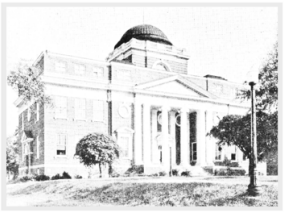
Honors Day Symposium

PRESENTER ABSTRACTS



Presbyterian College

April 18, 2024

Harper Art Gallery Opening Hours for Honors Day

We are pleased to announce that the Harper Art Gallery will be open to all attendees during Honors Day, where we can showcase the outstanding works of our undergraduate art students. Honors Day celebrates academic accomplishments and creative achievements of PC students.

Today the gallery will be open for viewing from noon until 4:30 PM. We cordially invite you to this wonderful opportunity to appreciate the talents and artistry of our students working across various mediums.

We look forward to welcoming you to the Harper Art Gallery on Honors Day.

Mark Anderson, M.F.A.
Lassiter Professor of Art

Hydrogen Fuel Cell and Hydrolysis

Ja'Nya Celis Austin
Eli Thomas Owens, Ph.D.
Department of Physics

For our project, we experimented with hydrogen fuel cells and the hydrolysis of water. To collect the hydrogen molecules, we used the process known as hydrolysis. Hydrolysis is a type of reaction that involves running a current through water after adding an electrolyte (borax) to the water. After applying an electrical current between the electrodes, this process separates hydrogen from water, leaving H_2 and O_2 molecules at the electrodes. To experiment with hydrolysis in our lab, we have created an oxygen-hydrogen split output hydrolysis device using stainless steel electrodes that are packed into a watertight container. We drilled two holes through the lid of the container so that the stainless steel tubes could surround each electrode handle and pass through the lid and each cap of the two bottles; the bottles and tubes were then held in place in order to direct the hydrogen and oxygen gas bubbles upwards through the different tubes. We then captured the H_2 molecules for the purpose of creating fuel cells to power a small battery-powered engine.

The Salary Disparity in Professional Sports

William Duncan Averbuck
Carla Hall Alphonso, Ph.D.
Department of Sociology

The topic of the gendered nature of professional sports and the increasingly wider salary difference between male and female professional athletes has become a recurring and notable topic in the world of sports. I will be sampling the top 25 endorsed female athletes and the top 25 endorsed male athletes to see if there is a correlation between the number of sponsorships an athlete has and the amount of money they make. Along with my independent and dependent variables, I will also be using control variables such as gender, and if they play on an individual or team sport. Although the salary disparity between male and female athletes in sports is hard to make disappear, there are strategies and potential solutions to solve this issue and make things even for both sides. The question we are examining is, what is the relationship between the gender of professional athletes and the amount of money earned based on salary and the number of sponsorships received by both sides?

HBOT: Video Game to Teach Programming Concepts

Olamiposi Awosanya
Olivia Mambo Nche, Ph.D.
Department of Computer Science

In recent years, there has been a surge in research exploring the potential benefits of using video games in computer science education. This paper delves into this field, aiming to uncover the advantages, summarize key experiences, and evaluate the empirical evidence regarding the effectiveness of integrating video games into Computer Science learning for children. One of the most frequently cited benefits is the boost in student motivation, particularly in regards to programming skills. Various approaches have been proposed, including leveraging games to inspire students, utilizing games as teaching tools for Computer Science concepts, and employing them as immersive environments for learning. However, the methodologies employed across studies vary widely, leading to inconclusive results regarding the efficacy of video games in Computer Science education. Therefore, there is a pressing need for further empirical research to gain deeper insights into the potential impact of video games and to refine effective strategies for their implementation in Computer Science education.

