Microplastics in Freshwater and Their Impact on Aquatic Life
By: Mary Grace Antonich
School: Bayer School of Natural & Environmental Sciences
Faculty Advisor: Brady Porter, Ph.D.

Abstract:
The world produces over 400 million tons of plastic every year and much of it ends up in our environment. Although most plastics do not decompose, they do break down into small pieces, reaching the category of a microplastic, when it is less than five millimeters in diameter. The amount of microplastic pollution in freshwater is correlated to urban runoff, human population density, wastewater treatment plant effluent, and agricultural runoff from wastewater treatment sludge. Microplastics have many toxic chemicals and easily absorb more as they travel through the aquatic environment. These chemically ridden microplastics are ingested by organisms at multiple trophic levels, negatively affecting their immune systems, metabolisms, cellular membranes, reproductive organs, and often, induce fatality. We just starting to understand how this largely negative synergy between microplastics and absorbed toxins can affect the entire aquatic food web. With increasing production of single-use plastics, the environmental consequences of microplastic pollution need to be a forefront concern of the human population.

Two Methods for Analyzing Aquatic Environmental DNA
By: Meredith Bennett
Major: Environmental Science School: Bayer School of Natural and Environmental Sciences
Faculty Advisor: Brady Porter, Ph.D.

Abstract:
Environmental DNA (eDNA) is shed by aquatic organisms in the form of tissues, feces, and gametes, allowing scientists to collect water samples and use them to detect invasive or imperiled aquatic species. This is particularly useful in areas where traditional sampling is difficult, or where species are in low abundance. Despite the advantages of eDNA surveys, natural resource managers may be hesitant to implement this new strategy due to concerns about methods, interpretation of results, and survey design. This poster will highlight the major concerns regarding aquatic eDNA methodology including detection distance, eDNA persistence, and quantification of eDNA results. We will compare eDNA-based methods with traditional sampling methods based on required time and the hazards to researchers and the organisms being studied. There are two main eDNA approaches: single-species detection and metabarcoding. The single species approach requires the development of a specific primer that only amplifies the species of interest. Metabarcoding uses general primers that amplify a broad taxonomic group of organisms. Both eDNA approaches are useful in specific situations, but we argue that the metabarcoding approach provides extensive information on the biological community, is more robust to logistical errors, and provides higher confidence in species detection. Subsequently, we identify metabarcoding as the most useful way to analyze eDNA to gain a detailed and comprehensive understanding of aquatic ecosystems. Although eDNA is still new to molecular ecology and presents novel challenges, we believe it is a valuable tool that can supplement and optimize traditional sampling
Female Roles in Antiquity: The Dichotomy Between the Stage and the Page

By: Bella Biancone
Major: Political Science and History School: McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Sarah Miller, Ph.D

ABSTRACT:
The women portrayed in Greek drama were often strong, courageous, and integral to the storyline. In contrast to their real-life counterparts (who may have not even been allowed to see the plays), these women stood out as individuals in their respective stories. They are bold, dynamic, intelligent and respected. They are meant to be seen and heard. Women in drama emerge as heroines of their own stories and serve to educate the audience on some aspect of women in Greece. On other hand, the women of Homeric epics tended to be subdued and traditional; they are background characters, merely present to help or hinder their heroes. The women in these poems are meant to serve a teaching purpose as well; they taught women how they should and should not strive to be. Both the stage and the page provide great insight into the expectations and realities of women in antiquity.

