% of 8 sessions of mindfulness self-compassion. Males attend more sessions than females (93.75% versus 72.5%). Positive reappraisal for females starting at 10.05 and ending at 13.81. Positive reappraisal for males started at 9.50 and ended at 8.25 (t-value -2.69; p-value 0.0186). Males had less change in coping than females. Self-compassion, caregiver burden, and perceived stress were not statically significant. Another way of coping-seeking social distancing was significant with mean difference in scores of -4.7143 (t-value -3.23; p-value 0.0069). Women’s change in score was almost 5 times higher than males change in score. Discussion: The secondary analysis suggests that mindfulness self-compassion may be beneficial for caregivers and for male and female caregivers to help with perceived stressors of caregiving. Mindfulness self-compassion related to positive reappraisal and indicated that male attitudes and opinions were more negative compared to females. Future studies are needed with larger sample sizes to validate the findings from this study.

Going Out or Staying In: How the COVID-19 Pandemic has Influenced College Students’ Drinking and Socializing
Megan Huey & Amy Yuhas
Nursing || School of Nursing
Faculty Advisor: Mai-Ly Nguyen Steers Ph.D.

ABSTRACT:
People’s daily social activities have been altered during the pandemic since they carry risk for contracting COVID-19. Prior to the pandemic, drinking socially was the highlight of many college students’ lives. This study explores how COVID-19 impacted college students’ drinking and social activities. We examined samples from a large, southern, public university both prior (N=65, Mean age=22.15, SD=2.03, 78.87% female) and during COVID-19 (N=47, Mean age=22.42, SD=1.64, 75.47% female). Students filled out an alcohol-related Timeline Follow Back Measure, in which they recalled their drinking over the past 30 days using anchor events inputted into a calendar. The events were qualitatively coded and assigned a COVID-19-risk behavior (CRB) score based on the Texas Medical Association’s 9-point scale. Activities now known to contain risk for COVID-19 contraction were classified as follows: moderate CRB (ranked 5-6; e.g., visiting friends), moderate-high CRB (ranked 7; e.g., attending a party), and high-CRB (ranked 8-9; e.g., going to a bar). Results revealed that students who engaged in CRBs that were ranked 5 and above were more likely to report greater number of drinks on one occasion in the past 30 days (e.g., peak drinks) and more drinks over the entire month (e.g., total monthly drinks). Although total alcohol consumption (e.g., peak drinks and total monthly drinks) remained unchanged, and students were less likely to partake in the highest ranked CRBs (e.g., ranked 8-9) during the pandemic, those who were participating in the highest ranked CRBs (e.g., 8-9) may have been more likely to contract or spread COVID-19.
How Does Text-to-Speech Affect Reading Comprehension in People with Aphasia?
Maya Louttit, Megan McCallister & Elizabeth Parisi
Speech Language Pathology || Rangos School of Health Sciences
Faculty Advisor: Sarah Wallace Ph.D

Abstract:
Aphasia, an acquired language disorder often resulting from stroke, affects multiple communication modalities including listening, speaking, reading, and writing. Technology may help individuals with aphasia understand various reading materials. Text-to-speech (TTS) technology presents written text and auditory output simultaneously. Personalization of technology like TTS is believed to maximize rehabilitation gains. Therefore, the study’s purpose was to measure the reading comprehension and rate of individuals with aphasia when they use personalized TTS systems compared to when they have no technological support.

Twenty people with chronic aphasia completed two individual sessions. First, participants selected preferred features across highlighting type, the highlighting color, rate of speech, and voice type. Next, the participants read six newspaper articles using their personalized TTS system and six articles without technology. After each reading, they answered six comprehension questions to determine accuracy.

Calculation of a paired sample t-test revealed no significant comprehension accuracy between unsupported and personalized TTS conditions. Computation of a Wilcoxon signed-ranks test revealed a significant difference between conditions (z= -2.1912, p = .004) such that participants spent less time reading in the personalized TTS condition as compared to the unsupported condition. Despite the lack of comprehension differences, participants preferred reading in the personalized TTS condition perhaps related to the participant’s increased reading efficiency. Potential clinical implications include utilizing TTS to optimize time management and make reading more functional. The current findings can be further explored during an at home study to determine if the amount of reading time increases or decreases when using TTS technology.

JA RUSYN BYL (I am Rusyn): investigating repressed Rusyn identity through the lens of folk music
Spencer McNeill
B.S. Music Education || Mary Pappert School of Music
Faculty Advisor: Nicole Vilkner Ph.D.