Multidrug Resistance in Lung Cancer Cells

Carter Joseph Baytes
Amy Messersmith-Love, Ph.D.
Pharmacy School

Individuals diagnosed with cancer and a comorbid mental illness have an increased mortality and shorter survival time, than those diagnosed with cancer alone. Although there are several contributing factors, such as a later overall stage of diagnoses and other contributing comorbidities, an avenue that is likely a neglected contributor to these poorer outcomes is multidrug resistance (MDR), defined as a resistance to multiple drugs with similar mechanisms of action. An increase in expression of P-glycoprotein (Pgp), a drug transporter encoded by the ATP-binding cassette subfamily B member 1 (ABCB1) gene, has been linked to MDR due to its ATP-dependent efflux of cytotoxic drugs. Interestingly, many drugs utilized for the treatment of mental illnesses are substrates for Pgp, potentially explaining poorer outcomes of patients with both mental illness and cancer. Patients diagnosed with schizophrenia are often treated with antipsychotic medications for various times prior to being diagnosed and treated for cancer. An in vitro model was established to assess if persistent treatment of human cancer cells with antipsychotics can induce resistance to cytotoxicity of chemotherapy drugs. Preliminary analyses demonstrate increases in ABCB1 expression and chemoresistance in cells treated with a chemotherapeutic agent at 6 to 9 months of treatment. Cells treated with antipsychotic medications show low levels of ABCB1 expression after 9 months of treatment. These data were collected as part of an ongoing study and the cell lines will be reevaluated for ABCB1 expression and chemoresistance after 12 months of treatment.

A Survey of Plant Diversity and Analysis of Soils of the Janet Harrison High Pond Preserve in Monetta, South Carolina

Morgan Rene′ Berry
Michael O. Rischbieter, Ph.D.
Department of Biology

The Janet Harrison High Pond preserve that sits on the end of Carolina Bay Trail in Monetta, South Carolina contains a diverse collection of plants that include the rare and endangered Harperella nodosa (Ptilimnium nodosum, Family Apiaceae) and Coreopsis rosea (Family Asteraceae). The 30 acres High Pond is a protected environment managed by SCDNR (South Carolina′s Heritage Preserves 2011). SCDNR refers to this area as a High Pond, which can also be described as a Carolina Bay. Harperella is only found in a very few locations in the state, and within the High Pond found in one small moist depression on the west side of the pond. Because there are several rare plants found in the High Pond, a study of the quantity and location of the plants of interest was undertaken to understand the dynamics of this unusual and diverse ecosystem. The study had two primary goals: assess diversity, and evaluate if the soil quality may have been the determining factor for the specific location of each rare plant population scattered around the High Pond. Individual plant genus/species and percentages of plant coverage in the quadrats were observed. This gave a very preliminary overview of plant life found in the High Pond and its dispersal across the High Pond and will need a more detailed analysis to verify what was observed. Soils were found to be slightly acidic with very similar levels of magnesium, calcium, and phosphorus along both transects and all of the quadrats. All soils were characterized by composition, and it was found that all fit into the category of the Ogeechee soil with a sandy loam quality. This was an expected observation due to previous surveys of soil identification studies conducted in Aiken County. Unfortunately, due to lack of significant difference in the chemical analysis of the soil the growth of the Harperella in one area of the bay is not likely due to the soil factors tested. A more likely cause of the dispersal in the bay may be due to the plant's tolerance of high soil moisture content.

An Investigation of the Catholic Church's Environmental Stewardship Doctrine

Morgan Rene' Berry
Julie Meadows, Ph.D.
Department of Religion and Philosophy

The Roman Catholic Church takes its official stance on environmental stewardship and the current issues with the environment as being a human and Catholic issue that needs to be addressed. Pope Francis makes it clearly known throughout the Faith that the environment is humanity's responsibility in his encyclical published in 2015, Laudato Si. Both doctrinal and Biblical sources support Catholicism's role in nurturing and caring for the environment. However, despite obvious key beliefs written within the denomination, the Roman Catholic Church fails to pass on these environmental teachings onto its practicing members of the faith. The shortcomings of the Church stem from the lack of respect and authority the Pope is able to command from within the Faith. From compilations of various sources, it becomes evident of how criticisms are formed and the criticisms that exist of the Pope's actions and words. The issues and inconsistencies with the Pope's stance within the environmental issues and overall Catholic teachings lead the Catholics, both clergy and lay people, to question his stance on the environment as being doctrine within the Church. From these findings, a survey was conducted to determine whether these ideas of the Church's inability to pass on its environmental stewardship values stand within a small church parish located in South Carolina. The overall goal of this research is not to show that the Pope is ineffective in his role of setting the guidelines for Catholics to follow. Instead, the purpose here is to show the official teachings of the Church, and provide some likely reasons as to why we do not find strong evidence of these teachings within the Church. The actions of humans are consequential to the environment and there is need for change. These changes can be done through awareness and cooperation between both religious organizations and government organizations to make a bigger impact when addressing the issues with the environment.

