Barry University

14th ANNUAL S.T.E.M.

RESEARCH SYMPOSIUM

April 8, 2022

Discovering Your Inner Scientist

Our ever-evolving world of science and technology seems out of reach for many Americans – let alone our students – who are looking towards career paths, making meaningful contributions to society, and building a future. The messages that 'science is too hard', or that one has to 'be good at math', or that 'it's not for girls', are impacting the ability of students to see a scientist within themselves no matter their age, gender, or background. Coming from a non-traditional path from a stage performer to, now, a scientist, I encountered and overcame my own self-imposed barriers of what I thought I was capable of. It was a role model, in the form of a woman Chemistry teacher in college, that completely shifted my view. I saw myself in her, and discovered how my own creativity, critical thinking, and attention to detail were not just skills but true talents that would serve me well in a career in science. Whether children or adults, being curious about oneself and the world is how passions are discovered. Who will be the one to engage and lead the discovery? Where does one look for role models? Perhaps within yourself.

Dr. Teresa Williams is a San Francisco Bay Area native who made the cross-country journey to Washington, D.C. in 2018 to serve on Capitol Hill as a Congressional Science and Engineering Fellow sponsored by the American Chemical Society. After her fellowship, she worked briefly in the U.S. House of Representatives for a Member of Congress covering a portfolio in energy, environment, and climate change, and now works as a Research Scientist in the National Nanotechnology Coordination Office. Her background includes 17 years of laboratory research in energy and health sciences, most recently as a researcher at The Molecular Foundry, a Department of Energy nanoscale science user facility at Lawrence Berkeley National Lab.

Dr. Williams is committed to global efforts supporting the next generation of women in STEM. As a volunteer professional mentor since 2016 with TechWomen, a U.S. Department of State mentorship/exchange program, she has hosted women scientists from Tunisia, South Africa and Kenya at Berkeley Lab, and mentored women from Tajikistan and Libya virtually. She was competitively selected to travel with Techwomen, on behalf of the U.S. Department of State, for week-long delegation trips to Egypt (2018) and Kenya (2017) for mentorship and STEM outreach with local women and girls. Dr. Williams received her Ph.D. in Applied Science and Technology from the College of Engineering at UC Berkeley and also holds a B.S. in Chemistry from UC Davis. She lives in Washington, D.C. with her husband and Sheepadoodle puppy, Olive.

14th Annual S.T.E.M. Research Symposium

This research symposium is aimed at engaging the Barry community in learning about and sharing in the excitement of ongoing discoveries and research within the Science, Technology, Engineering, and Math disciplines (S.T.E.M.), Medicine, Humanities and Social Sciences. Undergraduate students will present posters related to their past and current research in biology, chemistry, computer science, sports and exercise science, health science, humanities, mathematics, music, medicine, social sciences, psychology, and physics.

Friday, April 8, 2022

Poster Presentations

10:00 - 10:30 am ---------- Open Ceremony

Noon – 1:00 pm ---------- Keynote Seminar

1:00 – 2:00 pm ---------- Award Ceremony

Thanks to Wells Fargo for their generous donation in support of this event.
Organized by Members of Barry University's STEM Committee:

Sabrina Des Rosiers, Ph.D., Maurizio Giannotti, Ph.D., Christoph Hengartner, Ph.D., Ricardo Jimenez, Ph.D., Peter Lin, Ph.D., Zacharias Papadakis, Ph.D., Michael Robinson, Ph.D., Zuzana Zajickova, Ph.D., Anita Zavodska, Ph.D., and Sanja Zivanovic, Ph.D.

We gratefully acknowledge:

The dedication of research mentors, support staff, and undergraduate and graduate student researchers.

Special thanks for assisting with the Symposium to:
Department of Marketing and Brand, Department of Information Technology

Barry University College of Arts and Sciences

Department of Biology

1. Using DNA barcoding to identify plants on campus and determine phylogenetic relationships

Yessamin Alvarez Cedeno, Heriberto Cendejas, Jailene Cintron, Leida Holguin, Mia Hunt, Yael Kiser, Victoria Martinez Mercado, Dekayla McCurdy, Sherline Pierre, Vanessa Rodriquez, Chaasadah Stanford, Jamyah Tate, Taylor Thompson, Jorge Varela Batista, Azaleah Williams, and Flona Redway (Department of Biology, Barry University, Miami Shores, FL)

DNA barcoding is a tool used to identity plants and animals. As a plant identifier, it is based on the premise that since most plants contain chloroplasts, these plants carry the rbcL (Rubisco large unit) gene on the chloroplast genome. These genes contain short, highly variable regions unique to each plant species. In order to identify the species of plants on campus and determine how related they maybe to each other, DNA was isolated from plants in the Sienna courtyard. Conserved sequences that surround the variable rbcL gene were used as primers to amplify the barcoding regions via polymerase chain reaction. Gel electrophoresis was performed to confirm the amplification. DNA from a small segment of the rbcL gene was sequenced and the Basic Local Alignment Search Tool (BLAST) and DNA Subway platforms were used to identify the samples and to determine phylogenetic relationships. The results of the analysis will be presented and the real-life application discussed.

Funded by the Department of Biology at Barry University

2. Effects of temperature on seagrass Thalassia testudinum seedling survival and growth

Keitch Centeno, Olivia Marita, and Silvia Macia (Department of Biology, Barry University, Miami Shores, FL)

Seagrass ecosystems provide food and shelter for numerous marine organisms as well as storing carbon and providing coastal protection. This pilot study investigates the effects of temperature on growth and survival of turtlegrass (Thalassia testudinum) seedlings. Thalassia testudinum is the climax seagrass species in Florida and its fruits and seeds often wash up on shorelines, allowing for non-destructive collection. We collected seeds (both loose and from intact fruits) from Key Biscayne, Florida in July and August, 2021 and raised them hydroponically in laboratory aquaria (70 liters volume). The aquaria were maintained on a 12:12 hour light/dark cycle, four at a water temperature of 22°C and four at 28°C. Seeds collected during the four collection intervals (early July, late July, early August, late August) were distributed equally between two tanks at each of the respective temperatures. Seedling survival was monitored and leaf growth measured periodically. On most sampling dates, 10 seedlings (but occasionally 5 or 15) were randomly selected from each tank and the longest leaf measured. Seedlings increased in size for the first 3 months, then growth plateaued. The growth rate of the seedlings in the 28°C tanks was higher than those in the 22°C tanks. Our study has demonstrated that T. testudinum seedlings can be grown hydroponically for at least 3 months and that temperature does have an effect on the growth of the plants. Survival, however, was not affected by temperature. Future studies will use this experimental system to investigate the effects of global warming on seagrass seedlings.

Funded by the Department of Biology at Barry University

3. Characterizing the role of magnetic cues mediating spontaneous magnetic alignment behavior in guppy fish (Poecilia reticulate)

Zoraida Delgado , Kallista Capdevila , Javier Robinson, Luis Estrada , Mike Robinson , and Michael Painter (Department of Biology, Barry University, Miami Shores, FL)

It is well established that a diverse range of animals use cues provided by the Earth's magnetic field for spatial behaviors, including navigation and orientation. For example, migratory birds, amphibians, and mammals possess a magnetic compass to accomplish complex spatial tasks, such as migration, homing, and local-scale spatial behavior. However, the sensory receptors and biophysical mechanisms mediating magnetic sensing are not fully understood. Recent studies provide support for a distinct expression of magnetic orientation in several vertebrate taxa termed spontaneous magnetic alignment behavior (SMAB), during which animals preferentially align the body axis relative to the Earth's magnetic field. Unlike other forms of spatial behavior mediated by magnetic cues, the adaptive significance of SMAB remains unclear. In collaboration with the Robinson Lab, we have designed a behavioral assay involving guppy fish (Poecilia reticulate) aimed to further characterize the mechanisms and functional relevance of these unintuitive alignment behaviors. Guppies are placed individually in visually symmetrical circular arenas centered inside a series of electromagnetic coils used to rotate the alignment of the magnetic field into one of four topographic positions. Fish alignment and orientation behavior are filmed overnight using an infrared camera in a fixed magnetic field alignment set prior to each test. Video records are analyzed using tracking software to determine mean position, alignment, and activity. Data is then pooled relative to topographic and magnetic North to test for the expression of SMAB in guppies. Preliminary data is currently being collected and analyzed to determine if guppies exhibit SMAB under laboratory conditions.

Funded by Barry Faculty stimulus grant and the Department of Biology at Barry University

4. A novel approach to old questions about magnetic sensing in wild mammals

Luis Estrada [1], Kallista Capdevila [1], and Justin Blanco [2] ([1]Department of Biology, Barry University, Miami Shores, FL, [2]Electrical and Computer Engineering, United States Naval Academy, Annapolis, MD)

Animal spatial behavior, such as migration, homing and local-scale orientation, has intrigued ethologists for centuries. Since the discovery of a magnetic compass sense in birds, a diverse range of organisms have been shown to use the Earths magnetic field as a cue for complex spatial behaviors. Spontaneous magnetic alignment behavior (SMAB) i.e., the tendency of animals to align the body axis with respect to the magnetic field, appears widespread among vertebrate taxa, however the sensory mechanisms and adaptive significance underlying these behaviors remain unresolved, perhaps because these alignment responses have proven difficult to study in unnatural laboratory environments. Therefore, the Painter Lab takes advantage of recent advancements in biologging and tracking technologies to study animal behavior and spatial cognition in free-roaming mammals in natural contexts. Through a multinational collaboration, we equipped wild boar (Sus scorfa) with custom engineered biologging collars programed to record tri-axial acceleration and magnetometer data at 10 Hz and GPS fixes at 30 min intervals. Using machine learning techniques, we have developed a robust behavioral classifier capable of identifying a suite of boar behaviors from accelerometer profiles, as well as techniques for extracting compass headings from raw magnetometer data, both verified by ground-truthed datasets. Preliminary analyses collected from five individuals provide evidence for SMAB in wild boar during resting behaviors, consistent with the majority of published findings based on human observation. The volume and resolution of data collected from these biologging sensors coupled with our sophisticated analysis techniques allow for an unprecedented look into the spatial behavior of wild animals without the need for direction observation. Therefore, these methodologies will likely be of interest to a variety of other disciplines, including behavioral ecology, conservation, disease ecology, and land management.

Funded by Czech University of Life Sciences EVA 4.0 Grant as well as the Department of Biology at Barry University

5. **Role of eDNA in Staphylococcus epidermidis biofilm formation and antibiotic resistance.**
Oscar Gonzalez, Christoph Hengartner, and Leticia Vega (Department of Biology, Barry University, Miami Shores, FL)

Bacteria, the most abundant living organisms on the planet, are unicellular organisms that collectively have the power to alter environments and ecosystems and their biology can affect the metabolism of other organisms including humans. A common misconception is that all bacteria are dangerous to humans. However, most bacteria that colonize humans are harmless, co-existing in a symbiotic relationship where both bacteria and the human host benefit. A smaller number of bacteria are pathogenic and thus, can promote disease in otherwise healthy individuals. The human microbiome is the collection of microbes that inhabit a person which includes the helpful and pathogenic varieties. Staphylococcus epidermidis is a bacterium commonly found on human skin that can cause opportunist infections in hospitalized patients. Biofilm formation is a survival mechanism that bacteria have evolved to adapt to host defense systems and harsh environmental conditions. Biofilms are a protective layer produced by bacteria to shield them from hostile surroundings while also allowing them to adhere to surfaces more effectively than non-biofilm formers. A crucial component of biofilms is the polysaccharide matrix and extracellular DNA (eDNA) that allows bacteria to adhere to surfaces, including medical devices. While biofilm-producing bacteria are not inherently antibiotic-resistant, bacteria in biofilms can exhibit new characteristics, such as increased antibiotic resistance. In this study we will examine the role of eDNA in the formation of biofilm and its effect on bacterial antibiotic resistance. Together with our collaborators, we aim explore the potential impact of bacteriophage mediated cell lysis to either exacerbate or reduce Staphylococcus epidermidis biofilms.

Funded by the Department of Biology at Barry University

6. **Solving the mystery of rare males in a supposed asexual species**

Victoria Martinez Mercado[1], Andrew Forbes[2], John Logsdon[2], and Benjamin Trendle[2] ([1]Department of Biology, Barry University, Miami Shores, FL, [2]Department of Biology, University of Iowa, Iowa City, IA)

Parasitoid wasps belonging to the genus Diachasma have long been studied because of their intriguing parasitic behaviors. The females of this genus lay their eggs inside the larvae of some fly species such as Rhagoletis, and complete their life cycle the following year after the winter is over. There are three known species of Diachasma: D. ferrugineum and D. alloeum which reproduce sexually, and D. muliebre which after decades of collections yielding only females suggest that this species reproduces asexually. In 2020, Dr. Andrew Forbes discovered two D. muliebre male wasps which raised some interesting questions. The first is the possibility that these were functional males that are only occasionally produced in an otherwise all-female species. The second possibility is that these males were mutants, non-functional, and could not contribute to the gene pool. The primary objective of this experiment was to analyze the genome of these two wasps to determine their ploidy level. If the male wasps were haploid, they would essentially be like any other Hymenopteran male that can contribute to the gene pool by reproducing sexually. On the other hand, if they were diploid it would mean that perhaps the males had a developmental defect that resulted in them being masculinized females; in this case, sexual reproduction would not be happening. Based on the data gathered in this experiment through genetic sequencing of the males' DNA, we found even lower percent heterozygosity than in the females. This means that it is very likely that the males are haploid, and could be capable of sexual reproduction. Future directions would include exploring larger segments of the DNA to look for more heterozygosity and eventually determine if they could indeed reproduce sexually.