Abstract:
The Rusyns are a people indigenous to the Carpathian Mountains and its surrounding areas. Despite attempts by the Ukrainian government and surrounding nations to silently erase Rusyn culture from history, the Rusyn people have a distinct identity independent from that of any bordering nation. This unique identity is best outlined through Rusyn folk songs which depict beautiful images of the Carpathian homeland and patriotic tales of Rusyn ancestry. Much work to date has already been done documenting post Velvet Revolution revival of Rusyn culture. Because of this, I will instead focus on the lesser-known time prior and leading up to WWII and the Soviet bloc to highlight the slow practice of cultural repression of Rusyn folk culture by Czechoslovakia, Ukraine, the Soviet Union, and Hungary. I hope to dig up forgotten Rusyn folk songs from the 1919-1939 Czechoslovak occupation of the Carpathian Rus’ which proudly proclaim Rusyn heritage in protest to the oppressive pro-Ukrainian regime. It was because of this period of cultural repression that my family left Europe. Within my family’s reel to reel tapes, scrapbooks, and oral history lie Rusyn folk songs and personal accounts I hope
Numerical Study of Arterial Stenosis and its Sensitivity to Model Uncertainties
Angelica Alday, Talha Lone & Scott Toth
Biomedical Engineering || Rangos School of Health Sciences
Faculty Advisor: Rana Zakerzadeh Ph.D.

A B S T R A C T:
Arterial stenosis is the hardening of arteries caused by a buildup of fat and cells, which can lead to a narrowing of vessels and ultimately result in reduced fluid flow. Depending on the severity of the stenosis, it is possible for the condition to occur undiagnosed until cardiac failure, driving physicians to prematurely recommend surgical correction. Considering this strong clinical association, the need for a reproducible, comprehensive, non-invasive method is pressing. Thus, a fluid-structure interaction (FSI) solver based on the weak enforcement of interface conditions using Nitsche’s method was developed to simulate pressure wave propagation and the related arterial wall deformation into an arterial segment. Blood is modeled as an incompressible, viscous fluid and the arterial wall consists of a thick material, accounting for its multilayer structure.

The purpose of this study is to investigate the key parameters as they affect various hemodynamic functions. The numerical simulation evaluates the effects of the following relationships on trans-stenotic pressure gradients: geometry and stenosis severity, wall stiffness and vessel elasticity, wall heterogeneity (by assuming the elastic properties of the artery vary along the length), and blood viscosity. It was concluded from Fractional Flow Reserve (FFR) analysis, a method to assess severity of arterial damage, that severe stenoses inhibit wall motion. In contrast, only a marginal effect of wall stiffness was identified in comparison to the “hardening” or loss of elasticity in increasing stenosis levels. Finally, an increase in pressure gradient was observed with increasing blood viscosity due to viscous dissipation in the flow.

Occupational Exposures Among Dental Professionals: A Cross-Sectional Study
Jonah Lee
Biology/Pre-Dental || Rangos School of Health Sciences
Faculty Advisor: Bridget Calhoun Dr.P.H., M.M.S.

A B S T R A C T:
Dental health professionals and dental students frequently experience occupational exposures thereby placing them at significant risk for infection with bloodborne pathogens. Occupational exposures occur primarily through puncture wounds, lacerations from sharp instruments and splash injuries to mucous membranes. Pathogens such as hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) pose the greatest threat. In order to reduce or eliminate occupational exposures to bloodborne pathogens, dental professionals must be knowledgeable about viral transmission and specific exposure risk related to these bloodborne pathogens. This cross-sectional study involved surveying dental students and dental professionals about prior exposures, ability to
assess risk of viral transmission, knowledge of post-exposure prophylaxis, and how to promptly initiate prophylactic medications when necessary. A self-administered, electronic, anonymous survey was distributed to select US dental schools, professional list-serves, and professional dental societies in Pennsylvania, Connecticut, Texas, and California. Preliminary data demonstrate that occupational exposures are relatively common among this population which is almost equally split between men and women. This study demonstrates the need to education professionals regarding current CDC guidelines and how occupational exposures should be handled in order to minimize the risk of infection.

Data collected via this project demonstrated that the majority of dental professionals recognize the need to accurately assess for HBV, HCV and HIV exposure, however many dental professionals would benefit from more education about when post-exposure prophylaxis for HIV-infection is indicated. Future continuing education for dental professionals should include topics of infectious diseases and infection control.

Extracellular Vesicles/HSP27 Protein Nanoparticles Are a Promising Approach to Decrease Blood-Brain Barrier Permeability in Ischemic Stroke
Riyan Babidhan
Doctor of Pharmacy || School of Pharmacy and the Graduate School of Pharmaceutical Sciences
Faculty Advisor: Devika Manickam Ph.D.
Additional Authors: Devika S Manickam, Ph.D. (Faculty), Kandarp Dave (Graduate student)

ABSTRACT:
There is an unmet clinical need for effectively treating diseases like ischemic stroke. During ischemic stroke, the blood-brain barrier (BBB) is disrupted, followed by the extravasation of blood components into the brain exacerbating ischemic injury. It is known that decreasing endothelial cell death and BBB permeability can prevent the influx of deleterious inflammatory molecules from the blood to the brain side and vice versa. Engineered nanoparticles (NPs), 1-100 nanometers in particle diameter, are widely used as drug delivery systems due to their versatility and modifiable physicochemical properties. Modification of the NPs with polymers like poly(ethylene glycol), for instance, ensures the stability of therapeutic agents in vivo against enzymatic degradation and renal clearance, resulting in increased circulation half-lives and prolonged tissue retention. Endothelial, but not neuronal expression of heat shock protein 27 kDa (HSP27), ameliorated BBB disruption and enhanced the overall sensorimotor recovery for nearly a month post-ischemia in a mouse model of stroke. We will develop polymer/HSP27 nanoparticles to decrease BBB permeability in ischemic brain endothelial cells. Specifically, we are interested in comparing two polymers: poly(ethylene glycol)-b-poly(aspartate diethyltriamine) (PEG-DET) and poly(methacryloyloxyethyl phosphorylcholine) conjugated with dimethylaminoethyl methacrylate and butyl methacrylate (PMPC-DB) for HSP27 protein delivery due to their controlled and sustained-release properties, low toxicity, and biocompatibility with tissues and cells. We hypothesize that the delivery of HSP27 will decrease BBB permeability in ischemic brain endothelial cells, thus allowing them to retain their structure and function leading to improved outcomes in stroke therapies and patients’ quality of life.