Autism Across the Lifespan: Embracing and Redefining Disability

By: Abigail Bloom
Major: Speech and Language Pathology School: Rangos School of Health Sciences
Faculty Advisor: Abigail Delehanty, Ph.D., CCC-SLP

ABSTRACT:
The aim of this multiple-component research project was to explore how autism impacts individuals across their lifespan, from early childhood to adulthood. This study illustrates the early signs of autism, the challenges and strengths that may accompany autism in childhood and beyond, and the necessity of adequate services in the transition to adulthood. By including perspectives from those with autism, parents of a child with autism, and teachers who educate students with autism, this study presents the idea that autism should be embraced as a disability that may involve struggles, but also involves strengths. Components of this study included attending an online training that presented research on the early signs of autism, analysis of a nonfiction work focused on educating the public about the highs and lows of autism, a literature search and review of scholarly research articles focused on the transition to adulthood for those with autism, an exploration of perspectives from advocacy organizations and individuals with autism on transition, and observation of a life skills class involving special needs students working and learning together. Implications of the evidence obtained from this study are that more programs and services need to be made readily available for young adults with autism post-secondary school, to enable them to continue down a path of success. Overall, by considering autism from a lifespan point of view, my findings indicate that with the proper supports and structure, individuals with autism can grow and flourish.
Hydrodynamic Multiparticle Trapping
By: Jarrett Boyd
Major: Biomedical Engineering School: Biomedical Engineering
Faculty Advisor: Melikhan Tanyeri, Ph.D

A B S T R A C T:
Recent advancements in science and engineering have allowed for trapping and manipulation of individual particles and macromolecules within an aqueous medium using a flow-based confinement method. However, simultaneous contact-free trapping of multiple particles using fluid flow remains elusive. We investigated the feasibility of trapping and manipulating two particles using coupled planar extensional flows within a microfluidic device. Using Brownian dynamics simulations and a proportional feedback control algorithm, we show that two micro/nanoscale particles can be simultaneously confined and manipulated at the stagnation points of a pair of interconnected planar extensional flows. We specifically studied the effect of strain rate, particle size, and feedback control parameters on particle confinement. We further discuss the benefits of this new approach and highlight some of its applications in polymer science, particularly, trapping and stretching a linear polymer tethered to micro/nanoparticles at each end. Our study demonstrates the versatility of flow-based confinement and further our understanding of feedback-controlled particle manipulation.

Environmental Issues Affecting Belize Economy
By: Adele Bradley, Alex Campbell, Olivia Origer, and Jayden Sechrengost
Majors: Adele Bradley (International Relations), Alex Campbell (Pharmacy), Olivia Origer (Physical Therapy), and Jayden Sechrengost (International Relations and Spanish) School: McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Michael Irwin, Ph.D

A B S T R A C T:
An environmental factor affecting Belize’s struggling economy is the endangerment of scarlet macaws. The findings in this study will explain how the scarlet macaws affect Belize’s integration within the global economy. First, we will begin our research by emphasizing that some corporations and not-for-profit organizations help raise money to nurture scarlet macaws in safe environments and raise awareness of their declining numbers. Information for all of these topics will be pulled from different scholarly websites and books used in class as evidence. More information about these topics will also be given by talking to the tour guides, local residents, hosts, and brochures. Second, we will discuss the origins of ecotourism in Belize and focus on how and why Belize switched its agriculture-centered economy to one driven by ecotourism. Belize originally had an agriculture-centered economy. However, a shift in global perspective encouraged Belizeans to take advantage of the abundance of natural resources and develop the ecotourist sector. Third, we will expand on this research by highlighting the effects that ecotourism and international tourism have on Belize and scarlet macaws. Although tourism harms the land, it protects endangered species such as the scarlet macaw. Ecotourism brings attention to wildlife in Belize and helps it increase protection. Lastly, we will explain Belize’s political and economic relations with Canada, Guatemala, the United States, and the United Nations. These relations have a large impact on Belize’s economy and daily lifestyle.
Claude Debussy and Kamasi Washington: "Clair de Lune"
By: Madeleine Brawley
Major: Music Therapy School: Mary Pappert School of Music
Faculty Advisor: Benjamin Binder, Ph.D.