Funded by NSF awarded to University of Iowa's REU program in interdisciplinary evolutionary biology directed by Andrew Forbes

7. Nitrate and phosphorous content in low tide and high tide waters in Biscayne Bay mangroves.

Tatyana Moise (Department of Biology, Barry University, Miami Shores, FL)

Mangroves provide support and protection against erosion and absorb impact from severe/extreme weather (Kieckbusch, et al, 2004). They are essential for Florida's coastline and are what keeps coastal areas healthy (Kieckbusch, et al, 2004). Mangroves are an important habitat for some invertebrates and young reef fishes, making them a vital role for the food web system (Kieckbusch, et al, 2004). Phytoplankton, which inhabit mangroves, are also essential in providing nutrients for some marine organisms (Vadrucci, 2017). Phytoplankton deliver more oxygen to earth's atmosphere than land plants, showing how essential they are for both the ecosystem and for humans (Vadrucci, 2017). There have been significant decreases in Biscayne Bay, Florida marine ecosystem species (bay grasses, corals, and fishes) due to human activities. Habitat degradation, climate change, and increased pollution from waste dumps have caused these environmental changes (Faunce, Faunce and Jerome, 2003). Increased loading of nitrogen from fertilizers, topsoil, sewage, and others are important drivers of eutrophication in coastal areas all over the world (Scharler, et al, 2015). Eutrophication is the overall effect of excessive nutrient enrichment through runoff that causes an increase of phytoplankton, leading to imbalanced primary and secondary productivity (Khan and Ansari, 2005). Nutrient dynamics have been extensively studied due to these concerns over eutrophication (Scharler, et al, 2015). The N:P ratio is important for understanding the global crisis of coral reef decline (Scharler, et al., 2015). Increase of the N:P ratio can cause phosphorus starvation in corals and negative effects such as high temperature, decreased biodiversity, and reef degradation can occur (Lapointe, 2019). Algae blooms in coastal regions have also increased since the N:P stoichiometry has altered (Lapointe, 2019). These blooms produce toxins that can kill and degrade biological life such as mangroves, fishes, and phytoplankton (Dybas, 2003).

Funded by the Department of Biology at Barry University

8. Survey of south Florida water sources for potentially pathogenic amoeba

Erika Pierre, Libertad Gonzalez, Kallista Capdevila, Kendall Hovius, Luka Thompson, Stephanie Salterini, Kyra Johnson, Ashley Torrentes Palacios, Sofia Ruiz, Yael Kiser, Mariana Meyers, and Brenda Schoffstall (Department of Biology, Barry University, Miami Shores, FL)

Several species of free-living amoeba (FLA) are found living in local freshwater lakes and ponds, and even in chlorine treated swimming pools and fountains. Under specific conditions, some lead to deadly infections in humans. Naegleria fowleri can cause primary amoebic meningoencephalitis (PAM) which is a serious acute pathological state resulting in rapid death due to deterioration of brain tissue. It is known that very warm freshwater pond conditionssuch as those found during the summer months in South Florida encourage the growth of the form of N. fowleri that can parasitize humans. Some species of Acanthamoeba, which have been isolated from freshwater lakes, swimming pools, and hot tubs, can lead to chronic encephalitis or keratitis. We are interested in investigating the prevalence of such amoebic contamination in various types of water sources in South Florida. We are conducting a survey of a number of different water sources in the Miami area to test overall water quality and screen for potentially pathogenic FLA. A multi-test water quality kit provides biochemical parameters related to water quality; bacterial cultures of water samples give us a sense of microbial diversity; and amoeba cultures and microscopy enable us to isolate and identify amoeba based on morphology. We present the current findings of our water source survey; the goal is to determine if the aquatic environments in our geographical region provide the potential for pathogenic amoeba infection.

Funded by the Department of Biology at Barry University

DEPARTMENT OF MATH & COMPUTER SCIENCE

9. Changes in local weather

Ethan Brooks, and Sanja Zivanovic (Department of Math & Computer Science, Barry University, Miami Shores, FL)

It is evident that climate on our planet is transforming. The assumption is that human involvement is causing temperatures to rise, which would have a spiral effect on natural events. Although temperatures in Miami have remained consistent, changes in precipitation influence the rate in which water evaporates, causing, among other things, heavier rains, and ocean temperatures to remain colder or hotter for longer times. This is important because colder temperatures from December carry over to January, and we are interested in knowing what else carries over from month to month. Is the climate the same or will we see a hurricane in December sometime in the future? In this work, we present changes in local weather data by applying data analytics tools using Python programming language.

10. A python utilization for visualization of neighborhood crime

Jessica Garcia, and Sanja Zivanovic (Department of Math & Computer Science, Barry University, Miami Shores, FL)

Miami Metro Area is large, with great diversity in population, both in socioeconomic status and ethnicity. As such, one can drive five minutes in one direction and five minutes in the other direction and find him/herself in a completely distinct neighborhood. Even people living and working in Miami are not familiar with the safety of all the neighborhoods, let alone people that just moved to Miami, are visiting Miami for school, on vacation or business travel. Our goal is to obtain and inform the public of distinct types of safety zones in Miami, which we label as safe zones, zones with non-violent crime, and zones with predominately violent crime. We obtain such levels by applying K-Nearest Neighborhood (KNN) machine learning algorithm to crime data we obtained. Data was originally gathered by a website from a few arresting agencies, which we scrape, clean, and manipulate to get desired data we can work with. We utilize Python programming language for automatic processing of data and scikit-learn package to run the KNN machine learning algorithm.

11. Irrationality of p, e, and of the functions tan(x) and exp(x) at nonzero rational points

Jessica Garcia and Lubomir Markov (Department of Math & Computer Science, Barry University, Miami Shores, FL)

In a well-known paper published in 1947, Niven gives a simple proof that p is irrational. In that paper many details are suppressed, and critically important contributions of previous mathematicians are not acknowledged. We supply the missing details of Nivens proof, revealing the true utility of the method. We then present a more powerful approach which allows for a direct proof of the irrationality of p^2 (and hence that of p), and more generally the irrationality of the tangent and exponential functions at nonzero rational points.

12. Analysis of pornography content in the past and today

Carlo Jacques, and Sanja Zivanovic (Department of Math & Computer Science, Barry University, Miami Shores, FL)

With a wider and cheaper availability of internet, pornography usage and development have increased exponentially in the last couple of decades. As such, pornography is accessible to adolescents, with 1/5 of viewers being under the age of 18. While adolescents start using it as

educational content, research suggests viewing it frequently can be addictive and it can cause depression and behavioral problems. Surprisingly, there have not been many quantitative studies to illustrate growth and evolution of pornography and what kind of impact it can have on adolescents. In this paper, we conduct a comparative analysis using Natural Language Processing (NLP) to show differences in content from a decade ago to today.

13. Virtual college map - a service focused locator

Roger Osorio , Luis Perez , and James Haralambides (Department of Math & Computer Science, Barry University, Miami Shores, FL)

College campuses can be large, confusing, and intimidating for new students and visitors. Finding a path to campus may be easy using a GPS unit or Google Maps directions, but this changes when you are actually on campus. There is no service that provides detailed map assistance within the campus itself to someone at all times. This project presents the architecture and design specifications for a campus digital assistant on a mobile device platform. We design and implement a service-focused android application for the main campus of Barry University. The map is fully interactive with customized markers and detailed information for each building including classrooms, offices, services, and contacts. This project is an upgrade of an earlier prototype. It has added or refactored features that make it easier to locate resources, map services to buildings, and automate the communication process to contact points. There are several factors that must be considered when creating the Barry University map application, such as development methods, platforms, programming languages, userbase, and cost. However, through the use of Google Map technology, Java development environment, and Android platform, this mobile app explores the underlying university structure, classifies and organizes services offered, facilitates keyword-based searches, and makes navigation easier and user-friendly for parents, visitors, and students using mobile devices. An embedded user guide increases system usability. The application has been implemented on the Android Studio Integrated Development Environment and was deployed and tested on a smart phone.

14. Design considerations for a basic CPU-RAM configuration using a hardwired control unit

Luis Perez , Abrihana Rivera , and James Haralambides (Department of Math & Computer Science, Barry University, Miami Shores, FL)

The brain of a computer is the Central Processing Unit (CPU), which is the component whose main function is to execute the instructions of a computer program loaded in memory. The CPU is an electronic circuit designed to perform tasks like logic and arithmetic operations, read and write data to memory, fetch, decode, and execute instructions. We have implemented a simple CPU-RAM configuration with a hardwired control unit through simulation using Logisim-evolution. The computer includes an arithmetic and Logic Unit (ALU), internal registers, a Random Access Memory module (RAM), and circuitry for the implementation of a control unit that supports direct and indirect memory addressing and non-sequential flow of control. The circuit uses an 12-bit address bus with four bits dedicated to op code and a 12-bit data bus. Synchronous counters with asynchronous preset and reset pins are employed in the control unit to run the fetch, decode, and execute phases of the instruction cycle. The number of clock pulses per instruction cycle is determined by the latency of the RAM module which was measured at two pulses for each read or write operation. Assignment, selection, and transfer of control operations are implemented. Memory access is possible with choices of absolute addressing, direct access through memory to register transfers, and indirect access through an added fetch operand phase in the instruction cycle. Further optimization of the control unit may yield reduced execution times for register or memory direct data transfers.

15. A race and gender data analysis of imbalances as evidenced in the U.S. labor force

Abrihana Rivera, and James Haralambides (Department of Math & Computer Science, Barry University, Miami Shores, FL)

The United States labor force consists of the employed and unemployed population available for work. Due to the increase in unemployment after the pandemic, interest in the work distribution among various population groups and any pronounced socioeconomic variations became the center of our focus. We collect and organize information from the U.S. Bureau of Labor and Statistics website to analyze the labor force's racial and gender proportional participation differences. These include the gender groups male and female, the racial groups White, Black or African American, Asian, and the ethnic group Hispanic or Latino. The U.S Bureau of Labor and Statistics website provides percental and visual descriptions of the labor force distribution. We used this resource to select the information needed for our data analysis. The purpose of the project is to highlight the significant discrepancies of percentages within the labor force population through our data collection, filtering, and descriptive analysis. Our data collection process focuses on identifying labor forces distribution percentages in various categories of the job force (ex: management, computer and math occupations, etc.) that deviate significantly from the corresponding target group percentages in relation to the general population. A connection is made between under-represented as well as over-represented race and gender groups and relevant social, economic, and cultural parameters. Visual representation of data findings further illustrates any evidenced imbalances and invites a discussion for prescribed corrective measures.

16. Cryptanalysis for transposition techniques

Jorge Vera, Anahi Jimenez, and James Haralambides (Department of Math & Computer Science, Barry University, Miami Shores, FL)

We are examining the vulnerability of transposition techniques to brute-force attacks. Examined encryption methods include the rail fence cipher, columnar transpositions, with a single or multiple rounds, and the running key cipher. Transposition techniques are mainly based on the rearrangement of characters in a given plaintext. The goal of our work is twofold: the development of brute force algorithms that automate the process of decryption and the complexity analysis of such methods. The rail fence cipher is a relatively simple encryption method that requires minimal regrouping of characters in the ciphertext and a small execution time to break. The complexity of columnar transpositions is dependent on the length of the encryption key. The algorithm is bounded above by the asymptotic complexity of permutations of length n, where n denotes the length of the encryption key. Execution times rise sharply when multiple rounds are employed. This becomes more prevalent in running key cipher techniques where the key length matches that of plaintext. Generating all permutations can become computationally intensive for long plaintext streams. To produce cryptographically stronger ciphertexts, encryption is performed following filtering of the input stream; spaces are removed and all alphabetic characters are converted to lowercase. Decryption is performed as an iterative process over all permutations of the keys sorted by key length. Execution times may be substantially reduced if the generation of permutation candidates is performed as a preprocessing step for executions over multiple sets of plaintext. A graphical user interface allows for interactive use of the method.