Project ALIEN (Alternative Lifeform Identification and Exploration Navigator)
Rebecca McCallin, Madelyn Hoying, Lucia Secaida, Alexander Guy, Nina Dorfner, Alexander Evans, Karli Rae Sutton, Matthew Nestler, Amanda Trusiak, Selvin Hernandez, Garett Craig, Rachel Fernandez &
Paige Aley  
*Biology, Biomedical Engineering, Cybersecurity Studies || Bayer School of Natural and Environmental Sciences*  
Faculty Advisor: Melikhan Tanyeri Ph.D.

**ABSTRACT:**  
Alkaliphile bacteria *B. Arsenicoselenatis*, *B. Selenitireducens* and *Alkalilimnicola Ehrlichii* thrive in environments of high salinity and anoxic conditions, and respire anaerobically in the presence of arsenic, selenium, and nitrogen compounds. With the presumption that Martian microbes are metabolically similar to terrestrial extremophiles, this study proposes a two-phase approach to determine terrestrial alkaliphile survival and adaptability to Martian conditions and to probe for potential microbial life on Mars' Gale Crater.

Aforementioned terrestrial alkaliphiles will be harvested from Mono Lake, CA and sequenced. During travel to Mars, growth conditions including pH, salinity and temperature will be gradually adjusted to match conditions to those on the Martian surface. Once on Mars, microbes will be introduced to Martian soil and supplemented with lactate, pyruvate, and malate, facilitating respiration while determining which electron donors are most effective for respiration. To discover novel microbes, DAN (Dynamic Albedo of Neutrons) will be used to locate areas of high hydrogen concentration in brines of the Gale Crater, which will be exposed to arsenic and selenium compounds to trigger a microbial respiratory response. Samples with positive respiratory reactions will be proliferated using chemical compounds that instigated respiration. Finally, microbes will be sequenced using PCR amplification and BLAST analysis.

In summary, we will investigate adaptability of terrestrial alkaliphiles and presence of arsenic and/or selenium respiring microbes on the Martian surface. We will specifically monitor adaptation and mutation rate of microbes during long-duration spaceflight, which will inform improvement of astronaut health and safety.

Project ALIEN (Alternative Lifeform Identification and Exploration Navigator) is a comprehensive plan to send humans to Mars and search for life on the Martian surface while exploring the viability and adaptability of terrestrial microbes in Martian atmospheric conditions. ALIEN will use a ballistic capture trajectory to reach Mars and stay in aerostationary orbit for a 30-day surface mission, during which two surface crewmembers will perform a variety of experiments to search for evidence of microbial life within brines of the Gale Crater and test terrestrial microbe adaptability and viability to Martian conditions. Experimentation is based on the hypothesis that Martian microbes are metabolically similar to terrestrial extremophiles.

Adaptability will be tested using terrestrial alkaliphiles *B. Arsenicoselenatis*, *B. Selenitireducens* and *Alkalilimnicola Ehrlichii* which thrive in environments of high salinity and anoxic conditions, and respire anaerobically in the presence of arsenic, selenium, and nitrogen compounds. During travel to Mars, microbes will be subject to steady growth condition adjustments which replicate Martian environmental conditions. Microbes will then be introduced to Martian soil and be supplemented with respiratory facilitators to determine which electron donors are most effective for respiration. Samples of Martian brine will be exposed to arsenic and selenium compounds to trigger a respiratory response in presumptive Martian microbes. Those that initiate a response will be cryopreserved for transport back to Earth for further analysis.

After the surface mission, the two surface crewmembers will reunite with mission control in orbit around Mars and return to Earth via ballistic capture trajectory.
Quantum and Molecular Mechanical (QM/MM) Approach to Modeling the Water Solvated Uncatalyzed Decarboxylation of Monoanionic and Dianionic Malonate
Kezia Jemison
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Faculty Advisor: Jeffrey Evanseck Dr.
Additional Authors: Angel Tamez (graduate student), Dr. Jeffrey D. Evanseck (faculty)