ABSTRACT:
In spring of 1905, Claude Debussy published his Suite Bergamasque, a collection of four pieces for solo piano. The most famous piece of this work is the third, titled “Clair de Lune,” which still turns up frequently in popular culture and is instantly recognizable to a wide audience. In 2015, Kamasi Washington, a commercially recognizable jazz musician, released his interpretation of “Clair de Lune” on his album The Epic. Claude Debussy idealized an approach to music composition and listening that did not necessarily need to involve careful listening, demonstrated very clearly in his “Clair de Lune,” and the piece’s “open-ness” is one of the reasons it has been reimagined and reinterpreted countless times. Washington’s “Clair de Lune” is not one that could be described as “open” for interpretation in the same way, but this seems to be a reflection of Washington’s ideas about his relationship to the piece. Washington clearly outlines the differences between Debussy’s original composition and Washington’s arrangement in the introduction and conclusion of his arrangement, and he incorporates his own background as a jazz musician in this interpretation by treating this piece as one might a jazz standard in form and orchestration. Washington does not abandon Debussy’s ideas in this process, but is historical in incorporating Debussy’s compositional style with his own. Ultimately, Kamasi Washington seems to see himself in a similar light to Debussy in a historical context, utilizing traditional elements of music while challenging them and pushing music forward into new territory.

Striving to Get a lot Out of a Little: Enhancing Belize’s Educational System
By: Camryn Camp, Kylie Martin, Kaylee Fisher
Majors: Camryn Camp (Early Childhood Education), Kylie Martin (Early Childhood Education), Kaylee Fisher (Early Childhood Education) School: School of Education
Faculty Advisor: Michael Irwin, Ph.D.

ABSTRACT:
The purpose of this study is to examine the environmental impacts of the educational system in Belize and to find ways to improve the system as a whole. Beginning in 1816, Belize’s educational system was born out of a small group of poor children who worked as slaves. At the time, these schools were funded by donations from the public as well as some local funds. Overtime, Belize has made some advancements to their educational system such as incorporating government involvement, development of teacher training, and passing legislation that benefits individuals who want to receive an education. Studies show that Belize spends the most money on their education when compared to similar countries like Cuba, Barbados, and Costa Rica (“Improving Access,” 2012). Unfortunately, this high spending has not been able to sustain increasing or successful outcomes for the education of Belizean youth. Children not achieving satisfactory performance levels, lack of teacher training, and rising costs of resources are all issues that affect the school environment. Data on this topic has been collected through observation and interviews of local community members in Belize, scholarly and peer reviewed research articles, and theories from the text An Invitation to Environmental Sociology. Through
interviewing locals and observing Belize’s environment, the findings of this study suggest that Belizeans are content with their lifestyle, even if they do not have similar opportunities to the American educational system. This paper recommends the acknowledgment of Belizean perspectives and how their education paves the way for their future occupations.

PDE Based Deep Learning for Geometric Image Data

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

**A B S T R A C T:**
Image restoration is the process of estimating uncorrupted images from observations that have undergone degradations such as noise or blur. Previous results have shown that denoising image geometry, such as level line curvature data, and then reconstructing an image with the denoised geometric data yields more accurate results than denoising the image directly. Based on these findings, in this work, we implement and test a new convolutional neural network (CNN) whose architecture mimics that of a nonlinear partial differential equation. This CNN learns new higher-order geometrically motivated image features as well as corresponding convolution filters and activation functions that can be used for image restoration. The ultimate goal of this work is to use these learned features to formulate mathematically sound partial differential equation-based models for image restoration.

The Achievement Gap

By: Jessica Cetorelli  
School: School of Education  
Faculty Advisor: Sarah Rea, M. Ed

**A B S T R A C T:**
The Achievement Gap, also sometimes referred to as the Excellence Gap, is a term used in reference to discrepancies between different groups of students within an educational setting. In order to understand this gap, the root causes of it must be further examined. Through a variety of case and research studies, it has been proven that factors such as gender, socioeconomic status (SES), stereotype threat, and the usage of teacher-reported tracking systems all play a role in how affected individual students are by this phenomena.