DEPARTMENT OF CHEMISTRY AND PHYSICS

17. Development of selective M2 and M4, Gi/o-biased muscarinic agonists: A potential therapeutic alternative to opioid analgesics

Jahomy Burgos, Christina Diaz, and John Boulos (Department of Physical Sciences, Barry University, Miami Shores, FL)

Opioids are widely prescribed as analgesics but they are not always the best course of treatment due to adverse side effects and addictive properties. Therefore, a new class of smarter painkillers, drugs that specifically target therapeutic signaling pathways while avoiding others associated with adverse effects are highly desirable. An alternative route to finding more selective agonists for use as painkillers is through downstream signaling pathway associated with the activation of M2 and M4 muscarinic receptors. Similar to opioid receptors, activation of M2 and M4 receptors results in the coupling to the Gi/o family of G-proteins, inhibition of adenylate cyclase, reduction in cAMP and a decrease in neurotransmitter release. Preliminary data from both heterogeneous expression systems and ex vivo studies for several efficacious agonists, which caused substantial inhibition of cAMP and little stimulation of inositol phosphate accumulation, will be presented. Data strongly indicate that these compounds have much greater efficacy for M2 and M4 Gi/o signaling than for M1, M3 and M5 Gq signaling. These compounds, in contrast to carbachol, only inhibit production of cAMP at M2 and M4 receptors displaying absolute Gi/o bias. Similarly, at M1 and M3 receptors, these compounds only inhibit cAMP production. Simulation of molecular dynamics has revealed specific interaction of these biased agonists in the orthosteric binding site and specific conformation of the M2 receptor. In comparison with balanced agonists carbachol and iperoxo, these agonists bind deeper in the orthosteric binding site. The most striking difference is the absence of hydrogen bonding to N404 in TM6. Instead, they interact with W400 one turn deeper in TM6 via a combination of various weaker interactions.

Funded by the Department of Chemistry and Physics at Barry University

18. Advanced peptide aldehydes as SARS-CoV-2 Mpro inhibitors

Kyle Edwards, and Conrad Fischer (Department of Physical Sciences, Barry University, Miami Shores, FL)

The current pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) demands urgent development of medical intervention. By genomic sequencing of SARS-CoV-2, the beta-coronavirus causing COVID-19, two main cysteine proteases, Mpro and PLpro, have been identified as ideal drug targets due to their central role in cleaving vital virus polypeptides. Our lab has synthesized a series of short peptide aldehyde inhibitors that fit into the active site of SARS-CoV-2 Mpro. They possess an aldehyde warhead that can reversibly react with the nucleophilic sulfur from the active site cysteine forming a stable hemithioacetal. Furthermore, they feature side-chain variations in P1 and P2 to optimize their binding properties. These variations have been inspired by early-stage lead compounds GC-373 and boceprevir, both nanomolar binders to SARS-CoV-2 Mpro. The latter drug has been further modified by Pfizer and attracted recent attention as the first FDA approved drug-based therapy pill against COVID-19. The purpose of this study is the synthesis of chemically modified peptide aldehydes that structurally combine the beneficial features of GC-373 and boceprevir and optimize the literature synthesis. These molecules will be tested as advanced inhibitors of SARS-CoV-2 Mpro potentially leading to more effective therapeutics to combat COVID-19 and related diseases.

Funded by the Department of Chemistry and Physics at Barry University

19. Synthesis and purification of BODIPY-labeled elabela peptides as fluorescent probes for bioimaging applications

Jakub Ettrich, and Conrad Fischer (Department of Physical Sciences, Barry University, Miami Shores, FL)

Elabela (ELA) is a cardiovascular active endogenous peptide hormone that binds to the APJ receptor, a G-protein coupled receptor. Activation of APJ causes release of signals that regulate cardiovascular function and output among other vital metabolic actions. Based on the length of the ELA peptide different downstream pathways that are coupled to APJ are activated. Longer peptide isoforms show a more pronounced potency for β-arrestin recruitment leading to receptor internalization. While this effect can be demonstrated by effector assays, we would like to present a life imaging approach to visualize this functional bias. Therefore, BODIPY, a dye with green fluorescence emission is conjugated to the N-terminal end of two differently long ELA peptides, i.e. ELA-10 and ELA-14 via amide coupling reaction. We present the synthesis of BODIPY and the solid-phase assisted synthesis of these peptide conjugates. Once synthesized and purified by HPLC, as proof of concept, respective peptide isoforms are incubated with HEK-cells, that express APJ on their surface. While both isoforms are expected to bind, fluorescence inside the cell should be earlier detected with the longer isoform, thus suggesting preferential internalization of the receptor. In combination with luciferase labeling this approach could also be used to study receptor-receptor interactions or possibly identify additional (G-protein coupled) receptors that bind elabela.

Funded by Barry University Faculty stimulus grant

20. Peptide aldehyde inhibitors incorporating oxazolinyl alanine as novel drugs to combat COVID-19

Oscar Gonzalez, and Conrad Fischer (Department of Physical Sciences, Barry University, Miami Shores, FL)

The immense health and economic impact of the current COVID-19-pandemic, caused by SARS-CoV-2, a beta-coronavirus, requires immediate scientific action in the development of a drug-based therapeutic intervention. This is also necessary in response to infected patients suffering from long-COVID and immunocompromised people that can not tolerate vaccination. A series of short peptide aldehydes, derived from the feline corona-virus drug GC376 have been demonstrated successful inhibitors of the main protease Mpro of SARS-CoV-2. Since this protease is vital for virus replication, its inhibition will halt polypeptide processing in the virus ultimately killing the pathogen. Currently developed inhibitors display a surprising structural variability of the amino acid sidechain in P1 position, reaching from nonpolar cyclobutyl to 5-membered lactam moieties. Molecular modelling suggests oxazolinyl alanine as a suitable mimic in this position, potentially leading to tighter active site binding and thus better inhibition of Mpro. The current project aims to synthesize oxazolinyl alanine and test its use as isostere in P1 position of late-stage potent Mpro inhibitors. SARS-CoV-2 Mpro affinity of generated peptide aldehydes will be tested in vitro potentially leading to more effective therapeutics to combat COVID-19 and related diseases.

Funded by the Department of Chemistry and Physics at Barry University

21. 5,15-Dinaphthylporphyrins synthesized using mechanochemistry

Lise-Berthe Laurent[1], Austen Henerson[2], Joshua Ruppel[2], and Tamara Hamilton[1] ([1]Department of Physical Sciences, Barry University, Miami Shores, FL, [2]Department of Natural Sciences and Engineering, University of South Carolina Upstate, Spartanburg, SC)

Porphyrins are molecules that are excellent at holding ions to aid with transportation, whether it be iron to aid in oxygen transport in animals or magnesium to aid in electron transport in plants. Porphyrins with two substituents at opposite meso positions have lower symmetry than those with

four substituents, and therefore create a more synthetic challenge due to the possibility of scrambling occurrence. Di-substituted porphyrins would make for good starting compounds for syntheses of supramolecular materials in biomedical, solar energy, and optical applications due to their ability to uniquely hold more groups. Traditional syntheses include large amounts of harmful solvents with low yield production. Given this, the desire for stable and reliable porphyrin products with reduced harm to the environment is present. Our prior work consisted of examining the effects of different starting materials for the synthesis of tetra-substituted porphyrins using mechanical energy. With this, we present that 1- and 2- naphthaldehyde starters can create di-substituted porphyrins in acceptable yields. This was done by grinding equimolar amounts of 1- or 2- naphthaldehyde and dipyrromethene, along with an acid catalyst. Oxidation occurred in solution with 2,3-dichloro-5,6-dicyano-1,4-benzoquinone which gave yield to 5,15-di(1-naphthyl)porphyrin and 5,15-di(2-naphthyl)porphyrin, respectively. Yields up to 10% have been synthesized and characterized through proton Nuclear Magnetic Resonance and UV-Vis spectroscopy. The production of di-substituted porphyrins through the use of mechanochemistry introduces a new pathway of porphyrin syntheses and increases the types of porphyrins used for practical applications.

Funded by the Department of Chemistry and Physics at Barry University

22. Using magnetic accelerators to promote STEM education in Florida public schools

Yasmin Marsh, Lana Sumner-Borema, Jakub Ettrich, Luis Estrada, Kyle Edwards, Bartosz Fornal, Maurizio Giannotti, and Sanja Zivanovic (Department of Physical Sciences, Barry University, Miami Shores, FL)

Barry University is a Catholic Liberal Arts University promoting service-learning experiences in all courses of study. Barry University's Astro, Math and Physics (AMP) Club works to promote science in Florida schools by giving presentations within the Scientist in Every Florida School (SEFS) Program, Lutheran Social Services Refugee Resettlement Program, and various open house events involving high school students touring Barry University's Department of Chemistry and Physics. The goal of this particular project is to build a magnetic linear accelerator to demonstrate forces of motion and, specifically, the concept of momentum. The resulting demonstration will constitute a permanent tool for future presentations conducted by the Club, and the Physics Department in general, for Florida public school students. The need for such an engagement of school students in scientific experiences is further necessitated by the recent drop in science scores in standardized testing in Florida public schools due to COVID-19, and the demonstration will contribute to reversing this negative trend.

23. Asymmetric dark matter from gravitational waves

Erika Pierre, and Bartosz Fornal (Department of Physical Sciences, Barry University, Miami Shores, FL)

We investigate the prospects for probing asymmetric dark matter models through their gravitational wave signatures. We concentrate on a theory extending the Standard Model symmetry by a non-Abelian lepton number gauge group, under which charged leptons and neutrinos form doublets with new fermionic partners, one of them being a dark matter candidate. The breaking of this new symmetry occurs at the PeV scale and leads to a strong first order phase transition in the early Universe. The model explains baryogenesis in an asymmetric dark matter setting and predicts gravitational wave signals within the reach of near-future experiments.

24. Asymmetric synthesis of cycloalkyl-l-amino acid derivatives as isosteres for inhibitor development

Erika Pierre , and Conrad Fischer (Department of Physical Sciences, Barry University, Miami Shores, FL)

Proteinogenic amino acids (PAAs) are integral component of peptides and proteins but face instability under biological conditions. PAAs are broken down by enzymes, known as proteases, due to their side chains and sequence-dependent folds of resulting peptides which get recognized by these enzymes. Non-proteinogenic amino acids (NPAAs) introduce a solution to PAAs metabolic instability, by improving the structure and stability of proteins, serving as intermediates in biosynthesis and metabolic pathways, and expanding the chiral pool. Our objective is to synthesize Ni(II)-glycine-(S)-N-(2-Benzoylphenyl)-1-benzylpyrrolidine-2-carboxylamide (Ni-Gly-(S)-BPB), also known as Belokons complex, which can serve as an auxiliary in synthesizing unnatural L-amino acids, α-methylated amino acids, and α-deuterated amino acids. In this project we want to assemble and utilize Belokons recyclable complex to generate non-natural cycloalkyl-L-amino acids as structural isosteres for inhibitor development.

Funded by the Department of Chemistry and Physics at Barry University

25. Elabela peptides as potential therapeutics for cardiovascular disease

Lana Sumner-Borema , and Conrad Fischer (Department of Physical Sciences, Barry University, Miami Shores, FL)

Elabela peptides (ELA) are a body-own peptide hormone class that bind to the APJ receptor, a rhodopsin-like G-protein coupled receptor (GPCR). APJ receptor activation triggers physiological functions such as cardiovascular development and output, water metabolism and cell signaling. ELA peptides originate from a 54-amino acid prepropeptide that is processed in shorter isoforms such as ELA-32, ELA-21, and ELA-11. The C-terminal 10 amino acids are the minimum consensus structures to activate the receptor. The shortest ELA-10 isoforms display a biased response towards the activation of downstream pathways which is beneficial in prolonging physiological effects of this peptide and suppressing unwanted pathways. ELA-isoforms possess a short plasma half-life estimated to be <1.4min. PEGylation can successfully extend the plasma half-life up to three orders of magnitude. The goal of this project is the solid-phase assisted synthesis and purification of the native ELA-21 peptide to study the degradation of the native peptide by the body own proteases and as reference peptide in physiological assays. TLC will be used between each amino acid addition to ensure complete coupling while LCMS will be used at the halfway point to confirm the peptide is growing correctly on the resin and at the end to ensure the complete peptide has been formed.

Funded by Barry University Faculty Stimulus Grant

DEPARTMENT OF PSYCHOLOGY

26. Public perception of young adolescents who commit violent crimes: a comparison of those with or without a diagnosis of conduct disorder

Erica Ackerman (Department of Psychology, Barry University, Miami Shores, FL)

Young adolescents who commit violent crimes are perceived as a danger to society. This threat to society is evident through the implementation of public policy that supports treating juvenile offenders harshly. Furthermore, adolescents with conduct disorder are perceived as harmful and delinquent. It is common for individuals with conduct disorder to come into contact with the criminal justice system for engaging in illegal behavior (American Psychiatric Association, 2013). It has been concluded by

prior research that adolescents who commit violent crimes are perceived as dangerous and less amendable to treatment (Prasad & Kimonis, 2018). Prior research has also concluded that a conduct disorder diagnosis relates to criminality (Frick, 2016). However, it is undetermined if the presence of a conduct disorder diagnosis elicits attitudes of pro-punishment itself or if the socially undesirable characteristics associated with the disorder negatively influence the public's perception. Independent samples t-tests were conducted to assess whether the presence of a conduct disorder diagnosis would elicit feelings of pro-punishment or pro-rehabilitation for young adolescents who commit violent crimes. Results found that those who received the scenario where the adolescent was diagnosed with conduct disorder did not elicit attitudes that are in line with pro-punishment attitudes, nor did their responses differ from participants who received the scenario where the adolescent did not have a conduct disorder diagnosis. Implications include the need for providing more information to participants on conduct disorder prior to assessing their perceptions based on the presence or absence of the disorder.