A B S T R A C T:
Beta-Keto acids are essential to various enzymatic processes. One example of a beta-keto acid is Malonic acid is a \( \alpha \)-keto acid, which when substituted, undergoes decarboxylation catalyzed by the arylmalonate decarboxylase (AMDase) enzyme. AMDase is a common target for non-steroidal anti-inflammatory drugs (NSAIDs) (e.g. ibuprofen, naproxen, etc.). However, the factors that affect the mechanisms of enzymatic catalysis are highly debated and not well-defined. Part of the confusion arises from the fact that the uncatalyzed mechanism of malonate decarboxylation remains relatively unstudied. Our work focuses on establishing the mechanism of the uncatalyzed process of decarboxylation, such that a solid framework for understanding the factors that affect enzymatic catalysis are eventually defined. We have established that water clusters capable of forming hydrogen bonding networks are responsible for the decarboxylation of \( \alpha \)-keto acids. We used the subtractive QM/MM ONIOM method in the Gaussian16 software with various sized water clusters to systematically evaluate solvent-substrate interactions and “solvent cages” for the uncatalyzed decarboxylation of monoanionic malonate. Water clusters of 3, 10, and 15 with monoanionic malonate yielded a novel orthogonal ground state conformation, which outcompeted the commonly assumed pseudo-chair ground state conformation with a charge-assisted-intramolecular-hydrogen-bond (CAHB). All water cluster systems of the monoanion reproduced the experimental enthalpy of activation. Preliminary data for the dianion suggests a similar conformational preference for the ground state of the substrate. This work offers a better understanding of analogous solvent-substrate interactions and solvent cluster effects, which can be further applied to the description of enzyme catalyzed decarboxylation mechanisms of beta-keto acids.

Safety and efficacy of intravenous hydralazine and labetalol for the treatment of asymptomatic hypertension in hospitalized patients: a systematic review
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Pharmacy || School of Pharmacy and the Graduate School of Pharmaceutical Sciences
Faculty Advisor: Branden Nemecek PharmD, BCPS

A B S T R A C T:
Background: Current guidelines for the management of asymptomatic hypertension (HTN) in the inpatient setting recommend the use of oral antihypertensives. However, in clinical practice, intravenous (IV) antihypertensives are commonly utilized with little supporting evidence. The objective of this study was to evaluate literature examining the safety/efficacy of IV hydralazine and labetalol in hospitalized patients with non-emergent, asymptomatic HTN.

Methods: The PRISMA guidelines were utilized to structure the systematic review. A search strategy composed of drug-, inpatient-, and HTN-related terms was conducted utilizing PubMed, Embase, and Scopus databases through May 2020. Full-text, English-language articles describing IV labetalol and/or hydralazine use for non-emergent HTN in an inpatient setting that focused on clinical outcomes (i.e.,...
vitals, adverse effects, healthcare utilization) were included. Identified studies were screened/extracted using DistillerSR by two reviewers at each stage, and studies were evaluated qualitatively for the presence of bias.

Results: From 3362 records identified in the search, a final set of 10 articles were identified. Four studies focused on labetalol (40%), five studies on hydralazine and labetalol (50%), and one study on hydralazine (10%). The included studies presented a variety of outcomes, but several trends were identified, including reduction in average blood pressure in eight (80%) studies, a risk of adverse effects in six (60%), and increased length of stay in one (10%).

Discussion: The studies identified in this review raise concerns regarding the safety of IV hydralazine and labetalol in non-emergent HTN. Despite relatively broad clinical experience with these drugs, experimental investigations regarding their utility are recommended.

Suicide Trends Within Impoverished Areas: The Need for a Closer Look at Connections Between Suicide and Poverty
Odile Enslen
Forensic Science and Law || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Lyndsie Ferrara Ph.D
Additional Authors: Anita Zuberi, Ph.D, Mandy Tinkey, M.S

Abstract:
When examining suicide cases, previous studies have continuously used gender, age, and race to establish suicide trends among various demographics. One demographic excluded from being cross examined with suicide trends is poverty status (or income level). When analyzing cause of death in suicides, research has suggested that certain demographics use certain causes of death, such as firearms or hanging, more frequently than others. Suicide data along with census data from the years 2009 through 2018 were used to investigate relationships between suicide method and frequency of suicide across Allegheny County municipalities. The key comparisons investigated in this study were suicide prevalence and suicide trends between impoverished versus non-impoverished municipalities and then compared to National averages. All suicide data from 2010 through 2019 was supplied by the Allegheny County Medical Examiner’s Office and The American Community Survey (ACS) data was then used to look at the percent of people living under the poverty line in each municipality and the percent of people living under half of Allegheny County’s median household income. By combining these two data sets, suicides and cause of death can then be examined alongside income level. The findings from this study examine whether suicide rates are higher in impoverished communities and if suicide trends differ from national averages in impoverished communities. Results from this study will inform areas for improved preventative measures as well as highlight the important role that medical examiners play in educating and promoting research within public health issues.