Nation Building versus Marronage Resistance: Quilombos, Suppression, & Abolition – Brazil 1850-1888

Patrick Alexander Buchanan
Jaclyn A. Sumner, Ph.D.
Department of History

This presentation explores the modes of resistance that fugitive slaves (maroons) in Brazil utilized during the waning years of slavery, from 1850 to 1888, the year of Abolition. I analyze a selection of these communities, or quilombos, which presented a challenge to the nation-building prospects of various Brazilian provinces from the state and planter perspective. It is my contention that marronage resistance impacted the abolition movement and state-building from above (intellectual, political figures) as well as slaves and freedmen from below. Most importantly, it offered a new mode of resistance and an ideology of autonomous separatism for Afro-Brazilians leading up to abolition in 1888 up to the present.

Liberation Theology

Patrick Alexander Buchanan
Julie Meadows, Ph.D.
Department of Religion and Philosophy

This conversation is a survey of various seminal Liberation Theology texts that serve different communities in need of liberative conversation. Gustavo Gutiérrez The Power of the Poor in History follows the Peruvian Catholic's greater interest in materializing and historicizing struggle with a veritable Marxist stream of thought, and had important implications for the Catholic church in Latin America. Following Gutiérrez foundational "liberation theology" but arising out of the African-American community more particularly, James Cone's A Black Theology of Liberation. This was a counterpoint to White Protestant Christianity and its hegemonic oppressions towards black protestant Christianity, who in their struggle understood Christ and faith in a more material, tangible form than the intellectual, verticalized approach of white Protestantism. This was not a comprehensive text for all African-American Christians, however, especially for black women. Delores Williams' Sisters in the Wilderness: The Challenge of Womanist God-Talk challenged the Christology, eschatology, and general theology of James Cone amongst other male liberation theologians, and offered a experiential theology based on surrogacy, family-commitment, and patriarchal oppression–an intersectional understanding of faith for black women. Though this is not an expansive survey of liberation theology, they are seminal texts that will affect other strains and topics of liberation. To address this, we offer a brief discussion of some of the other texts we surveyed in our course.

Regulatory Insights: Examining the Landscape of State Policies that Allow Medication for Pharmacists with Substance Use Disorder

Audra Grace Butler
Amy Messersmith-Love, Ph.D.
Pharmacy School

Individuals with an opioid use disorder (OUD) have several treatment methods to consider: an abstinence-based approach, outpatient treatment, cognitive therapy, and medication prescribed for the OUD (mOUD), including methadone, naltrexone, or buprenorphine. The goals of therapy are to minimize cravings and withdrawal symptoms and return to activities of daily living. These same principles apply to healthcare professionals who have an OUD, but state regulations differ on medications that are allowed, restricted, or simply vague in guidance for the practitioner. For example, a pharmacist who is stabilized on buprenorphine as an mOUD may not be allowed to return to practice due to policies restricting its use with enrollment in a state's recovering professionals program. A similar scenario was recently brought to light by a United States Department of Justice finding against the Indiana State Board of Nursing and Indiana State Nursing Assistance Program (March 2022).This study sought to establish the landscape of regulatory policies related to mOUD for pharmacists. Clear and effective communication between program participants, licensing boards, and treatment providers can help these licensees return to practice while reducing the risk to public safety. Ideal characteristics of mOUD include medications with proven safety and efficacy, low abuse potential, easy monitoring, and protection against return to use. Healthcare professionals are not exempt from the threat of OUD and sometimes are even more susceptible due to the access to these substances. Pharmacists are entrusted to have full cognitive function and clear judgment while practicing for the good of public health. By establishing clear guidance on the rehabilitation and maintenance of OUD in pharmacists, including pathways back to licensure, these individuals can seek and establish effective treatment strategies without compromising patient safety.