27. Course expectations and academic interest: examining the relationship between classroom engagement and student motivation.

Liz Calvo , Daryle Pyles , and Trent Wondra (Department of Psychology, Barry University, Miami Shores, FL)

Professors strive to create optimal learning environments for their students. Therefore, efforts to improve the learning environment often consider different methods of learning and how they can increase their students motivation throughout a semester. Previous research has found that students who feel engaged in the classroom display higher levels of intrinsic motivation (Wilson and Wilson 2007). Additionally, studies have also shown that when students are put in activities that require engagement and collaboration with other students, they are more likely to remember the material and feel better about doing assignments for the class (Jeong, 2019). Our current study was designed to gauge how classroom engagement affects student motivation via group assignments wherein students are engaged with and dependent on their peers. We hypothesized that students who receive the syllabus containing group activities and assignments would feel more motivated than students who received the syllabus that contains individually completed weekly quizzes. To test this hypothesis, participants will include 50 college students who will be asked to give their demographic information, such as gender, age, year of study, ethnicity, and social class, as well as asked to rate each syllabus, one including weekly individual quizzes with and the other with weekly group assignments. A seven-item (e.g., I feel that I will enjoy the course) Likert-type scale (1= strongly disagree to 5 = strongly agree) will be utilized to determine how motivated participants would feel if they were enrolled in each course. Whether or not participants prefer one syllabus or the other, will help inform the instructor's methodology when looking into ways to improve students overall motivation. Therefore, research can contribute to aiding public education systems and instructors in understanding what teaching methods should be used to improve a students academic performance.

28. Perceived racism and COVID-19 stigma in the black community

Tennille Crawford , Latrisha Robinson , Brittini Thomas , Massiel Pinales , and Pamela Hall (Department of Psychology, Barry University, Miami Shores, FL)

Due to the high rates of Blacks contacting and/or dying from COVID-19, many Blacks feel stigmatized by the wider community. They also feel that they are treated unfairly by medical professionals, which often creates iatrophobia or fear of the white coat amongst Blacks. The present study examined the relationship between perceived racial stigma and COVID-19 vaccine comfort amongst a cross-section of Blacks. Method: Participants consisted of 2480 participants that self-identified as Black/Africana (i.e., Black, Black American, African American, African, Afro-Caribbean, Afro-Latinx, etc.); 732 men, 1631 women, nine nonbinary/gender fluid individuals, and five transgender participants whose (M = 36.60, SD = 14.86. Participants were recruited through Qualtrics LLC's survey panel, whereby a survey link was distributed to states that were hotspots for COVID and had a high percentage of Blacks. Participants completed five items on a 7-point Likert scale to assess vaccine comfort. A

single-item 7-point Likert scale was used to measure general racial stigma and racial medical stigma. Results from correlation analyses yielded a significant positive relationship between vaccine comfort level and general racial stigma (e.g., people thinking because they were Black, they had COVID), r =.158, p < .01. Further, there was a significant relationship between racial medical stigma and vaccine comfort (e.g., participants believe their quality of care was worse because they are Black), r =.21, p < .01. The findings suggest more diversity, equity, and inclusion training for the general public and the health care professionals would help reduce the anxiety and worry Blacks associated with racial stigmas.

Research Commissioned by: The Congressional Tri-Caucus (Black; Asian/Pacific Islander; Latinx) and two Native American congresspersons.

29. The relationship between self-esteem and body image among emerging adults in college

Atia Hossain, Sabrina Des Rosiers, and Guillermo Wated (Department of Psychology, Barry University, Miami Shores, FL)

Emerging adulthood is the period of the lifespan spanning the early to late 20s (Arnett, 2004). Self-esteem refers to subjective evaluations about oneself. (Rosenberg, 1965). Studies show self-esteem is directly associated with body image (Stapleton et al., 2017). This pattern was found to differ by gender (Choukas-Bradley et al., 2019). According to Gioia et al. (2020), females reported higher levels of body shame whereas males control body image to improve sexual attractiveness. The goal of the present is two-fold: 1) evaluate differences between emerging adults who self-identify as men and women on self-esteem and body dissatisfaction, 2) explore the association between self-esteem and body dissatisfaction. The sample was drawn from an archived study on well-being (Des Rosiers et al., 2012). Participants were mostly freshmen, 250 women and 214 men, ages from 18-25, and predominantly White. Independent samples t-test showed that men (M=38.18,SD=7.10) and women (M=38.35,SD= 7.44) did not differ in self-esteem. However, there was a statistical significance in body image by gender, t(393)= 4.07,p <.001,d= .41, M=2.39,95% CI [1.24,3.54]. Men (M=27.64,SD=5.19) reported less body dissatisfaction compared to women (M=25.26,SD=6.25). A positive moderate correlation between self-esteem and body image (r=.46,n=393,p< .001) was observed. Given gender differences, correlation analyses were conducted individually. Results showed a stronger association for women (r=.53,n=216 p< .001) compared to men (r=.39,n=177,p< .001). These findings replicated previous research and highlighted patterns of association between self-esteem and body image is stronger for women.

30. External and internal factors associated with academic motivation and performance among minority college students: a descriptive analysis

Melanie Valle, Sabrina Des Rosiers, and Guillermo (Department of Psychology, Barry University, Miami Shores, FL)

A large landscape of studies that has examined college students outcomes have focused on both academic motivation and performance (e.g., Ames, 1992; Dweck, & Master,2009; Koenka et al 2021). Whereas academic performance has been measured by college students overall grade point average (GPA), academic motivation has been defined as the process by which students engaged in goal-directed behaviors that lead to successful academic performance (Schunk, Meece, & Pintrich, 2014). Studies show that academic motivation and academic performance are strongly and directly related. Such that higher level of motivation is associated with higher level of performance (Hughes et al., 2019). Furthermore, studies show there are various external and internal factors that predict a students success including their academic performance and motivation. It is also noteworthy that predictors of academic performance and academic motivation appear to overlap (Stoffel & Cain, 2018. For example, college climate was shown to be associated with both academic performance and motivation. Similarly academic stress was found to predict both GPA and academic motivation. Despite these important findings researchers in this field of study have suggested the identification of internal and external factors predicting college student success remains an area that merit continued

research examination (e.g., Doleck & Lajoie, 2018). In addition, fewer studies have evaluated such factors associated with academic performance and motivation among minority college. The present study is based on empirical evidence regarding academic motivation and performance to evaluate the hypothesis that school alienation conceptualized an external factor as well as self-reported academic stress conceptualized as an internal factor will predict both academic motivation and academic performance in a sample of minority college students. The sample for the present study (N = 230) derived from a larger study on cultural stress in college students (Wated and Des Rosiers, 2018). The average age of the participants was 21.89, SD = 5.44. It was a diverse sample of students who identify being from a minority group. They self-identified as Afro-Caribbean (8%); Native American (1%); Asian (9%); African American (29%); Hispanic (52%) and Pacific Islander less than 1%. Most students reported being in their sophomore year (22%) and junior year (21%). About 17% were in their senior year and 16% were in their freshman year. Most students (71%) were enrolled in college full-time. The majority of students (64%) self-identify as women and 16% self-identify as men. About 19% of the sample did not report their gender identification. The predictors variables were school alienation measured by The School Alienation subscale (Studsrod & Bru, 2009) and academic stress the Traditional College Student Stress Scale (Renner & Mackin, 1998). The outcome variable academic motivation was measured by the Motivation for Continued Education subscale (Studsrod & Bru, 2009) and the other outcome variable academic performance was measured by students self-reported GPA. The mean GPA for the sample was 3.27, SD = .62. A multiple regression was conducted to test the hypothesis that school alienation and academic stress would predict motivation. Another multiple regression was conducted to evaluate these the predictive relationship between these external and internal variables (i.e., academic stress and school alienation) with academic performance. Results showed that the linear combination of school alienation and academic stress was significantly related to academic performance measured by GPA $F (2, 176 = 3.06)$, $p < .05$, Adjusted $R^2 = .02$. Similar results were observed for the predictive utility of school alienation and academic stress on motivation for continued education, $F (2, 228 = 54.90$ $p < .001$, Adjusted $R^2 = .32$. These findings are important for informing about the experiences pertinent for the academic success of minority students enrolled in college.

DEPARTMENT OF SPORT & EXERCISE SCIENCES

31. Examining the relationship between trait energy and fatigue and feelings of depression in young healthy adults

Marc-Antoine D. Harris[1], Lauren Nesshover[2], Ashley Carpenter[2], Selina Sampieri[2], Jennifer Keefer[2], Chelsea Yager[3], Andrew Pickett[4], Matthew L. Smith[5,6], Ali Boolani[2,7], Andreas Stamatis[8], and Zacharias Papadakis[1]. ([1]Human Performance Laboratory; Department of Sport and Exercise Sciences, Barry University; Miami Shores, FL; [2]Physical Therapy; Clarkson University; Potsdam, NY; [3]Neurology; St. Joseph's Hospital Health Center; Syracuse, NY; [4]Kinesiology & Sport Management; University of South Dakota; Vermillion, SD; [5]Center for Population Health and Aging; Texas A&M University; College Station, TX; [6]Environmental and Occupational Health; Texas A&M University; College Station, TX; [7]Biology; Clarkson University; Potsdam, NY; [8]Exercise and Nutrition Sciences; SUNY Plattsburgh; Plattsburgh, NY)

Depression is usually co-morbid with fatigue. However, we are unaware of studies exploring the relationship between trait energy and fatigue and feelings of depression. Recent evidence suggests that energy and fatigue are two distinct moods. **PURPOSE:** To examine the association between trait mental and physical energy and fatigue and feelings of depression, within an otherwise healthy young adult cohort. **METHODS:** Using a cross-sectional design, healthy respondents (n=495) completed a series of self-reported surveys measuring depression, lifestyle factors (sleep, diet, physical activity), and trait mental and physical energy and fatigue. Using a step-wise regression, we controlled for demographics and lifestyle and added trait mental and physical energy and fatigue to the second model. **RESULTS:** When trait mental and physical energy and fatigue were added to the models, the adjusted R2 increased by 5% ($R2 = .112$, $F (13, 457) = 4.455$, $p < .001$). In our second model, trait

mental fatigue was the only significant predictor of depressive mood states (B = .159, t (457) = 2.512, p = 0.01). **CONCLUSION:** Young adults, who struggle with high mental fatigue, may also be more likely to report feeling depressed suggesting that fatigue and depression are co-morbid, while low energy and depression are not. Future research should aim to identify epigenetic/genetic factors that influence mental fatigue and how those may be associated with feelings of depression.

32. To scale or not to scale when predicting female rowers' off-water performance?

Michelle Etchebaster, Zoey Jackson , and Zacharias Papadakis. (Human Performance Laboratory, Department of Sport & Exercise Sciences, Barry University, Miami Shores, FL)

Maximum oxygen uptake (VO2max) off-water 2000 m rowing ergometer assessment value expressed in absolute value (ml/min) is used as rowers' on-water performance predictor. Rowers with larger body mass (BM) contain more muscle and larger body cross-section to expend more energy, hence the higher VO2max achieved during full power stroke and the faster race time. Since absolute VO2max does not allow for comparisons between athletes, VO2max is alternatively expressed relative to BM (ml/kg/min). Such normalization though, does not account for body size and composition variations. Rowers with the largest dimensions will have the smallest relative VO2max, even though they are able to generate faster race times despite being heavier. Therefore, allometric BM scaling to 0.67 (Surface Law), 0.73 (Biological Variation – Brody's Law), and 0.75 (Energy Transport System) have been proposed to facilitate rowers' inter-comparison across a wide range of body weights. **PURPOSE:** To examine the predictive power between absolute, relative and allometric BM scaling modeling on off-water 2000 m performance time. **METHODS:** Eleven female NCAA Division II rowers participated, based on their off-water performance on 2000 m testing in a discontinuous incremental rowing ergometer test to exhaustion to establish their VO2max values. VO2max values were expressed as absolute (ml/min), relative to BM (ml/min/kg), and allometric scaling to BM (ml/kg$^{0.67}$/min, ml/kg$^{0.73}$/min, and ml/kg$^{0.75}$/min). Five multiple VO2max linear regression models were created and analyzed by SPSS vs 28 based on the expressed VO2max values. **RESULTS:** Only the absolute model ($F_{1,9}$=12.0, p = .007, R^2 = .6) and the allometric BM model scaled to 0.67 ($F_{1,9}$=5.2, p = .049, R^2 = .4) significantly predicted the 2000 m off-water performance time. **CONCLUSION:** Among the different VO2max expressions, the absolute value is the best 2000 m performance time predictor. Moreover, our results indicate that Surface Law may have more predictive power on 2000 m performance time, compared to biological and energy transport systems as reflected by the respective allometric exponents. When inter-comparisons between rowers are needed, allometric BM scaling to 0.67 is probably the best solution among other allometric methods to predict rowers' 2000 m performance time.