A microfluidic platform for high-throughput screening of aquaporin performance

By: Adriana Del Pino Herrera, Jordan Hoydick, Rachel Rauh, Elyssa El-hajj, Madison Burchfield  
Majors: Jordan Hoydick (Biomedical Engineering), Rachel Rauh (Biomedical Engineering), Elyssa El-hajj (Biomedical Engineering), Madison Burchfield (Biomedical Engineering) School: Biomedical Engineering  
Faculty Advisor: Melikhan Tanyeri, Ph.D.

**A B S T R A C T:**
Aquaporins are a family of small integral membrane proteins that transport water across cell membranes in response to osmotic gradients. They facilitate fluid secretion and absorption across
epithelial surfaces in kidney tubules, exocrine glands, and gastrointestinal tract. Here, we describe a novel microfluidic method to evaluate and screen for aquaporin-based transmembrane permeability in mammalian cells. A microfluidic device was designed and fabricated for the encapsulation of single mammalian and yeast cells in micron-sized droplets. For this purpose, Chinese Hamster Ovarian (CHO) cells were used. CHO cells express AQP1 (aquaporin-1) homologous to human kidney aquaporins. The cells were cultivated and exposed to different osmotic stresses to study the transmembrane water transport performance of aquaporins. Our microfluidic platform has the potential to screen for and isolate cells with best aquaporin water transport performance for a number of applications in bioengineering.

**Effect of Intraluminal Thrombus Thickness, Bulge Diameter, and Wall Thickness on Abdominal Aortic Aneurysm**

By: Nina Dorfner  
Major: Biomedical Engineering  
School: Rangos School of Health Sciences  
Faculty Advisor: Rana Zakerzadeh, Ph.D.

**ABSTRACT:** Abdominal Aortic Aneurysms (AAA) have extreme medical prevalence as an asymptomatic cause of death in society. The intraluminal thrombus (ILT) commonly found within AAA may serve as a barrier to oxygen diffusion from the lumen to the inner layers of the aortic wall. The purpose of this work is to address this hypothesis and to assess the effects of AAA bulge diameter, ILT thickness, and wall thickness on the oxygen flow. In order to investigate the effect of the ILT on wall hypoxia, a three-dimensional model of AAA containing ILT is created for computational analysis in commercial finite volume software ANSYS CFX 19.3.

The model utilizes properties of fluid dynamics in all components of AAA applied to both blood flow and oxygen transport. Four different geometries are used to investigate the influence of the ILT thickness and the bulge diameter on oxygen transport. The second set of tests examines the impact of fluctuating wall thickness on oxygen flow. Geometries A and D from the original test are compared to versions adapted with thicker arterial wall.

Our results demonstrate that the diameter of the AAA bulge has little effect on the oxygen flow, but that the thickness of the ILT layer has a profound effect. In addition, arterial wall thickness also greatly affects the oxygen transport through the vessel. This study suggests that consideration of both ILT and arterial wall size and anatomy may be important in considering the severity of a particular AAA.

**Anxiety, Depression, or Insomnia in College Students: An Evaluation of Cranial Electrotherapy Stimulation (CES) and Mindfulness**

By: Heather Haley, Kelsey Gorman, Paige Tademaru, Gina Stephenson  
Majors: Heather Haley (OTS), Kelsey Gorman (OTS), Paige Tademaru (OTS), Gina Stephenson (BA, OTS)  
School: Rangos School of Health Sciences  
Faculty Advisor: Amy Mattila, MBA, MS, OTR/L

**ABSTRACT:**
Purpose: (1) To explore occupational therapy’s (OT) role in this emerging field of mental health and (2) to investigate the effects of Cranial Electrotherapy Stimulation (CES) and Mindfulness in reducing symptoms of depression, stress or insomnia among college students.

Design: A pre/posttest design was utilized with participants randomized into 2 groups: CES alone (Group A) and mindfulness meditation and CES (Group B). A purposeful sample of students from the campus population were recruited, all with a previous diagnosis or self-report of stress or anxiety.