La Malinche: Destruction of Malinchism

Cassidy Marie Canfield
Jaclyn A. Sumner, Ph.D.
Department of History

During the Spanish conquest of the Aztecs, La Malinche, an indigenous Nahua woman, served as Spanish conquistador Hernán Cortes' translator. As a result of her role in the Spanish conquest, she has been portrayed by others who vilify her. The portrayals of La Malinche from post-Mexican independence to the present have shaped a negative characterization of her and have instilled deep resentment and generational trauma among current-day Mexicans. As a result of La Malinche's life and legacy, as a woman who helped the Spanish conquer the Aztecs, La Malinche has shaped different ideas about Mexican national identity, both positive and negative. This capstone will analyze how portrayals of La Malinche have changed from the Spanish conquest to the present based on the perspectives of Mexicans, Indigenous peoples, and Chicanas.

Leaf Breakdown Rates and Aquatic Insects in a Piedmont Headwater Stream

Simran K. Chhatwal
Sabrina Moore, Ph.D.
Department of Biology

One of the primary energy sources for freshwater streams is terrestrial leaf litter. Currently, there is a trend of loss of biodiversity in riparian habitats due to climate change and urbanization. Our objective is to determine what communities of stream organisms are supported by two different types of leaf packs. We hypothesized that differing leaf species will have different breakdown rates and therefore support different benthic macroinvertebrate communities. This study was conducted at Miller's Fork Creek, a headwater stream, fed from filtered groundwater in Clinton, SC. Thirty pre-weighed leaf packs of the leaf species, Acer rubrum and Quercus stellata, were installed in the stream along with a temperature logger recording every six hours. Water quality and habitat assessments were conducted to describe the conditions in Miller's Fork Creek. After 10-, 33-, and 66- days, leaf packs were retrieved, benthic macroinvertebrates were collected during the washing process, and leaf packs were air dried. Using a muffle furnace, leaves were burned at 500 °C and the Ash Free Dry Mass was calculated to precisely measure the breakdown rate coefficient. Benthic macroinvertebrates were identified to family level and diversity indices were calculated comparing communities by leaf type and time deployed in the stream. Our results showed that the species A. rubrum had a faster breakdown rate than the species Q. stellata and that the community of benthic macroinvertebrate were different by leaf type. These results aid in the understanding of the need for a healthy riparian habitat with diverse species to supply a continuum of resources. Our study adds to the understanding of how global climate change affects carbon cycling. These results are a part of an ongoing research effort to create best management practices to conserve and protect the drinking water supply for Clinton, SC.

Investigating the Unjamming Transition for the Development of a Soft-Robotic Gripper

Jacob Kieth Clerc
Eli Thomas Owens, Ph.D.
Department of Physics

As innovations are made in the field of prosthetics, the quality/cost ratio continually increases. While there are open-sourced prosthetics, most lack the ability to grip uniquely-shaped objects or require arduous coding efforts to do so. Therefore, there is a need for affordable prostheses with universal grippers that can perform everyday tasks. Various styles of grippers exist, including both hard-robotic and soft-robotic designs. Generally, hard robots have a solid form that is rigid and fixed. The most common hard-robotic grippers utilize complex jointed fingers, which resemble a hand, or enveloping grippers which can be imagined as devices that "bite down" on an object. However, our efforts have been focused on a soft-robotic design, particularly a "malleable gripper." This design autonomously conforms to objects of all geometries, and is then able to grasp the object through the use of a granular material. Granular materials exhibit properties of solids, liquids, and gasses; and they can transition between phases. Sand, for example, can act like a solid or a liquid within the appropriate conditions. We can exploit this by having our confined granular material conform to the shape of an object while in the liquid state. We then induce jamming to make the granular material solid and grasp the object. This has been previously accomplished with pneumatic grippers which jam the granular materials within a membrane by removing the air. Though useful, pneumatic designs can be cumbersome and sluggish which has led us to explore the advantages of magnetically induced jamming. We can take advantage of granular materials, such as iron filings, that can be manipulated using a magnetic field. Solenoids can be used to produce magnetic fields which then pull the filings together causing them to jam– gripping the object within the granular material. This project design furthers the affordability of prosthetics through the creation of a low cost, open-sourced universal gripper.