33. The limited role of grit in the associations between lifestyle behavior and feelings of energy and fatigue during the early stages of the COVID-19 pandemic

Meesha Carter[1], Jessica Adams[2], Joel Martin[3], Matthew Lee Smith[4,5], Italia Milani[6], Shane Caswell[3], Nelson Cortes[3], Ali Boolani[2,7,8], Andreas Stamatis[9], and Zacharias Papadakis[1].([1]Human Performance Laboratory, Department of Sport and Exercise Sciences; Barry University; Miami Shores, FL; [2]Biology, Clarkson University; Potsdam, NY; [3]Sports Medicine Assessment Research & Testing (SMART) Laboratory; George Mason University; Fairfax, VA; [4]Center for Population Health and Aging; Texas A&M University; College Station, TX; [5]Environmental and Occupational Health; Texas A&M University; College Station, TX; [6]Psychology; Clarkson University; Potsdam, NY; [7]Physical Therapy; Clarkson University; Potsdam, NY; [8]Honors Program, Clarkson University; Potsdam, NY; [9]Exercise and Nutrition Sciences, SUNY Plattsburgh, Plattsburgh, NY)

Grit has been positively associated with feelings of energy (when measured as the opposite end of fatigue). During the COVID-19 pandemic, grit has been inter-related with positive health-related behaviors, which are known to influence feelings of energy and fatigue. **PURPOSE:** To identify the association between grit, health-related behaviors and feelings of mental and physical energy (ME, PE) and fatigue (MF, PF) during the COVID-19 health crisis. **METHODS:** Using snowball sampling

method during the early stages of the pandemic, participants (n=859) completed validated online surveys regarding physical activity (PA), diet, time sitting, grit, and feelings of ME, MF, PE and PF. Using a series of multi-variate regression models, we assessed the association between grit, health-related lifestyle, and the moods of ME, MF, PE and PF. **RESULTS:** Approximately, 31% of participants reported testing positive for COVID-19. In our models that accounted for all factors, only vigorous PA (β_{PE}=.229, p<.001; β_{PF}=-.102, p<.01;β_{ME}=.091, p<.05 ;β_{MF}=-.097, p<.05), time sitting (β_{PE}=-.183, p<.001; β_{PF}=.164, p<.001; β_{ME}=-.139, p<.001; β_{MF}=.193, p<.001), and diet habits (β_{PE}=.173, p<.001; β_{PF}=-.182, p<.001; β_{ME}=.118, p<.001; β_{MF}=-.133, p<.001) were associated with the four moods, while grit and all COVID-associated factors (e.g., COVID-19 diagnosis, 7-day inflection rates) measured in this study were not (p>.05). **CONCLUSION:** This study is innovative as it examines the aforementioned relationships in the context of a pandemic. Our findings underscore the need to adopt a healthy lifestyle behavior (i.e., performing vigorous PA, sitting less, eating a high-quality diet) to improve feelings of energy and fatigue in the face of high-stress situations, such as a global pandemic. Unlike previous literature, our results indicate that grit is not associated with feelings of energy and fatigue during at least the early stages of the COVID-19 health crisis.

34. The relation between measured subjects body fat percentage and three upper quarter y-balance test variations in college students.

Ryan Cedeno, Tal Amasay, Michelle Etchebaster[1], and Samuel Vilmeau. (Motion Analysis Center Laboratory, Department of Sport & Exercise Sciences, Barry University, Miami Shores, FL)

College students tend to gain weight and increase body fat percentage (BF%) during their four academic years. Cross-sectional studies and longitudinal studies are starting to highlight the importance of body composition and its correlation to a decrease in joint health. While the Upper Quarter Y-Balance Test (UQYBT) has been proven to be a reliable tool to measure upper extremity joint mobility and stability in young healthy individuals. Past research has failed to account for physiological differences in body composition and body size of college students. The UQYBT in its current format might not be ideal for overweight individuals since it requires isometric strength to support body weight. **PURPOSE:** To investigate the relation between BF% of college students with their performance in three UQYBT variations. **METHODS:** Twenty college students (24.5±6.7 years, 1.69±0.06 m, 69.8±12.1 kg) 11 females and nine males participated in this study. Body fat percentage was collected using handheld BIA prior to testing, followed by five minutes upper extremity warm-up on an arm ergometer. All participants successfully performed the Standard (traditional push-up position), Modified (modified push-up position), and Wall (standing erect) UQYBT variations. Participants max scores of the three reaches (medial, inferolateral, and superolateral) were collected and composite scores were calculated. A Pearson correlation analysis was performed between the reaches scores in each of the UQYBT variations and BF%. Significance level was set to .05. **RESULTS:** Body fat percentage was found to be 20.8±7.5%. Moderate negative correlation were found between BF% and the max absolute scores in Standard UQYBT medial reach (r=-.33), inferolateral reach (r=-.34), superolateral reach (r=-.40), and in Modified UQYBT superolateral reach (r=-.39). In contrast, moderate to strong positive correlation were found between BF% and the max relative scores in Wall UQYBT inferolateral reach (r=.54), superolateral (r=.48), and composite score (r=.52). In addition, moderate positive correlation was found between BF% and the max absolute scores in Wall UQYBT inferolateral reach (r=.32). *CONCLUSION:* Our findings identify differences between the three UQYBT variations and BF%. When the participant carries his body weight in the traditional or modify push-up position the correlation is negative, which means that the heavier you are the lower your reach score will be. On the contrary, when performing UQYBT in a standing position the correlation between the BF% and the reach scores were positive. This could be related to gender differences or differences in upper body range of motion. Future studies need to examine gender differences and range of motion of upper body with respect to UQYBT.

35. Is our student body fit? A comparison of current fitness levels to normative data

Melissa Dorvily, Michelle Etchebaster, Zoey Jackson, and Zacharias Papadakis. (Human Performance Laboratory, Department of Sport and Exercise Sciences, Barry University, Miami Shores, FL)

Physical Activity (PA) among university students yields 40-50% participation and this statistic continues to make a steady decline. This has caused a widespread call to action for universities to provide resources and education to encourage students to increase physical activity. Prior to and during COVID-19 pandemic our student body reported decreased levels of PA. Amid the return to an in-person student life, many students have reported increased challenges in returning to fitness related activities. In tandem with our Exercise is Medicine-On Campus (EIM-OC) initiative, an interactive health fair open to the entire body of 4,495 students was held to address current physical fitness levels. **PURPOSE:** To examine physical fitness levels of students upon return to instruction practices for the 2021-2022 academic year. **METHODS:** Just 4% (N=220) of Barry's students attended the health fair. Only 16% (N=37) completed some form of fitness testing, and only 10 (6 female, 4 male; age 24.3 ± 9.3) completed all 5 physical fitness assessments (i.e. muscular strength, muscular endurance, flexibility, body composition, cardiorespiratory endurance). Participants' data were compared to normative data for their corresponding gender and age to assess current fitness level. **RESULTS:** Male and female participants overall excelled in cardiovascular fitness and muscular endurance, while body composition, flexibility and muscle strength ranged from fair to average. Females exhibited normal or average classifications across 4 of the 5 areas of testing. Males exhibited good classifications for body fat % and flexibility, and an excellent classification for muscular strength. **CONCLUSION:** Samples' overall fitness levels were considered average to above average, but the small sample size does not allow for valid inferences. However, even though it was not the purpose of this study, the data collected highlight an important co-existing issue between college exercise education programs and their efficiency in marketing to their audience. Students were offered an abundance of free giveaways and other incentives for this event, yet the yield was only 4% of the student body. Further research is needed to determine the most effective forms of garnering increased participation in on- campus exercise education programs.

36. A comparison of constrained and unconstrained upper quarter y-balance tests performance in the adult active population

Michelle Etchebaster, Tal Amasay, Ryan Cedeno, and Samuel Vilmeau. (Motion Analysis Center Laboratory, Department of Sport & Exercise Sciences, Barry University, Miami Shores, FL)

Common screening tools for upper extremity functionality tend to focus only on power, speed, and/or stability of the shoulder. Previous research studies validated the reliability of the Upper Quarter Y-Balance Test (UQYBT) as a clinical tool to measure unilateral upper extremity function, dynamics, as well as indirectly thoracic mobility. The distinctiveness of this test is the combination of shoulder girdle mobility and stability, core stability, thoracic rotation, and overall muscles strength to reach as far as possible without losing balance in the single arm stance position. Thus, measuring upper body strength and thoracic rotation may predict performance. **PURPOSE:** The aim of this study is to compare the performance of physically active individuals in two variations of the UQYBT, constrained and unconstrained, and to measure the relation of upper body strength and trunk mobility with the UQYBT reach scores. **METHODS:** Five male (31.2±9.0 years, 1.73±.02 m, 78.8±7.0 kg) and five female (24.4±.8 years, 1.67±.06 m, 71.4±2.7 kg) college students participated in two testing sessions. Participants completed a maximal push-up test and a maximal seated trunk rotation mobility test. During the second session, participants performed the Constrained UQYBT (participant keeps the push-up position) and the Unconstrained variation in which it was allowed to flex elbow of supporting arm and flex the hip when reaching in any direction. For each test, subjects completed three reaches in medial, inferolateral, and superolateral directions. Maximal reach scores in each direction were identified and composite scores were calculated for the two UQYBTs. MANOVA was used to identify differences in reach scores between the Constrained and Unconstrained UQYBTs, significance level

was set to .05. Pearson correlation was used to identify relations between maximal push-up score and maximal trunk rotation range of motion (ROM) with the UQYBT reach scores. **RESULTS:** Significant differences were observed for all reach scores between the Constrained and Unconstrained UQYBTs. Unconstrained UQYBT had higher reach score scores than the Constrained UQYBT in the medial (119±9% vs 100±7%, p-value<.001), inferolateral (110±14% vs 80±10%, p-value<.001), and superolateral (82±13% vs 73±13%, p-value=.042) directions, and in the composite score (103±10% vs 84±8%, p-value<.001). Moderate to strong positive correlations were observed between maximal trunk rotation ROM and most reach scores in Constrained and Unconstrained UQYBTs. The correlation coefficients were between .331 to .605. Moderate positive coefficient (r=.365) was identified between max push-ups and Constrained Inferolateral reach. In contrast, strong negative correlation (r=-584) was identified between Unconstrained superolateral reach and max push-ups. **CONCLUSION:** The main finding of this study identified the big difference in reach scores between Constrained and Unconstrained UQYBTs. Practitioners need to be cautions when performing the UQYBT and when comparing reach scores from different resources. Moreover, it seems that large trunk mobility is associated with higher UQYBT reach scores.

37. Cardiorespiratory coordination among intermediate and novice female collegiate rowers

Zoey Jackson [1], Michelle Etchebaster [1], Paula Guierrez [2], Gemma Hernandez [2], Sergi Garcia-Retortillo [3], and Zacharias Papadakis [1]. ([1]Department of Sport & Exercise Sciences, Barry University, Miami Shores, FL, [2] Universitat de Girona, Girona, FL, [3] Boston University, Boston, MA)

Elite rowers present high levels of cardiorespiratory performance. Rowers' on-water performance can be predicted by a cardiopulmonary exercise test (CPET) and related measured parameters such as maximum oxygen uptake test (VO2max), ventilation (VE), heart rate (HR), expired fraction of oxygen (FeO2) and carbon dioxide (FeCO2). However, such testing provides little information about the non-linear dynamic interactions during rowing and the qualitative synergetic reconfigurations between cardiovascular and respiratory systems to adjust to the individual's rowing performance. Cardiorespiratory coordination (CRC) has been proposed as a method to measure the co-variation among cardiorespiratory variables during a CPET. **PURPOSE:** To measure and compare the CRC through principal components analysis (PCA) between intermediate (9) and novice (9) rowers. **METHODS:** Eighteen females, members of NCAA Division II team, participated based on their off-water performance on 6000 m time trial and training status (i.e., Intermediate vs, Novice) in a discontinuous incremental rowing ergometer test to exhaustion. A variety of cardiorespiratory values were recorded. VE, HR, FeO2, and FeCO2 values during the last two stages before volitional fatigue between intermediate and novice rowers were analyzed by PCA on SPSS vs28. The number of principal components (PCs) and the first PC eigenvalues were computed for each group. **RESULTS:** While 67% of participants in the intermediate group showed one PC, only 22% of the novice group displayed 1 single PC. The formation of an additional PC in N rowers was the result of the shift of FeCO2 from the PC1 cluster of variables. **CONCLUSION:** Intermediate rowers showed a trend towards lower number of PCs compared to novice rowers, reflecting a higher degree of CRC. These findings point toward a higher efficiency of cardiorespiratory function in intermediate rowers, potentially as a result of improved bicarbonate buffering efficiency during high-intensity exercise. Intermediate rowers presented better gas exchange and relied less on ventilation for a given oxygen consumption. CRC appears as a complementary measure to assess aerobic fitness as well as cardiorespiratory interactions and their response to exercise in rowing may be useful to coaches, athletes and other stakeholders.