Method: This study measured sleep, anxiety, trait mindfulness, and daily function using the HAM-A, FMI, FSQ, and PSQI. These assessments were taken at baseline, weeks 5, 8, and 12. Following intake, students began the 5-week treatment protocol. Week 1, participants completed CES or CES/meditations for 7 days. In weeks 2-5, participants completed CES or CES/meditations 4-5 times/week.

Results: Repeated-measures ANOVA revealed a significant effect of time over 8 weeks for HAM-A \[F(1,22) = 19.42, p < 0.05\], FMI \[F(2,21) = 10.41, p < 0.05\], PSQI \[F(2,22) = 19.01\], p < 0.05, and FSQ Social Role Function \[F(2,21) = 5.00, p < 0.05\]. There were no significant differences between groups for all four assessments, nor a significant effect of time for the Physical/Psychological FSQ categories.

Conclusion: Time is the biggest factor in reducing anxiety, and increasing mindfulness, sleep, and daily function, despite differences in groups. This demonstrates that CES and mindfulness are effective interventions to improve outcomes over time in the field of OT mental health.

Efforts Towards the Synthesis of Epibatidine
By: Mariannne Hanna
Major: Biochemistry School: Bayer School of Natural and Environmental Sciences
Faculty Advisor: Thomas Montgomery, Ph.D.

A B S T R A C T:
Epibatidine is a naturally toxic chemical found in the secretion of poison dart frogs. Given its structural similarities to the compound nicotine epibatidine binds strongly to nicotine receptors in the central nervous system (CTS). Epibatidine’s bioactivity arises from its unique geometry which allows it to bind to the α4β2 subunit in the nicotinic receptor. This triggers an analgesic effect without a release of dopamine, differentiating its activity from opioids. Prior efforts towards synthesizing epibatidine and its analogs have involved many steps making them untenable for pharmaceutical use. By using computational and experimental methods to study the mechanism for an interrupted Polonovski [3+2] cycloaddition which will give direct access to the epibatidine core motif. By synthesizing strategic derivatives of epibatidine through this route we will investigate opioid alternatives which lack many of their addictive qualities.

Community-Based Supports for Individuals with Aphasia
By: Kaitlyn Holtz
School: Rangos School of Health Sciences
Faculty Advisor: Rebecca Hayes, Ph.D.
A B S T R A C T:
Aphasia is a language impairment that results from brain damage, affecting verbal and nonverbal aspects of communication depending on the severity of the disorder. With over two million Americans afflicted, recognizing and understanding the characteristics of aphasia is only the first step towards successful communication. Implementing simple techniques and multimodal aids can create meaningful discourse between individuals with typical processing systems and individuals with deviant processing systems. In this paper, I will provide effective communication strategies to generate community-based supports for individuals with aphasia. These approaches will come from a review of existing experimental research.

Interracial Relations: History and Cultural Identity in The Invention of Wings
By: Taylor Hopkins
School: McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Erin Speese, Ph.D.

A B S T R A C T:
The historical fiction novel The Invention of Wings by Sue Monk Kidd displays a notable relationship between feminist and racial ideals during the nineteenth century. The story is based on the historical figure, Sarah Grimké, an American abolitionist and advocate for women’s rights. Over the course of thirty-five years, the narration alternates between the two main characters: Sarah Grimké and Hetty Handful Grimké, a young slave on the Grimké plantation. The interactions between the two begin when Hetty is presented to Sarah as a personal waiting maid for Sarah’s eleventh birthday. As the story continues, the dynamics between the two characters shift as they learn how to coexist while constantly being faced with the societal and familial pressures that pit them against one another. These external pressures shape each character in their own ways of thinking and heavily influence their perception of freedom and feminism. This study explores the relationship between the critical ideas of racial equality and gender equality and their combined impact on Sarah and Hetty’s relationship within the novel. Additionally, this project examines barriers between the main characters and a theory that provides an understanding of the difficulty in creating and maintaining their relationship.