The Effect of COVID-19 on Elementary Students’ Use of Language Online
Emma Polen
Integrated Marketing Communication || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: James Purdy Ph.D.
A B S T R A C T:
The COVID-19 pandemic has made in-person communication among elementary students difficult. With the lack of in-person contact with friends, children are discovering ways to communicate online while they are apart. In fact, in their exploration of new forms of communication, elementary students have created a new language. This new discourse is completely digital and based on visual content which has not been used in this way by any previous generations. The question I ask in my research project is: How has the reliance on digital communication platforms compelled by COVID-19 affected elementary students' use of language? Digital communication between children is increasing, and young children have greater access to online platforms to communicate with friends. Some children are even utilizing their school email to reach peers. For my study, I surveyed parents of elementary school children in my district and observed Zoom chat room activities among three eight-year-olds. My survey sample size was 16 and I reached them through family connections with an anonymous survey link. Both methods of conducting my research build on the existing understanding that digital communication is a new and versatile method of contact, especially among young children (Yamada-Rice 341-361). My results have implications in the wider world of education. How children are changing their use of language, especially with increased access to digital modes of communication, is valuable to shifting the way in which information is presented to children.

The Relationship Between Focused Attention and Object Permanence
Amber DelPrince, Melanie Tommer, Claire Boe, Jessica Spirnak & Karl Jancart
Spanish || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Regina Harbourne Ph.D.

A B S T R A C T:
Background: Focused attention (uninterrupted attention to task) and understanding of object permanence (knowledge that objects exist when not seen) are two constructs in infancy that build future cognitive skills. The relationship between the two in infants with delays is poorly understood.

Purpose: The purpose of this study was to examine the relationship of early focused attention at the point of early sitting independence to object permanence skill one year later in infants with motor delays.

Methods: 15 infants (aged 8-16 months) with motor delays were scored on an analog scale of 1-5 (5 = greatest focus) to indicate their level of global focused attention during two specific object permanence tasks, a switch task and a displacement task. All infants were enrolled in a larger trial aimed at improving motor development. Object permanence testing was conducted after 12 months. The scores were correlated using a graphing method.

Results: Increased focused attention on the displacement task at 1.5 months correlated strongly to overall object permanence at 12 months (estimate R²=0.52). The correlation between focused attention during the switch task at 1.5 months and total object permanence at 12 months was low (R²=0.10). The stronger correlation of the displacement task likely occurs because the displacement task only requires observation of actions, whereas the switch task requires both memory of the hidden object and observation of actions.

Conclusion: This study provides evidence that focused attention early in development contributes to building cognitive constructs like object permanence in infants with motor delays.
Understanding the effect of adaptive mutations on the three-dimensional structure of RNA

Justin Cook
Biomedical Engineering || Biomedical Engineering
Faculty Advisor: Lauren Sugden Ph.D.

A B S T R A C T:
Single-nucleotide polymorphisms (SNPs) are variations in the genome where one base pair can differ between individuals (NIH). SNPs occur throughout the genome and can correlate to a disease-state if they occur in a functional region of DNA (NIH). According to the central dogma of molecular biology, any variation in the DNA sequence will have a direct effect on the RNA sequence and will potentially alter the identity or conformation of a protein product. A single RNA molecule, due to intramolecular base pairing, can acquire a plethora of 3-D conformations that are described by its structural ensemble. One SNP, rs12477830, which was previously shown to harbor signatures of positive selection by Sugden et al., was passed through multiple RNA folding algorithms. The results of SNPfold demonstrate that the SNP significantly alters the structural ensemble, and the significance of this change offers a potential explanation of SWIF(r)'s result (Sugden et al., 2018). Furthermore, the RNAfold Webserver reveals that the mutant RNA molecule is more stable than the wild-type with a more negative free energy and a higher frequency. These loci of variation should be studied in order to understand the potentially induced conformational changes that could significantly alter the functional capacity of an RNA molecule. Future work aims to assess conformational changes elicited by SNPs previously shown to harbor signatures of positive selection using ancestry-specific reference genomes to better understand motivations behind a locus experiencing positive selective pressure.

Using Online Learning and Gamification to Enhance Ethics Education in Forensic Science

Sarah McKendrick
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Faculty Advisor: Lyndsie Ferrara Ph.D.
Additional Authors: Jim Schreiber, Ph.D. (faculty), Sara Bitner, M.S. (committee member), Pamela Marshall, Ph.D. (faculty), Lyndsie Ferrara Ph.D. (faculty)

A B S T R A C T:
Generally, many people believe they possess adequate ethical reasoning skills and an understanding of ethics to work in their specific disciplines. Though this may be true sometimes, employers have reported a deficiency of ethics education in the workplace. The focus of this research was to develop methods to effectively teach forensic science students about reasoning and ethics. This research worked to enhance ethics education in forensic science by effectively using a flipped classroom model. This pedagogy enables students to learn content and then utilize it where an educator can oversee the application and assist students as needed. It was hypothesized that a flipped classroom model would be an effective pedagogical model for ethics education. Prior to attending class, students completed online modules pertaining to reasoning and ethical concepts. A comparison of pre-test and post-test scores was used to determine a gain in knowledge. The content taught through the online modules was then implemented into a classroom activity so students could apply what they learned. To test the activity, some students who did not complete the modules participated. Analysis included comparing worksheets based on completion of the modules. Preliminary findings indicated that this pedagogical model for ethics education is efficacious. Student feedback regarding the modules and the in-class activities indicated proclivity toward this pedagogy. Results thus far indicate the flipped classroom model is effective.
Further testing should be completed to statistically prove the effectiveness of this model. Overall, this model offers an engaging format for ethics education in forensic science.