38. Acute partial sleep deprivation and high-intensity exercise effects on cardiovascular autonomic regulation and lipemia network

Zacharias Papadakis[1], and Sergio Garcia-Retortillo[2]. ([1]Department of Sport & Exercise Sciences, Barry University, Miami Shores, FL, [2]Department of Physics, Boston University, Boston, MA)

Autonomic nervous system imbalance demonstrated by decreased heart rate variability (HRV) is linked to acute partial sleep deprivation (ASPD) and cardiovascular disease (CVD). Cardiometabolic lipemia has been linked to changes in HRV. Habitually active individuals exercising in the morning hours under APSD and consuming afterwards a high-fat breakfast, may disrupt the network coordination of both the cardiovascular autonomic regulation and cardiometabolic lipemic systems jeopardizing their health. The human organism is comprised by an integrated network of interconnected organ systems and functions, therefore, a disruption/failure of one system can trigger a cascade of failures manifested as disease state. **PURPOSE:** To investigate the postprandial network interactions of autonomic regulation assessed by heart rate variability (HRV) and cardiometabolic lipemia assessed by low-density lipoprotein (LDL) cholesterol under APSD and after a high-intensity interval exercise (HIIE). **METHODS:** Fifteen healthy males (age 31 ± 5 years) participated in: (a) reference sleep (RS) (~ 9.5 h) and HIIE (RSX) and (b) APSD and HIIE (SSX). HIIE was performed in 3:2 min intervals at 90% and 40% of VO2reserve. HRV selected time and frequency domain indices were recorded the night before (D1), the morning of the next day (D2), 1 hr post-HIEE (1hrPE), 2 hr (2hrPE)-, 4hr (4hrPE), and 6-hr post-HIIE (6hrPE). Postprandial LDL was assessed at D1, D2, 1hrPE and 4hrPE. Pearson correlation coefficients and correlation matrices were used to investigate the physiologic network during RSX and SSX. Interactions within each network were computed by the number of links (i.e., number of significant Pearson correlations) and presented as positive and negative links. **RESULTS:** The total number of links increased by 90% under SSX compared to RSX due to: (i) manifestation of weak and intermediate negative links between the HRV and the LDL sub-networks and (ii) a 100% increase of positive links within the LDL sub-network. **CONCLUSION:** This study shows a complex network of interactions between autonomic regulation and cardiometabolic lipemia. Our results uncover how this physiological network reorganizes in response to APSD confirming the inverse relationship between HRV and LDL. HRV can be used as an alternative non-invasive marker of CVD.

39. Distal tibiofibular syndesmotic and anterior inferior tibiofibular ligament disruption concurrent with deltoid ligament rupture and talar chondromalac

Angel Picart[1], Laura Cubillos[2], and Scott Freer[1]. ([1]Department of Sport & Exercise Sciences, Barry University, Miami Shores, FL and [2]South Miami Senior High School)

A 17-year-old male high school football athlete, with no previous history of lower leg or ankle injury, suffered a severe ankle injury after multiple players fell on lower leg during a game. The initial evaluation presented with a significant soft tissue deformity around lateral malleolus and anterior distal tibia. An audible pop at time of injury was described by the patient. An increase in pain was elicited during palpation of medial and lateral malleoli and ligaments. Immediately immobilization of the lower leg was determined and performed on the field prior to being referred for radiographic imaging. **Differential Diagnosis:** Bimalleolar fracture, Avulsion fracture, Talas Fracture, Isolated Ligamentous Tear. Intervention/Treatment: Weightbearing radiographs revealed an obvious widening of the syndesmosis, which was later confirmed with non-weightbearing CT scan. At post injury day 4, the patient underwent an open reduction and internal fixation of distal tibiofibular syndesmotic disruption, open reconstruction of anterior inferior tibiofibular ligament, an open deltoid ligament repair, partial synovectomy, and chondroplasty of the talus.Post-surgical care consisted of non-weightbearing ambulation for 8 weeks followed by a gradual return to weightbearing status. At the time of this abstract, the patient is beginning a graded weightbearing protocol, range of motion (ROM) and isometric strengthening exercises. A return to sport has not been determined. **Uniqueness:** Injuries to the ankle are common in the athletic population. Previous reports indicate that approximately 1% -18% of ankle sprains include the syndesmosis. Isolated deltoid ligament injuries have been reported to account for about 3% - 4% of all ankle ligament injuries and over 40% of ankle

fractures have deltoid ligament involvement. The most common mechanism for a syndesmotic injury is external rotation of the foot whereas common mechanisms for deltoid tears are pronation with external rotation or supination with external rotation. Depending on the magnitude of the force applied, fractures of the fibula or tibia are frequent comorbidities. The extent of the injuries without associated fractures are unique in this particular case. **Conclusion:** Athletic trainers should consider tears to the deltoid ligament in association with disruptions to the syndesmosis and anterior inferior tibiofibular ligament despite the unusual mechanism of injury.

40. Exploring physical fitness profile of college students through principal component analysis: a case study

Alejandra Rincon, Melissa Dorvily, Zoey Jackson, Michelle Etchebaster, and Zacharias Papadakis. (Department of Sport & Exercise Sciences, Barry University, Miami Shores, FL)

Universities offer lifetime physical fitness (PF) courses and organize health fairs to keep their students physically fit. Despite these efforts, only 49.9% of US students meeting the National Guidelines for physical activity, reporting low fitness levels, as evaluated by the respective scores of the five fitness components. Fitness evaluation though is a time-consuming process and students time constrains have been postulated as reasons for lack of participation, motivation, and involvement. **PURPOSE:** Since time availability may influence students' participation in a battery of fitness testing for evaluating their PF levels, this study aimed through principal component analysis (PCA) to reduce the health-related PF components to the minimum required to assessed them in college students. **METHODS:** Students' (N=36) PF of cardiovascular endurance (i.e., Queens College-VO2), musculoskeletal strength (i.e., handgrip-HG) and endurance (i.e., pushups-PU), flexibility (i.e., sit-and-reach-SR), and body composition (i.e., bioelectrical impedance-BF) were assessed during a campus wide Health Fair. PCA was used to reduce the # of examined variables. Kaiser-Myer-Olkin (KMO) values and Bartlett's Sphericity test with Eigenvalues >1 were considered for the extraction of PCA. Varimax rotation and threshold of .7 in each PCA loading were used for correlation, differentiation, and interpretation between components. Parallel analysis was also used to verify the number of extracted components. Data analysis was performed by SPSS vs 28. **RESULTS:** From 36 students that participated in the fair, only 25% (6 Females, 3 Males) actually completed all fitness testing. For PC1, KMO was .61, $p<.049$. Two components were extracted; HG, VO2, PU, BF with 60% and SR with 21% variance explained respectively. Running PCA again with SR removed this time, resulted to PC2 with KMO = .63, $p<.007$, yielding one component (HG, VO2, PU) with 69% of the variance explained. **CONCLUSION:** This study confirmed the importance of musculoskeletal strength and endurance, and cardiovascular endurance for PF evaluation. Even though the sample size used in the PCA was marginally acceptable, results indicated that when examining PF in college students, instead of testing all 5 of them, for brevity 3 PF components may be used as well.

41. Gender performance differences in standard upper quarter y-balance test and two modified versions

Samuel Vilmeau, Tal Amasay, Michelle Etchebaster, and Ryan Cedeno. (Motion Analysis Center Laboratory, Department of Sport & Exercise Sciences, Barry University, Miami Shores, FL)

Preparticipation screening evaluating musculoskeletal functioning is gaining popularity in young adults. The Upper Quarter Y-Balance Test (UQYBT) is often used to measure shoulder mobility and stability, and screening for upper extremities musculoskeletal injuries. The UQYBT is renowned for its unique approach to testing shoulder and core stability in the athletic and active population. Its feasibility in less active individuals is questionable due to its strength and balance requirements. Moreover, there is minimal data comparing UQYBT scores between genders of different fitness levels. **PURPOSE:** To examine performance differences between women and men executing the standard UQYBT and two modifications. **METHODS:** Eleven women (22.5±3.2 years, 1.64±0.04 m, 66.1±10.5 kg) and nine men (27.0±8.8 years, 1.74±0.03 m, 74.2±12.8 kg) college students took part in this study. Prior to testing, participants completed five minutes warm-up on an arm ergometer.

Participants completed the three UQYBT variations in a randomized order; Standard (traditional push-up position), Modified (modified push-up position), and Wall (standing erect). In each variation, participants completed three reaches in the medial, inferolateral, and superolateral direction. Maximal relative scores were collected, and composite scores were calculated. MANOVA was conducted comparing the differences between women and men reach scores in each direction and for each UQYBT variation. Significance level was set to .05. **RESULTS:** Significant differences were observed in the Modified UQYBT for the inferolateral reach, women had higher max relative scores than men, p-value<.01. Women average maximal relative score was 89±10%, whereas men average score was 80±8%. Similar significance trend was identified in the Wall UQYBT during the inferolateral reach. Women reach score (82±8%) was higher than the men reach score (72±11%), p-values<.01. No significant differences were observed in any of the other reaches measured during the three UQYBT variations. **CONCLUSION:** In this study we measured gender differences during three UQYBT variations. The most body weight the upper extremity needs to balance is during the Standard position, followed by the Modified and Wall UQYBT. We have found gender differences in the Modified and Wall UQYBTs during the inferolateral reach. The difference may be related to fact that during the Modified and Wall UQYBTs there is less body weight on the upper extremity which may increase women ability to have better shoulder mobility and stability than the men. Further research is required in this area.

42. Concurrent tibial plateau fracture, posterior cruciate ligament and collateral ligament tears in a female collegiate basketball athlete

Jillian Wilson[1], Scott Freer[1], and George Fernandez[2]. ([1]Department of Sport & Exercise Sciences, Barry University, Miami Shores, FL, [2]Department of Intercollegiate Athletics, Barry University, Miami Shores, FL)

A 19-year-old female collegiate basketball athlete hyperextended her (L) knee when landing after colliding with an opposing athlete when attempting a rebound. Pain scale was reported as 9/10 during initial on-court evaluation. She exhibited tenderness with palpation on the anterior medial and lateral tibial plateau, deep in the popliteal fossa, and along both collateral ligaments. Due to pain, range of motion (ROM) was grossly limited and ligamentous stress tests were unsuccessful. No ecchymosis or edema was present at the time of injury. Previous injury history included repetitive patellar subluxations with no other underlying health conditions or surgeries. The athlete was immobilized, fitted for crutches with non-weight bearing instructions, and directed to follow-up the next morning. Differential **Diagnosis:** Tibial plateau contusion, femoral condyle contusion, cruciate ligament tears, meniscal tears, and collateral ligament tears. **Treatment:** No significant changes were found during the follow-up evaluation. Team orthopedic surgeon was consulted who ordered magnetic resonance imaging (MRI) with a follow-up appointment three days post imaging. Cryotherapy with pneumatic compression (30 minutes daily), electrical stimulation, and non-steroidal anti-inflammatory drugs (NSAIDS) were used as a means to control pain and swelling until post-imaging follow-up with the orthopedic surgeon. Final impressions were anterior tibial plateau fracture, grade 2 tear of the lateral collateral ligament (LCL), grade 2 tear of the medial collateral ligament (MCL), and partial tearing of the posterior cruciate ligament (PCL). Crutches were discontinued and the athlete was able to progress to full weight bearing as tolerated at four weeks post injury. During post-injury weeks 4-8, the rehabilitation protocol consisted of 1) improving ROM, 2) improving strength with and with neuromuscular stimulation, 3) proprioceptive exercises, and 4) maintaining cardiorespiratory endurance. At the time of this abstract, the athlete is continuing to progress through the rehabilitation protocol and sport specific training. A date to return to play has not been set. **Uniqueness:** Tibial plateau fractures are commonly associated with high-energy, axial loading of the knee and should be included in the differential diagnosis for any patient noting such a history in the setting of knee pain. Hyperextension tibial plateau fractures are typically characterized as fractures and concomitant ligament injury. Tibial plateau fractures occur in about 1% of all fractures and mainly occur in adults aged 40-60. Depending upon the Schatzker classification, these fractures may be difficult to diagnose solely with x-rays and will require further radiographic imaging. **Conclusion:** The current case underscores the importance of considering anterior tibial plateau fractures in patients with hyperextension knee injuries.