The Eternal Sunshine of the Spotless Mind and Memory: Through a Freudian Perspective
By: Elise Hreha
School: School of Pharmacy and the Graduate School of Pharmaceutical Sciences
Faculty Advisor: Matthew Ussia, Ph.D

A B S T R A C T:
Memories are a strong, formative parts of one’s identity. Some of those most important memories are made during childhood and impact adulthood life. In the film The Eternal Sunshine of the Spotless Mind, memory and its’ importance are very prevalent themes. The film emphasizes why memory cannot be ignored or removed. The purpose of this project is to connect scenes from the movie and the psychoanalytic views of Sigmund Freud on memory. Specifically, quotes and themes from the film will be compared to Sigmund Freud’s iceberg metaphor for the human mind and other views on memory. The idea of revising your own memory will also be researched and discussed.
Daenerys Targaryen and Feminist Theory in "Game of Thrones"
By: Lauren Humphreys
Major: English (Literary Studies concentration) School: McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Sarah Wright, Ph.D.

Abstract:
The world of A Song of Ice and Fire (most recently adopted by HBO's Game of Thrones) is a sprawling fantasy platform open to critiques from many schools of thought and theories. Scholars examining the books and the show often study the roles and representations of women. Both media have received feminist backlash for the way women are portrayed within the world of Westeros, particularly in regards to the arguably main female character: Daenerys Targaryen. This paper examines the line of criticism by examining Daenerys' subjugation through marriage and male political maneuvering. In addition, the essay argues that her resistance to sexist power structures eventually leads to the dissolution of the societal entity that oppressed her, and other women, for so long.

Antisemitism and Sinophobia: Blaming the "Other" for Disease
By: Alexa Michaels
Major: Pharmacy (English minor) School: School of Pharmacy and the Graduate School of Pharmaceutical Sciences
Faculty Advisor: Emad Mirmotahari, Ph.D.

Abstract:
There has always been a fear of what is different: the other, foreign, or strange. Minorities are blamed for unfortunate events across the globe. For instance, Jews were blamed for the plague in Medieval Europe. Now, the Chinese are being blamed for the coronavirus pandemic. Blaming the racial “other” for disease and illness is a common thread throughout cases of epidemics and pandemics. When something is not understood, it becomes something of which to be afraid. Sometimes the blame was placed on a group because of differing hygiene practices, or because they ate different foods. The misrepresentation of religion caused anti-Muslim sentiment after the attack on the World Trade Center on September 11, 2001. A lack of understanding and empathy causes discrimination. Currently, Sinophobia is causing difficulties for people of Asian descent all over the world. One woman was denied service at a nail salon because the employees were concerned that she could be carrying the virus, even though the virus had not yet reached the US. A man from Singapore was attacked in London when a group of people accused him of bringing the virus into their country. These racially aggravated attacks parallel antisemitic attacks during the bubonic plague and the Holocaust, and many other xenophobic incidents during times of hardship. Disease and xenophobia go hand-in-hand, and the long-existing trope of the “other” or the unknown being associated with agents of illness still exists today.
Modeling the Effects of Fentanyl and Narcan on the Opioid Epidemic in Allegheny County Using Mathematics

By: Lindsay Moskal, Lauren Sines
Majors: Lindsay Moskal (Chemistry), Lauren Sines (Biology)
School: McAnulty College and Graduate School of Liberal Arts, Bayer School of Natural and Environmental Sciences
Faculty Advisor: Rachael Neilan, Ph.D.

Abstract:
Starting in the 1990s, physicians across the United States have increasingly prescribed opioid pain relievers, which has given rise to the current opioid epidemic. As a result, there has been a drastic increase in the number of overdose fatalities. In 2017, the number of opioid overdose deaths peaked and the U.S. declared the crisis as a public health emergency. One state that has contributed significantly to this epidemic is Pennsylvania, which ranks first for the greatest number of overdose deaths and third for the highest death rate. In fact, Allegheny County has witnessed an overdose death rate that is three times that of the national rate.