Electromagnetic Levitation of Aluminum

James Edwin Davis
Eli Thomas Owens, Ph.D.
Department of Physics

Magnets in everyday use only affect iron, steel, and other ferrous metals. Electromagnets using DC can only affect iron and steel. Running AC allows electromagnets to affect other metals like aluminum. Electromagnetic levitation has seen use in household decorations, and has been experimented with in transportation. The goal of this research project is to create an electromagnet comprised of two concentric coils, with the respective currents running in opposite directions, that can levitate aluminum.

Cayley Graphs and Their Applications to Group Theory and the Banach-Tarski Paradox

Kathryn Dover
Kara L. Shavo, Ph.D.
Department of Mathematics

A Cayley graph, $C(G, S)$, is a graph formed from a group G and a generating set $S \subseteq G$, where the vertices of the graph are the elements in G, and two vertices a and b have an edge between them iff there is a generator $s \in S$ where $a \cdot s = b$. The Cayley graph provides a visual representation of many of the group's properties such as associativity and commutativity. In this paper, we explore this relationship between groups and their Cayley graphs. We also look at applications of Cayley graphs including the Banach-Tarski Paradox, which states that a three-dimensional, solid sphere can be decomposed into a finite number of disjoint sets and then reassembled with a group of rotations into two spheres of the same size as the first. The proof for the Banach-Tarski paradox relies on the paradoxical decomposition of the free group F_2, a decomposition that can be represented visually in the Cayley graph of F_2.

Creative Writing: Senior Portfolio

Kathryn Dover
Robert E. Stutts, M.F.A.
Department of English

Students in Creative Writing: Senior Portfolio revise previously written pieces for a professional portfolio.

Preferences, Voting, and Paradox

Kathryn Dover, Daniel Martens, and Sabrina Santos
Kara L. Shavo, Ph.D.
Department of Mathematics

Multiplayer game theory is the analysis of strategies and payoffs in games with more than two participants such as the facility location game. We explore the application of multiplayer game theory to preferential voting, in which voters rank candidates in accordance with their preferences. We also discuss several paradoxes that can arise when more than two candidates are running for office, including the non-transitivity of voter rankings in aggregate, known as Condorcet's paradox.

The Effect of pH on the SERS of Rhodamine B on Silver and Gold Nanoparticles

Lauren Taite Driggers
Latha A. Gearheart, Ph.D.
Department of Chemistry and Biochemistry

This project predominantly focuses on the effects of pH on the plasmonics of silver and gold nanoparticles (NP) when attached to rhodamine B. Unlike their bulk component, silver and gold nanoparticles possess a unique ability for the surface electrons to become excited and resonate upon irradiation with visible light. This property, known as surface plasmon resonance (SPR), can be utilized in the technique, surface-enhanced Raman spectroscopy (SERS). With SERS, the Raman signal of a molecule is enhanced tremendously when the molecule is within close proximity of a metal nanoparticle's surface due largely to the SPR of the nanoparticles. With 100-10,000 times enhancements routinely achieved, silver and gold nanoparticles are the most commonly used SERS optical substrates. In this project, aqueous suspensions of silver and gold nanoparticles were prepared by reducing the metal salts in the presence of a weak reducing agent. Rhodamine B, was chosen as a model SERS analyte specifically for its strong SERS enhancement and for its fluorescent property, which could also be monitored. Furthermore, rhodamine-B is an FDA-regulated dye toxic to mammals. An immediate goal of this project included (1) maximizing conditions for detecting rhodamine B and (2) better understanding the analyte-surface interactions between silver and gold with rhodamine B by developing a SERS- binding isotherm. In particular, significant variations in signal strength have been observed by adjusting the system's pH. We hope this research will have implications in testing levels of rhodamine B and other FDA regulated molecules in substances such as foods, spices, and beverages.