AMERICAN HERITAGE SCHOOL

43. Characterizing Mesoporous Carbon-Based Dopamine as an Efficient Carrier for Treatment in HeLa Cells

Alejandra Abramson ([1]FIU Materials and Mechanical Engineering Department, [2]American Heritage School)

This experiment delves into the category of nanoparticles as a potential treatment for cancer in HeLa cells. Nanoparticles are at the forefront of the research division because their hollow interior allows them to transport chemicals or drugs throughout the body with controlled release, creating a potential treatment for one of the most deadly diseases in modern history. Mesoporous carbon particles work using heat as a release trigger that can be engulfed into the cell to release dopamine that works to kill the cancer cells in a certain area; HeLa cells are the most common immortalized lines for cervical cancer. Assays such as IC-50, photothermal, and photostability curves test for the structural integrity of both the cell and the nanoparticle under ranges of direct heat from a laser; moreover, these assays allow for the confirmation of the particle as a carrier that is properly absorbed by the cell and its functional concentration range. After analysis, the data presented that the 100 ug/mL was the most efficient concentration to infiltrate the cell and not be deteriorated by the activation heat exposure; all three curves created from the assay data determined that too high of a concentration tended to kill the cell and higher heat levels on the other concentrations destroyed both. Hence, these results can be further applied to alternative cancer treatment research fields and the further investigation of nanoparticles.

44. The Synergistic and Independent Effects of Various Non-Immunosuppressive Drug Treatments for Leaky Gut Syndrome on the Severity of Inflammatory Bowel Disease in Atg16 and Rab19 Mutant Drosophila melanogaster

Carla del Río (American Heritage School)

The purpose of this experiment was to compare the reparative effect of current treatments for Inflammatory Bowel Disease (IBD) on the intestinal mucosa in Drosophila to that of non-immunosuppressive drug treatments for Leaky Gut Syndrome (LGS). Furthermore, the drugs for LGS investigated in this experiment could potentially be applied in the real world to treat IBD without causing adverse effects on the immune system. The experiment consisted of breeding and maintaining wildtype and hybrid mutant Drosophila (crossbred Atg16 and Rab19 mutants), treating each group of Drosophila with a distinct combination of medicines, and conducting the Smurf and Mortality assays for each of the sixteen groups. The investigation involved the following sixteen groups: mutant Drosophila administered glutamine, quercetin, vitamin D, budesonide, infliximab, mesalamine, and no treatment (all with and without tdp-43), as well as mutant Drosophila administered larazotide acetate and wildtype Drosophila administered no treatment. The results of this experiment indicated that TAR DNA-binding protein 43 (tdp-43) administration significantly improved the integrity of the intestinal mucosa in Drosophila with IBD. Additionally, the effect of tdp-43 was amplified when administered together with a supplementary medication such as glutamine, quercetin, or vitamin D. It was also found that budesonide and infliximab were not more effective treatments for IBD than mesalamine, both with and without supplementary drugs. In summation, the conclusions drawn from this experiment supported the ameliorative effects of administering the non-immunosuppressive drugs tdp-43 and mesalamine, as well as their administration together with a supplementary medication such as glutamine, quercetin, or vitamin D.

45. The Efficacy of Sinomenine as a Novel Pharmacotherapy for Attenuating Ethanol and Nicotine-induced Behaviors Through Regulation of the cAMP/PKA/CREB Pathway in Drosophila Melanogaster

Jacob Federici (American Heritage School)

The purpose of this experiment is to determine the efficacy of Sinomenine, an opioid receptor antagonist, in attenuating ethanol and nicotine induced behaviors in Drosophila melanogaster. While ethanol and nicotine are quite different in their direct mechanism of action, current research suggests that CREB-mediated transcription, opiate reward, and long-term potentiation are common pathways implicated in the development of various addictions. The FDA approval of naltrexone, a mu-opioid receptor antagonist, to treat alcohol use disorder, is support for the hypothesis that inhibition of opiate-induced CREB phosphorylation may prevent the development of addiction. In a CAFE assay performed to measure preference through consumption of ethanol or nicotine, Sinomenine reverses both naive and conditioned preference for ethanol, as well as conditioned nicotine aversion. Measuring locomotion, Sinomenine attenuated both the ethanol and nicotine induced decreases in negative geotaxis exhibition in Drosophila. Quantifying olfactory preference, Sinomenine reversed conditioned odor preference in a Y-maze, but not naive preference. Reflecting its effects on the CREB pathway, Sinomenine inhibited a nicotine increase in cAMP, but did not significantly affect cAMP levels in ethanol treated Drosophila. According to these results, Sinomenine is particularly effective in attenuating conditioned ethanol or nicotine-induced behavior, and produces mixed results in terms of naive exposure. The natural chemosensory preferences or aversion of ethanol and nicotine may be independent of the CREB pathway, while developed preference may be directly dependent on it. The results of this study further empirically demonstrate that Drosophila melanogaster are a useful model for studying drug induced behavior and reward.

46. The Effect of Microplastics Alone and in Combination with Neonicotinoids and Heavy Metals in Apis mellifera Using Drosophila melanogaster as a Model Organism

Melodi Fugate (American Heritage School)

Recently, plastic consumption has become a source of concern for scientists. As large amounts of plastic accumulate in the environment, microplastics have emerged as a common pollutant. In the past years, there has also been a significant reduction in honeybee (Apis mellifera) colonies with no identifiable cause. This has led scientists to look into pollutants as a potential culprit for these losses. They have discovered that common pesticides, such as imidacloprid, and heavy metals, such as Cobalt, produce sublethal effects on honeybees. However, little is known about how microplastics may affect honeybees. Previous research has demonstrated that microplastics produce an alteration in the gut microbiota of bees, however no other effects have been researched. The aim of this project is to further investigate how microplastics may impact honeybees using Drosophila melanogaster as a model organism. This will allow for the assessment of how microplastics affect locomotion, intestinal barrier permeability, short-term memory, and DNA damage. Upon assessing the data and results, the negative effects of microplastics were demonstrated. Microplastics cause abnormalities in locomotion, intestinal barrier function, memory, and DNA damage. Several additive effects were demonstrated in locomotion when microplastics and Cobalt are combined as well as a likely additive effect of microplastics and imidacloprid when it comes to memory. Due to Drosophila and honeybees' homology; these results indicate that microplastics contribute to the rising loss of honeybee colonies, however, there is no evidence to fully prove that microplastics aggravate the effects of the other pollutants tested (e.g. Cobalt and Imidacloprid).

47. Chronic Joint Pain and Its Impact on Allostatic Load and Health Outcomes: Results from the National Health and Nutrition Examination Survey (NHANES)

Ellaheh Gohari (American Heritage School)

Allostatic load (AL) is the physiologic cost of chronic exposure to environmental stressors. High AL has also been associated with increased risk of cancer, cardiovascular disease, and death. Arthritis is prevalent and a leading cause of disability. There is very little information about the impact of chronic joint pain on AL. The purpose of this study was to examine this relationship using data from the National Health and Nutrition Examination Survey (NHANES). It was hypothesized that individuals with chronic joint pain, will have a higher AL even when adjusting for other risk factors. Multivariable logistic and linear regression models were used to examine associations between AL and joint pain. 4099 subjects had a mean age of 50 ± 19 years. Joint pain was more likely to be reported by women and white non-Hispanic participants. Arthritis, diabetes and cancer was diagnosed more commonly in the joint pain group. All individual components of the AL score, with the exception of Cholesterol and HDL were significantly worse in joint pain group. AL score (range 0 to 8), mean score of 2.6 ± 1.8, was significantly greater in joint pain group. For any given age, income level, past history of smoking or diabetes, those who reported chronic join pain had higher statistically significant AL scores. Early recognition of factors that add to physiological stress and overload, including prevention, recognition, and managing joint pain before it becomes chronic, may play a role in reducing AL long-term, leading to better health outcomes.

48. The effect of inflammation and oxidative stress on the recovery time of seizures using Caenorhabditis elegans as the model organism

Shrika Kantipudi (American Heritage School, Plantation)

Epilepsy is the most frequent neurological condition in the United States. Neuroinflammation continues to play a role in the occurrence and severity of seizures. Within the brain and spinal cord, there is frequently an inflammatory response. During oxidative stress, the balance between free radical generation and antioxidant defense is disturbed. Oxidative stress has been shown to speed up aging and reduce reproductivity in Caenorhabditis elegans. The longevity, egg-laying, and electroshock experiments were all used to model oxidative stress and convulsions in the worms. Pseudomonas aeruginosa, a harmful microbe, was used as an oxidative stressor in this experiment. Oxidative stress produces neuroinflammation in C. elegans. Three anti-inflammatory proteins are released when neurons become inflamed. This means that neuroinflammation occurs when C. elegans are exposed to P. aeruginosa. To reduce inflammation, three anti-inflammatory genes, PMK-1, ELT-2, and SKN-1, are active when neuroinflammation occurs. RNA interference (RNAi) is a biological mechanism that causes gene expression to be stopped. Anti-inflammatory genes were knocked out using RNAi to prevent the worms from recovering from the inflammation. These experiments investigated the power of oxidative stress and neuroinflammation within the three assays by incorporating RNAi and P. aeruginosa into the C. elegans diet. The study revealed that oxidative stress and neuroinflammation diminish longevity and reproductivity while also increasing recovery time in three experiments. These findings suggest that neuroinflammation and oxidative stress prolong seizure recovery time. Further study backs up these findings, indicating that neuroinflammation and oxidative stress both worsen seizure severity.

49. Deep Learning for the Detection and Segmentation of Glioblastoma Multiforme

Maya Neeranjun[1], McKell Woodland[2] ([1]American Heritage School, Plantation; [2]Rice University, Houston)

The purpose of this experiment is to determine whether deep learning models can accurately diagnose patients with Glioblastoma Multiforme cancer while segmenting the brain tumor. If deep learning models are used with epochs, then the efficiency of detection and segmentation will increase with the most amount of epochs. If deep learning models are used with data augmentation, then the

efficiency of detection and segmentation will increase with the use of data augmentation. The BraTS dataset was converted from nifty to png, and data augmentation was applied to the data. The hyperparameters and learning rate of a U-net segmentation model were both changed, and the number of epochs was set to 70. The number of epochs increased to create different models. The augmented and original dataset were converted to a TFRecord. Both were fed into the model where the DiceLoss, validation accuracy, and training accuracy were recorded for each type of dataset. The most amount of epochs and the use of data augmentation led to a higher accuracy and DiceLoss making the model more efficient. This model had a validation accuracy of 76 percent and a DiceLoss of .87. As a result, both the hypotheses stated before were supported. Different deep learning models with more epochs and data augmentation can be applied to other brain conditions such as meningioma and astrocytomas. Other validated models can also be used in other areas of the body with other diseases to help diagnose patients that have pain.

50. Unraveling the Mysteries of Inflammasomes in Alzheimer's Disease

Likhitha Selvan (American Heritage School)

Alzheimer's disease (AD) is a progressive neurodegenerative disease characterized by a loss of neurons, leading to symptoms such as difficulty in planning and thinking. There have been several causes correlated to AD. However, a recent focus has been how the build up of the toxic amyloid-beta (Aβ) protein causes inflammation through microglia. TREM2/TYROBP are a receptor complex found to be implicated in Alzheimer's pathology, specifically involved in the phagocytosis of amyloid plaques and inflammation. The downstream pathway of inflammasomes is still relatively unknown. Therefore, the study focused on elucidating the role of TREM2 and TYROBP in inflammasome activation in the context of Alzheimer's disease. The BV-2 mouse microglial cell line was used to better understand the pathway. Utilizing siRNA, the gene coding for TYROBP was knocked down, causing TREM2 to also lose function. The microglia were then exposed to Aβ oligomers to simulate an AD environment. Three assays were performed to measure if the TYROBP/TREM2 complex was implicated in the inflammasome downstream pathway: NLRP3 qPCR and Caspase 4 qPCR for gene expression, and an IL-18 ELISA for protein quantification. The results signified that in Alzheimer's disease, the inflammasome pathway gets activated regardless of TREM2 and TYROBP expression on microglia. This study allows researchers to focus on other receptors and pathways in inflammatory responses by microglia to Aβ. Since the TREM2/TYROBP complex may not be involved in the inflammasome pathway, the detrimental effects of inflammasomes can be addressed without impacting TREM2/TYROBP, which are essential to prevent progression of AD.

51. Predicting the intensity of blocking events using machine and deep learning

Emir Sahin (American Heritage School)

Blocking events are high pressure systems that occur in the middle to upper latitudes, diverting the flow of the jet stream and preventing the regular progression of the weather. Blocking events can persist for days to weeks, potentially causing extreme weather events such as droughts or heatwaves. Due to the harmful effects associated with the weather conditions that blocking events can cause, there have been ongoing efforts to forecast them. One such effort includes the Global Ensemble Forecast System (GEFS), which has been reported to underestimate the intensity of stronger blocking events by approximately ten percent. In the current study, one deep learning and three machine learning models were developed to predict the intensity of newly formed blocking events at onset. It was hypothesized that the models would have comparable percent error to the GEFS while using less time and computational resources, that there would be a strong correlation between predicted and actual blocking intensity, and that the deep learning model would have lower error than the machine learning models. The results showed that the models did indeed have comparable error to the GEFS and that there was a statistically significant correlation between predicted and actual blocking intensity for all four models, thus supporting the first two parts of the hypothesis. The third part was not supported since there was no statistically significant difference in error between any of the models, however the deep learning model was noted for not overfitting unlike the machine learning models.