In collaboration with the Allegheny County Department of Human Services (DHS), we developed a comprehensive mathematical model to describe the opioid epidemic in Allegheny County. The model is a system of differential equations describing how the size of each population class—Susceptible, Prescribed, Addicted, and Recovered—changes over time. Variables describing the presence of fentanyl (a synthetic opioid) and the use of Narcan (medication used to block the effects of opioids) were included in the model. Model parameters were estimated to reflect the addiction and overdose rates in Allegheny County using data provided by the DHS. Model simulations highlight the impact of fentanyl and Narcan on the annual overdose death rates. Additional results show that increasing the availability of Narcan in the community will result in a meaningful reduction in overdose deaths; however, an increased presence of fentanyl will render Narcan less effective.

Analysis of RarA, a Unique Metalloid Reductase from Sulfurospirillum barnesii SES-3

By: Lauren Rebel
Major: Biology
School: Bayer School of Natural and Environmental Sciences
Faculty Advisor: John Stolz, Ph.D.

Abstract:
Consumption of arsenic-contaminated drinking water is a major health threat faced by over 140 million people around the world. When arsenic exposure is prolonged, it can lead to dangerous health effects such as the development of skin lesions, cancer of the skin, urinary bladder, or lungs, as well as an increased risk of developing cardiovascular disease. While arsenic is toxic to most organisms, several microbes have been found to reduce arsenate through their cellular respiration, such as our bacterium of interest, Sulfurospirillum barnesii SES-3. SES-3 has the capability of reducing arsenate due to its unique reductase, RarA. Found only in species of Sulfurospirillum, RarA is an enzyme that allows SES-3 to respire various metal and metalloid substrates. This suggests that by mobilizing arsenic in aqueous environments, RarA could be valuable in the bioremediation of contaminated water. The purpose of this
Why Diversity Matters: The Importance of Introducing Diversity into Monocultural Schools

By: Kylie Snellbaker
Major: Kylie Snellbaker (Early Childhood Education) School: School of Education
Faculty Advisor: Deborah Scigliano, Ed.D

A B S T R A C T:
In this paper I will discuss the importance of including diversity in mono-cultural schools. While the United States of America is rapidly growing to be one of the most diverse countries in the world, the racial diversity in schools is still catching up. Many public schools are growing in diversity, but there are still numerous schools that lack diversity. In monocultural schools, there is a lack of exposure to different ethnicities and cultures besides the dominant ethnicity. If children are to be able to live in our diverse society, they need to be exposed first in the classroom. Having a diverse classroom environment can help students navigate adulthood, improve knowledge, promote tolerance, and learn both cognitive and social skills. There is an abundance of research and testimonials that show the impact multicultural teaching can have in monocultural schools.

The Spanish Flu

By: Owen Sporrer
School: McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Janet Addlespurger

A B S T R A C T:
The Spanish Flu was a cataclysmic event of the twentieth century which shaped Europe and the world for decades. During World War One it is estimated as much as five percent (upwards of fifty million people) (1) of the world population died due to the influenza outbreak of nineteen eighteen. The way this contagion began its spread was like many others throughout history, filth and petulance in an area of high human concentrations being carried by those infected to other populations. In the trenches of World War One the gruesome suffering was unimaginable but just as bad as the bullets and bombs were the diseases spread from soldier to soldier in these horrible conditions. During times of War it is well understood that diseases and malnutrition can wreck even more havoc on an army than the enemy, this was especially true during World War One.

In nineteen seventeen French military doctors started to notice soldiers having a very high mortality rate with a flu going through the overcrowded military hospitals. These field hospitals were already overrun with horribly wounded soldiers then the added pressure of the Spanish Flu arrived and the hospitals were completely un-prepared for it.