**Creative Video Projects**

**Occupational Therapy's Distinct Value at CLASS**
Delaney Batik, Lindsey Brand, Molly McHugh & Olivia Shope
Occupational Therapy || Rangos School of Health Sciences
Faculty Advisor: Retta Martin MS, OTR/L

**A B S T R A C T:**
One of the core concepts of Occupational Therapy (OT) is to integrate meaningfulness into people’s lives, and amplify their participation in their communities. People with disabilities face challenges everyday that limit their opportunities, and with the added changes to an online format due to the COVID-19 pandemic, they meet continuous difficulties. As occupational therapy students we had the opportunity to provide interventions to the participants at Community Living and Support Services (CLASS) which is a nonprofit organization that offers a vast array of resources and supports for individuals with varying abilities including adults with IDD and cerebral palsy. We were able to be a part of three of the classes they have in their adult day program including Computers, Fitness, and Financial Management. Although these classes seem very different, it became clear that OT adds value to each class. The impact of COVID-19 has limited the participants' opportunities for social interaction, participation and the learning of generalizable skills that they can implement in their daily lives. We strive to support the participants in engaging in meaningful activities that will lead to increased independence, quality of life and overall well-being. In this video presentation, we will articulate the distinct value that occupational therapy can have in this setting despite the barriers of interacting with the participants through a virtual platform.

**Mary Todd Lincoln: Duty and Depression**
Bella Biancone
History and Political Science || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Jennifer Taylor Ph.D

**A B S T R A C T:**
First Lady Mary Todd Lincoln was perceived by Victorian America as materialistic and unbalanced. Behind the closed doors of the Executive Mansion, however, lie a grief-stricken mother struggling to manage an undiagnosed and untreated mental illness. Her fragile condition was exacerbated with each death of her beloved family. Yet, this First Lady played an integral role in the White House, acting as hostess, advisor to the President, and activist in her own right. She was not a passive bystander as her husband worked tirelessly to preserve the Union, but an active participant in the war effort. Following Abraham Lincoln’s premature demise, Mary Lincoln’s internal battle amplified tenfold. The devastated widow’s mental well-being continued to rapidly decline until her death. Despite her handicap, Mary became the sole custodian of the Lincoln legacy and worked determinedly to honor his memory and wishes. After her time as First Lady came to an abrupt end, Mary continued to lobby for the lavish lifestyle she believed the wife of Lincoln deserved. She became an advocate of widow’s rights, especially when it came to bereavement pensions. While battling her inner demons Mary Lincoln battled the
Democrats, Confederates, Radical Republicans, her own family, and the American people. Despite her external traumas and internal turmoil, Mary Todd Lincoln was an active and trendsetting First Lady both during and after her tenure at the White House.

The Role of Occupational Therapy at ACHIEVA and ASPIRE
Anna Fish, Katelyn Budhai, Katie Cerny, Cat Colpoys & Heather Haley
Occupational Therapy || Rangos School of Health Sciences
Faculty Advisor: Retta Martin MS, OTR/L

A B S T R A C T:
Our video will focus on the role of occupational therapy students working with adults who have intellectual and developmental disabilities (IDD). During the 2020-2021 school year, Duquesne occupational therapy (OT) students worked with adults who have an IDD at ACHIEVA and ASPIRE. ACHIEVA and ASPIRE are two Pittsburgh organizations that advocate for and empower individuals with disabilities to gain independence by supporting their participation in community life and vocational opportunities. After working with adults with IDD this past year, we found that this population is experiencing a sense of social isolation due to the COVID-19 pandemic, which requires the use of new virtual platforms. Our goal for the rest of the school year is to increase this population’s participation in their occupations of social participation, work, and leisure. To do so, we will utilize the OT model called the Model of Human Occupation to design and guide our weekly online group sessions. The OT intervention sessions will focus on how to use the Zoom platform to increase the clients' engagement in social participation while online. Our presentation will end with an overview of the strengths and weaknesses of providing therapy services online. With this understanding, we will share how we adapted online therapy services to meet the varying cognitive and communication needs of those who attend ACHIEVA and ASPIRE, as we hope to continue these adaptations as future health care providers who will likely provide therapy services online and services to individuals who have IDD.

Shepherd's Heart House of Hope: The Impact of Occupational Therapy and Telehealth
Jamie Foster, Julia Bersani, Emily Georgia & Sara McDonald
Occupational Therapy || Rangos School of Health Sciences
Faculty Advisor: Retta Martin

A B S T R A C T:
In this video we will be introducing Shepherd’s Heart, a transitional home for veterans experiencing homelessness. We will discuss the distinct role that occupational therapy plays at Shepherd’s Heart, and how we can improve multiple skills in their lives that will assist with independent living. We will also dive into the impact that COVID 19 had on the veterans of Shepherd’s Heart, such as lack of social participation and lack of employment opportunities. Having these telehealth sessions has provided a great opportunity to utilize an online platform to provide services when working with an at risk population. Although we have had a successful experience, we have had to face many challenges. With the circumstances of COVID 19, we have had to adapt many activities to fit the new virtual environment. This video will give a brief overview of our unique experience in navigating telehealth in a community based setting.
**Occupational Therapy at ARYSE**  
Caitlyn Hallihan, Madison Galloni, Maria Guerin & Emily Wright  
Occupational Therapy || Rangos School of Health Sciences  
Faculty Advisor: Retta Martin MS, OTR/L