52. Transgenerational effects of the synergy of Nicotine, Atomoxetine, Buspirone in egg laying behaviors, gene expression, and oxidative stress levels of Caenorhabditis elegans

Malcolm Owusu (American Heritage School)

Today, vaping runs rampant among adolescents, the so-called"vaping epidemic" is a big issue for today's youth. Vaping obviously delivers high levels of nicotine into the body of the children using the vapes. This can often lead to nicotine addiction in adolescents which comes with its own myriad of problems. Mainly withdrawal symptoms, a major withdrawal symptom is anxiety. Anxiety rates are rising among adolescents with the recent pandemic. Moreover, ADHD diagnosis rates are steadily increasing over the years. Increasing rates of ADHD and anxiety among adolescents mean that more children are being medicated for these conditions. Atomoxetine and Buspirone are commonly prescribed to teens with ADHD and Anxiety respectively. The purpose of this experiment was to identify the synergistic effects of buspirone and atomoxetine on the already observed transgenerational effects of nicotine. In order tosimulate the intake of nicotine and/or atomoxetine and buspirone in adolescents. The researcher used the egg laying, gene expression and oxidative stress levels of C. Elegans to collect data for the experiment. Homologous genes were chosen to ensure that results could be applied to humans. Age synchronized C. Elegans were placed on agar plates with varying drug concentrations. The eggs were then taken and placed onto NGM agar plates with no drugs and were grown to the L4 stage for assaying. The results showed that the drugs had transgenerational effects on gene expression and egg laying but not oxidative stress levels. These results can be applied to the child psychiatric industry to influence prescription.

53. Developing Novel Plant Waste Based Hydrogels for Skin Regeneration and Infection Detection in Diabetic Wounds

Calvin Mathew (American Heritage School)

More than 70,000 diabetic patients have amputations annually due to wound care complications. Poor circulation and hyperglycemia-related nerve damage, which are complications of diabetes, prevent natural wound healing processes. The purpose of this investigation is to develop a hydrogel to aid skin regeneration by creating an extracellular matrix for fibroblast growth with antibacterial and infection detection properties. Two natural, hydrogels based in pectin and potato peels were developed and characterized for fibroblast compatibility through rheology, scanning electron microscopy, swelling, degradation, and cell cytotoxicity assays. All five assays indicated that potato peel starch and citrus pectin were capable of mimicking natural skin, with a relevant pore diameter (potato: 82.105, pectin: 56.639 micrometers) and stiffness (potato: 798.77, pectin: 830.7 complex moduli Pa). Both groups were able to absorb 40 times their weight before naturally degrading and supported upwards of 500% NIH 3T3 fibroblast proliferation. Additionally, anthocyanin, a pigmented flavonoid, was encapsulated in hydrogels and used as an infection biomarker and preventative agent. A pH responsivity test and time-to-kill antibacterial assay were conducted, validating the ability of anthocyanin to noticeably change colors in hydrogels and assert bactericidal effects even at low concentrations. A concentration of 200 milligrams could prevent bacteria growth and showed no effect on fibroblast growth. Overall, this experiment fabricated various hydrogels capable of acting as skin substitutes and counteracting infections to facilitate wound healing. Following further testing and validation, these hydrogels could alleviate the 13-billion-dollar financial burden of foot ulcer treatment.

54. Python-based Prediction of Rapid Intensification from MIMIC-TC Ensemble (PRIME)

Lorenzo Pulmano (American Heritage School)

Rapid intensification (RI), as defined by the National Hurricane Center (NHC), is an increase in the maximum sustained winds of a tropical cyclone (TC) of at least 30 knots (~34-35 mph) within a 24-hour period. Intensity forecasting is one of the most difficult aspects of TC analysis forecasting, with RI prediction being one of the most challenging issues. Predicting intensity and RI is critical for emergency responses, including evacuation and disaster prevention. Deep learning (DL) and its application in TC analysis holds much potential. Morphed Integrated Microwave Imagery at the

Cooperative Institute for Meteorological Satellite Studies (MIMIC) is a product that synthesizes "morphed" images of TCs. MIMIC-TC is a product that uses 85-92 GHz microwave imagery to create the images. Using the Python programming language, a DL convolutional neural network (CNN) ensemble was developed as a proof-of-concept for prediction of RI, known as the Prediction of Rapid Intensification from MIMIC-TC Ensemble (PRIME). Six members comprise PRIME, split into three 10 and 20 epoch models. Each model has either 2, 3, or 4 convolutional layers. A MIMIC-TC dataset was created using available North Atlantic Basin (NATL) storms from 2019 and 2020, and a total of 1508 images were used for training the models. After running the Ensemble on all available storms from 2019 and 2020, it appeared all models were overfit, and subsequently gave inaccurate classifications. The average percentage of correct classifications of "No RI" (nRI) was 30%, and the average percentage of correct classifications of "Possible RI" (pRI) was 27%.

55. Downregulation of Triadin as a Possible Treatment for CPVT

Amarachukwu Okpala (American Heritage School)

Catecholaminergic Polymorphic Ventricular Tachycardia (CPVT) occurs when the leak of calcium ions (Ca^{2+}) causes the ventricles to contract at quicker rates than normal. When RYR2 is mutated, it can cause the leak of Ca^{2+}, causing the ions to bind to troponin before the heart can fill completely with blood. Triadin keeps the structural integrity of the calcium release unit, the knockout leading to no release of Ca^{2+}. The hypotheses were, "if triadin is knocked down in cells exhibiting a CPVT like RYR2 mutation, they will show improved viability/proliferation and control of calcium leak than the mutated cells alone", and "will be equal to or close to cells exhibiting normal RYR2 characteristics". HEK293T cells (human embryonic kidney cells) are being used due to being good models for studying arrhythmias related to the RYR2. RYR2-S2808D cells are mutated cells that leak Ca^{2+}, as seen in CPVT. Experiments included ensuring transfections worked, the release of Ca2+ (calcium imaging), and the cell viability (MTT Assay). The treatment group is the cells transfected with triadin knock down, Both hypotheses were fully supported. The calcium imaging assay results show that the triadin knockdown in CPVT like mutated RYR2 cells stopped the leak of Ca^{2+} from the endoplasmic reticulum, the levels of calcium close to the WT RYR2 cells. The MTT assay results show that the triadin knockdown RYR2-S2808D cells also improves cell viability/proliferation, close to the WT RYR2 cells. Therefore, triadin knockdown can be explored for treatment for CPVT.

56. The Effects of Air and Water Pollutants on the Development of Myelination using Danio Rerio Embryos as a Model Organism

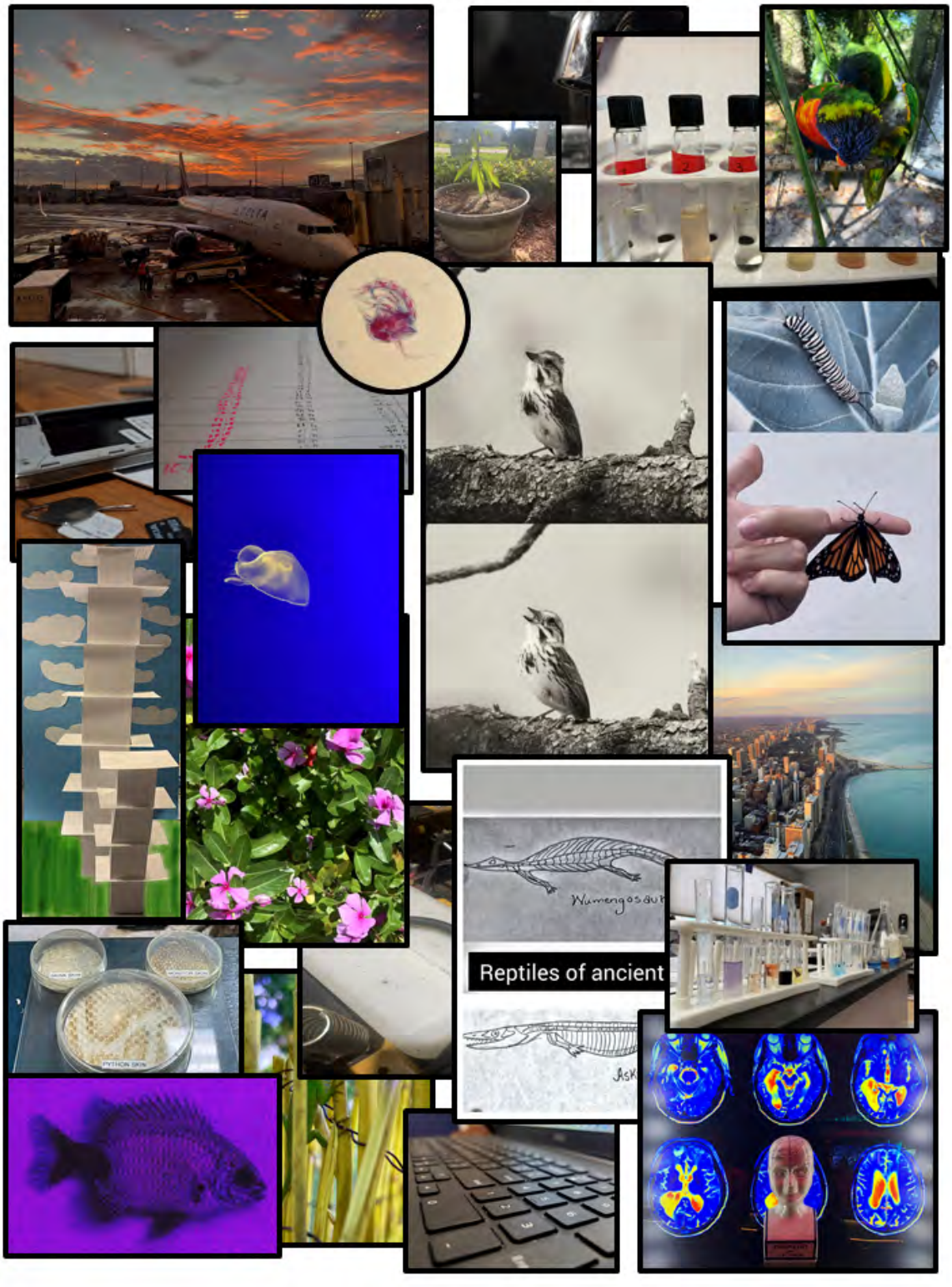
Celine Yacoub (American Heritage School)

Myelination is the process by which layers of myelin wrap around axons in order to increase the speed of electrical impulses. Due to a variety of factors, not all nerves are myelinated; air and water pollutants have shown to promote demyelination in adults and have resulted in newborn deficiencies. This study highlighted the effects of pharmaceuticals, PFAs, and PM10, on the development of myelination while also linking it to Vitamin D deficiencies, collagen levels, locomotion, decision making, mortality rate and developmental deficiencies to display how detrimental the exposure of these pollutants are to fetal development. Zebrafish embryos were exposed to 32 combinations of air and water pollutants, 4 days post fertilization, myelin, collagen and Vitamin D concentrations were measured. Collagen and myelin were quantified using a Picro Mallory Stain Kit which allowed the differentiation of tissues, they were then quantified using ImageJ. Vitamin D concentrations were quantified using the Total OH Vitamin-D Eliza kit which is a highly sensitive assay used to quantify levels of the protein. Zebrafish were left to grow until 6 dpf before conducting the behavioral assays, the T-Maze decision making test apparatus was used to measure effort-based decision making of the larvae, and the reaction time assay measured the time between a stimulus and the larvae's response to it. Results from the conducted assays exhibited a direct correlation between myelin, collagen, Vitamin D and cognitive functions in most pollutants, the original hypothesis was supported by the conducted experimentation and as such, the null hypothesis was rejected.

Barry's Fourth Annual Art Contest in S.T.E.M.

The fifth annual S.T.E.A.M. Art Contest was organized in conjunction with the 15th annual S.T.E.M. Symposium. The aim of this contest is to add the Arts to encourage students, faculty and staff to look at and approach S.T.E.M. through different perspectives and to develop their artistic side. Additionally, this approach can make S.T.E.M. more appealing and accessible to those people outside of S.T.E.M.

2022 S.T.E.A.M. Participants: Mohammed Bajeri, Mariakarla Fernandez, Jordyn Hawkins, Joselin Hernandez, Kendall Hovius, Kyra Johnson, Victoria Martinez Mercado, Skyla Miller, Janexy Sanchez, Camren Sutton



Barry University

S.T.E.M.
SCIENCE, TECHNOLOGY, ENGINEERING & MATHEMATICS

Sponsored by: The Departments of Biology, Mathematics & Computer Science, Physical Sciences, and Psychology | College of Nursing and Health Sciences
Private Donors

Cover Design by: Nicole Beltran