Exploring the Spectrum of Elementary Reading Programs: Inconsistencies in Teacher Perspectives

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Department of Education

Research indicates that elementary teachers are often required to implement new reading programs as a result of federal and state requirements. However, when districts do not provide professional development, teachers tend to rely on methods they are most familiar with, which means the mandated reading programs do not get implemented with fidelity. In order to determine how many reading programs elementary teachers had been trained on since they started teaching, I administered a nationwide survey via Facebook. Of the participants (N=112), the majority had been teaching for 5-9 years. I gathered data on whether teachers felt adequately prepared to implement new reading programs when they were adopted by their districts, and if they had to supplement comprehensive programs with their own instructional methods. I also asked teachers if there was one particular program they considered to be most effective. The results of my survey indicated that 37% of teachers did not receive training on new reading programs that their districts required them to implement, and 68% of teachers only "sometimes" felt adequately prepared to implement the program. There were teachers who had been teaching between 10-14 years who had to implement up to 9 new reading programs. One teacher had only been teaching 5-9 years and had implemented 7 new programs. Nearly all of the teachers had to pull supplemental instructional resources to assist with the implementation of the reading programs. Overall, there was vast disagreement among the teachers on which programs they found effective and which programs they found ineffective.

Positional Players and their Statistics in Lacrosse

Abigail Baldwin Edmisten
Rachel G. Childers, Ph.D.
Department of Economics and Business Administration

This paper is going to consider the relationship between the three different positions in division one lacrosse and their statistics. The purpose of this paper and study was to determine if there is a relationship in the statistics a player achieves in comparison to the position they play on the field. The three positions in women's lacrosse are attack, midfield, and defenders. Statistics were collected from the division one lacrosse team at Presbyterian College for the last four years of play. These four years include four sets of statistics with lacrosse taking place as a spring sport. Overall, 13 pieces of information were collected for each player for each year. The pieces of information collected were number, name, year, position, games played, goals, assists, points, shots, draw controls, turnovers, caused turnovers, and ground balls. By looking at these statistics I will be able to make a conclusion on the relationship between players position and their statistics. We would make the assumption that most offensive stats are going to be most present in the attackers and then midfielders while the defensives states will be seen most in defenders then midfielders. For example, statistics such as goals, assists, and points will almost only be seen in offensive players. The reason for including four years of statistics is to make sure we are making an assumption that is significant. By looking at four different years we can make an overall conclusion about the relationship between statistics and position of the player or position group.

Effects of Dietary Iron on Taxonomic Composition and Function of Zebrafish Gut Microbiome

Samuel Lawton Evans
Stuart Gordon, Ph.D.
Department of Biology

A healthy gut microbiota is essential to promote host health and well-being, and it plays a crucial role in the gastrointestinal tract. As this system often serves as a major route of infection, it is important to investigate the effects of dietary components on the gut microbiome. Iron, an essential component of heme and iron-sulfur proteins, plays a central role in many biological activities, including oxygen transport and cellular respiration. In particular, the iron homeostasis system is one of the best characterized due to iron′s causative relationship with iron-deficiency anemia. Dietary iron supplementation is a commonly used treatment for iron deficiency anemia; however, the known direct impacts of iron on the gut microbiome functional potential remain limited. In the present study, using Zebrafish (Danio rerio) as a model organism, we sought to determine if increases in dietary iron would cause changes in taxonomic composition and gut microbiome function. Based on our analysis, an increase in dietary iron significantly altered the zebrafish microbiome taxonomic composition with specific increases in Firmicutes and Proteobacteria. Analysis of taxa for functional potential suggested that iron enriches physiological functions such as aerobic respiration. In addition, gas chromatography mass spectrometry and liquid chromatography mass spectrometry were utilized to measure primary metabolites and lipids, respectively. When considering the primary metabolites, there was found to be a significant increase in amino acids when iron levels were increased. However, there was no significant change within the lipid data when dietary iron was altered. Further studies should elucidate the importance of these observed changes in primary metabolites.