**A B S T R A C T:**  
Our occupational therapy level III fieldwork provided us with the opportunity to partner with the ARYSE Middle School After School Club. ARYSE is a non-profit organization that was founded in 2013 and was created for youth refugees who have resettled in the Pittsburgh area. The After School Club provides educational and community resources to their students through homework help, tutoring, mentoring, and enrichment programs. With the effects of the COVID-19 pandemic eliminating the opportunity to interact with one another in-person, their safe environment was transitioned online. During our fieldwork III experience we rigorously worked to rebuild a safe and trusting environment for the students to engage in during the virtual meetings. Their needs did not stop there. The ARYSE students still had difficulty expressing and regulating emotions, managing behaviors, and developing social skills. Occupational therapists have a unique skill set. Occupational therapists can thoroughly assess the students’ social interaction, cognitive, and psychosocial skills and intervene using a trauma-informed-care approach. The goal at ARYSE for occupational therapy moving forward is to develop healthy coping mechanisms, self-expression, and collaboration and communication skills that are needed for everyday activities. With these skills, the ARYSE students will be able to better participate in what they find meaningful as a part of their everyday life.

**Occupational Therapy at St. Anthony’s: Virtual Edition**  
Haley Kabo, Sudhee Acharya, Jackson Johnson, Emma McCleery & Emily Weingartner  
Occupational Therapy || Rangos School of Health Sciences  
Faculty Advisor: Retta Martin MS, OTR/L

**A B S T R A C T:**  
This video will focus on the role of occupational therapy (OT) students who are working with young adults with intellectual and developmental disabilities (IDD) transitioning into adulthood (ages 18-21). Many individuals with IDD have difficulty completing their daily tasks independently, creating social relationships, and finding/maintaining employment. St. Anthony’s Post Secondary Program at Duquesne University provides services related to life skills and job training in order to promote independence in these individuals. As OT students at Duquesne University, we have been implementing interventions throughout the 2020-2021 school year to help increase the clients’ independence, participation in daily life tasks, mental wellbeing, and physical health. This video will depict the important role occupational therapy plays within this population and how both the focus and method of our interventions has changed due to the COVID-19 pandemic. Despite these changes, occupational therapy interventions continue to make an impact on the students’ health and wellness, both physically and mentally.

**Occupational Therapy for Older Adults Amongst the COVID-19 Pandemic**  
Emma Naegler, Olivia Borovich, Nicole Jones & Rebecca LaCroix  
Occupational Therapy || Rangos School of Health Sciences  
Faculty Advisor: Retta Martin MS, OTR/L
A B S T R A C T:
This video outlines the role of occupational therapy students working with older adults living at Vincentian, an assisted living facility, during the COVID-19 pandemic. Occupational therapy has a unique role in providing services for the geriatric population, especially for individuals experiencing cognitive deficits. Within this population, occupational therapy works specifically on areas such as reminiscing, memory, providing sensory experiences, and improving mental health. The COVID-19 pandemic has had a significant impact on this population, leading to feelings of isolation, depression, and lack of social interaction. Given these circumstances, occupational therapy students from Duquesne have implemented meaningful and engaging activities for the residents to participate in every week. All of the activities have been adapted in order to accommodate the virtual platform, however, the activities are still just as impactful. Several examples of intervention include sensory stimulating activities such as light exercise, visual reminiscing, and rhythmical music engagement. With regards to implementing occupational therapy intervention, the aim is to maintain cognitive function and social engagement of the older adult population at Vincentian during the COVID-19 pandemic.

Modern Deuteron Form Factor Parameterization.
Asia Parker
Physics and Mathematics || Bayer School of Natural and Environmental Sciences
Faculty Advisor: Fatiha Benmokhtar Ph.D
Additional Author: Dr. Douglas Higinbotham

A B S T R A C T:
The determination of the deuteron form factors is essential for both the understanding of the simplest bound nuclear system and for the future EIC where one can determine the polarization of a stored deuteron beam with elastic deuteron scattering. New deuteron elastic data from the Jefferson Lab’s Low Energy Deuteron EXperiments (LEDEX) experiment, and previous results, will be used to perform new parameterizations of the deuteron form factors. Previous parameterizations have had singularities and nonphysical behavior beyond the range of the experimental data. Refitting the data to a new parameterization will ensure the proper analytic properties so that it can be used outside the range. By using python libraries such as matplotlib to generate plots in the interactive environment Jupyter Notebook, the parameterization of the deuteron form factors are able to be generated and plotted for further analysis. Through the careful parameterization of the experimental results, the domain of the parameterization has been extended beyond the range of the data and confirmed that there exists no singularities outside the initial range. Previous deuteron form factor parameterization could not reliably extend the range of the experimental data due to singularities or other non-physical features. By extending the range using the new parameterization, more detailed and accurate predictions of future experiments will be made. The deuteron’s fundamental form factors will allow these parameterizations to be used in EIC studies where knowledge of the deuteron form factors is needed to determine the polarization of a stored deuteron beam.