Thermoelectric Materials: Promising Energy

By: Megan Treece
Major: Chemistry School: Bayer School of Natural and Environmental Sciences
Faculty Advisor: David Seybert, Ph.D.
ABSTRACT:
As technology advances, the global need for energy increases. Much of the energy production methods used today create carbon dioxide emissions as well as other waste products that pollute the earth. Advances in renewable and sustainable energy production methods have been gaining momentum in recent years. The use of thermoelectric materials to harness energy that is lost in many other forms (such as heat) creates a cleaner energy source due to the lack of pollutant waste products. The use of ambient energy helps to reduce the amount of fossil fuels needed for transport of materials and industrial energy production. Thermoelectric materials use energy that is readily present in a usable form. Thermoelectric materials have very little waste, and recent advances have created some systems from nontoxic, abundant earth elements. Improvements in methods and materials have led to the increase in popularity and has caused a decrease in costs of production as well as a reduction in greenhouse gas pollution.

Change vs. Complacency: The Implications of Unethical Practices on Research and Policy
By: Serina Tressler
Major: Chemistry School: Bayer School of Natural and Environmental Sciences
Faculty Advisor: Emad Mirmotahari, Ph.D.

ABSTRACT:
This project seeks to define the relationship between the ethics of scientific research and the narratives produced about that research. The discovery of the HeLa cell line was a major breakthrough in medical research, leading to countless drugs, vaccines, and scientific advancements. However, the woman behind those cells, Henrietta Lacks, was never made aware of the use of her cells for anything other than treating her own cancer. This story is one of many, all pushing toward the establishment of modern laws and standards for what is considered ethical in research and what is not. There have been many instances similar to this leading to policy changes, including the Tuskegee Syphilis Experiment and the case of Moore v. Regents of the University of California; the issues presented by these have prefaced important amendments or decisions regarding human rights and research studies in the past 50 years, many of which are not well-known by the American public.

Ecotourism Business’s Effects on Environmental Justice
By: Hannah Weber, Ashley Beaken
Majors: Hannah Weber (Biochemistry B.S.), Ashley Beaken (Early Education) School: McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Michael Irwin, Ph.D.

ABSTRACT:
When researching environmental justice in Belize, it is essential to find out how ecotourism business plays a part. While reading about the village and finding out how much has changed there since ecotourism has taken over, it is interesting the impact it has had on the environment, and more specifically, environmental justice. In Belize, more of the direct impacts of ecotourism on the environment was investigated due to personally being the ecotourists and experiencing its impact.
firsthand. Overall, it is interesting to discover what role ecotourism plays in environmental justice and how big of an impact it is compared to other factors. Aspects of ecotourism that are most present in Belize were also investigated. Another important thing discovered in research is how the people of Belize view ecotourism. This was found out by asking questions and also observing their behaviors and attitudes toward ecotourists and business while we are there. Some things focused on in our research includes environmental justice, sustainability, sociology of environmental justice, and ecotourism. When looking at these the impact ecotourism has on the environment can be seen.

Project-Based Learning in Social Statistics: Direct and indirect assessment of student learning outcomes
By: Zachary Weland, Nicole Marshall
Major: School: McAnulty College and Graduate School of Liberal Arts
Faculty Advisor: Cathleen Appelt, Ph.D.

ABSTRACT:
The two co-authors were students in this statistics course last year and initiated this project based on their observation that some of their peers struggled with the course content. Statistics education literature suggests anxiety and low sense of self-efficacy related to learning statistics are significant barriers to student engagement and learning in undergraduate social statistics courses. We designed and implemented a Problem-Based Learning (PBL) intervention in a social statistics course in Spring 2020. Preliminary analyses from our ongoing project includes both direct and indirect assessment of student learning (demonstrated student learning and statistics anxiety and efficacy, respectively) among a sample of 29 students currently enrolled in a social statistics course at Duquesne University. Our indirect measures of student learning are based on student responses to validated scales in questionnaires administered at the start of term and at Week 11. Improvements in mean anxiety and efficacy scores were observed, but did not reach statistical significance. However, students indicated high levels of satisfaction with the PBL intervention, despite reporting challenges related to the transition to online learning (after closure of the campus due to the COVID-19 Pandemic).
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