Classical Influence on the Gynecology of the Virgin Mary
Erin Ridge
Classical Civilizations & Philosophy || McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Sarah Miller Ph.D
ABSTRACT:
The gynecology of a virgin mother in antiquity it is necessary to read the writings and theories on virginity and birth from the classics. The purpose of this research is to demonstrate that there is a strong classical influence on the gynecology of the Virgin Mary. There are five major sources used to research this claim. The British Medical Journal offers insight to the Temple of Aesculapius and how studying early medicine is necessary, as well as the role of Aesculapius in Ancient Rome. Papers of the British School at Rome, discusses the fertility cults, the integration of women in religious life in Italy, and the role of votives in promoting maternal health and family continuity. The Athenian Agora offers a catalogue of anatomical votives and produces images of reliefs and votives found in the Agora. This source is useful in gaining numerical data on how many and what type of votives were dedicated to each deity. Edith Hamilton’s, Mythology, of course gives extensive information on the life of Aesculapius. This source is necessary in finding the parallels between the stories of the virginal births. The Protoevangelium of James provides information on the gynecology of the Virgin Mary. This study revealed that the story of Mary is not one that would have been unfamiliar. There are practical implications in understanding the gynecology of Mary and what may have influenced the story.

What is Our Value?: Occupational Therapy's Distinct Role with Youth Experiencing Homelessness
Gabriella Santacecilia, Stephanie Galasso, Kira Minicucci & McKenna Killion
Occupational Therapy || Rangos School of Health Sciences
Faculty Advisor: Retta Martin MS, OTR/L

ABSTRACT:
Youth experiencing homelessness is not a traditional population to which occupational therapists provide intervention. However, occupational therapists play a key role in helping these individuals increase their occupational performance in the activities that they want and need to do on a daily basis. Occupational therapists view their client’s occupational engagement through models of practice, which help the therapist to consider the patient holistically. These models of practice provide a framework that allows the therapist to systematically analyze different areas of their client’s life to determine where their problems lie, what barriers they may have to their participation, and what supports are available to aid their participation. The Model of Human Occupation (MOHO) was the framework we utilized during our fieldwork experience at Downtown Outreach Center and Shelter (DOCS) while working with youth experiencing homelessness. Through the lens of MOHO, the role of occupational therapy with this population will be clearly defined. Intervention strategies implemented at DOCS are client-centered and include goal setting, mindfulness, time management, and interpersonal skills. Throughout the fieldwork experience at Downtown Outreach Center and Shelter (DOCS), a group of occupational therapy students have come to learn more about the role they have in working with youth experiencing homelessness, as occupational therapists. Intervention strategies implemented at the DOCS will be explored through this model in order to elucidate occupational therapy’s role in working with youth experiencing homelessness.

Symptom Screening Application: Inclusiveness During COVID-19
Olivia Shope
Occupational Therapy || Rangos School of Health Sciences
Faculty Advisor: Richard Simpson Ph.D., ATP
ABSTRACT:
The COVID-19 pandemic has required several changes to everyday life. Daily symptom screenings are now required, however the delivery and design of these screenings are not accessible to many people. This app was designed in collaboration with a student on campus with an intellectual/developmental disability to better fit his needs. It was developed by trialing various functions and utilizing the ones that the student found particularly helpful, such as the questions being read aloud, picture modeling of the symptoms being asked about, and a way for helpers to review the data.

Undergraduate Project Submissions by School

McAnulty College and Graduate School of Liberal Arts: 31

A.J. Palumbo School of Business Administration: 6

Bayer School of Natural and Environmental Sciences: 64

Biomedical Engineering Program: 13

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Rangos School of Health Sciences: 29

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School of Nursing: 7

School of Pharmacy and the Graduate School of Pharmaceutical Sciences: 7

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Luis Avila
Isabel Bauer
Hannah Campbell
Jeremy Haas
Colleen Higgins
Julianne Howley
Jayden Jackson
Deena Sallah
Claire Stoner
Madysn Tusick
Yan Jin Tan
Zoe Zilcosky
Bayer School of Natural and Environmental Sciences

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Brooke Baker
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Sydney Bivens
Kayce Boggess
Aiden Boyer
Taylor McClure
Emily Chadwick
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Mia DiFrancesco
Adriana Duncan
*Odile Enslen
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Jordan Essinger
A. Louise Ferris
Alyssa Gadsby
Geno Gallo
William Gibbs
Maeve Godshalk
Joshua Goodwill
Cheyenne Granger
Nicole Haase
Kyra Hardenburg
Regan Harmon
Derek Heacox
Tiffany Hoke
Madelyn Hoying
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*Kezia Jemison
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Sara Magoun
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Elle McGregor
Clancy McIntyre
*Sarah McKendrick
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Jordan Stancil
Savannah Stout
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Madison Uhrin
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Thomas Washington
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Henry Strobel

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*Gina Joy
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*Elizabeth Timanus