Characterization of U-Si Bonds in Azo Compound Reaction

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Department of Chemistry

A uranium (III) disilyl-ate compound [K(DME)$_4$][UI$_2${(Si(SiMe$_3$)$_2$SiMe$_2$)$_2$O}] was stabilized with 18-crown-6 forming [K(18-crown-6)][UI$_2${(Si(SiMe$_3$)$_2$SiMe$_2$)$_2$O}] (1-crown). The 1-crown was reacted with an ortho-substituted diazene (2,4,6-Me$_3$-C$_6$H$_2$N)$_2$ and resulted in the formation of the analogous compound 2-Mes and 2-MesKI as well as a highly asymmetric complex 3-Mes. The 3-Mes compound was purified from the analogous compounds. Compounds were characterized by multinuclear NMR spectroscopy (1H, 19F, and 29Si), UV-vis/NIR absorption spectroscopy, and single crystal X-ray crystallography.

Examining the Influence of Foster Parents' Marital Status on Foster Children's Emotional Well-being

Luke Alan Gibson
Carla Hall Alphonso, Ph.D.
Department of Sociology

The purpose of this study is to look into the relationship between foster parents' marital status and the chance that foster children would receive an emotional disorder diagnosis. Data is gathered from two main sources, the Adoption and Foster Care Analysis and Reporting System (AFCARS) and the National Data Archive on Child Abuse and Neglect (NDACAN) #274, using quantitative approaches. In particular, AFCARS case study #22—which focuses on emotionally disturbed cases—will be analyzed in conjunction with Dataset #133, which investigates the utilization of mental health services by young people aging out of foster care between 2001 and 2003. The sample comprises 406 youth in the Missouri foster care system, interviewed near their 17th birthday and subsequently every three months until their 19th birthday, with a shown 80% retention rate at age 19. Statistical analysis will be utilized through descriptive statistics and chi-square tests to explore relationships between variables. According to the study, foster children raised by married couples are expected to exhibit lower rates of emotional illnesses than foster children raised by divorced parents. The goal of this research is to further knowledge on how foster families' dynamics affect the mental health of their children, which could lead to the development of support networks and interventions for this vulnerable demographic.

Maximizing Fan Engagement: Sports Marketing in Collegiate Athletics

Luke Richard Gladden
James T. Allen, Ph.D.
Department of Economics and Business Administration

Research in sports marketing plays a pivotal role in identifying and understanding an organization's target audience for attendance at sports events. Market research in sport serves as a crucial tool for maximizing revenue generation and fostering a loyal fan base. With the global population estimated at 8.1 billion individuals, of which approximately 28% have access to online platforms, tailoring marketing strategies in the sports industry can engage the roughly 2.3 billion people using these platforms (Meng, 2021; Feng, 2021). This not only serves the interests of the sport organization or league but also benefits the fans themselves. To delve deeper into this relationship, primary data was collected on the campus of a small, private, college competing in NCAA Division I athletics. The researcher, first obtaining Institutional Review Board (IRB) approval, distributed a voluntary online survey to all undergraduate students on campus via the Qualtrics platform. These surveys were initially distributed and then re-sent four times to maximize the response rate and reduce non-response bias. The data collection process yielded a 15% survey completion rate with no duplicates among the undergraduate student population. Descriptive statistics provided crucial insight into students' gender, class orientation, varsity athlete status, as well which specific sport(s) the student-athlete engaged in. The collected data was then subjected to statistical analysis using a chi-square test to determine the significance of the relationship between students' majors and their attendance at varsity athletic events. The chi-square test was utilized to assess the relationship between the observed and expected values across three distinct populations: Economics/Business Majors, Natural Science Majors, and Social Science/Humanities/Arts Majors. However, the results indicated there was not a statistically significant relationship between students' major and their frequency of attendance. This finding suggests that college athletic departments may be able to effectively attract students to events without investing resources into segmentation strategies based on major. Qualitative data was also obtained via the survey instrument. Based on analysis of the data obtained, marketing strategies for small NCAA Division I athletic departments are discussed.

The Evolution of Money Laundering and Tax Evasion

Jack Andrew Gorman
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Department of Economics and Business Administration

This paper attempts to examine the evolution of white-collar crimes, particularly focusing on money laundering and tax evasion. As the world undergoes transformations and advancements, the methods of executing these crimes are also evolving. The paper will analyze past instances of these crimes, analyzing the shifts in their methods, execution, and underlying objectives over time. Using statistical data from scholarly articles and other reputable sources, this paper will show the current trends and forecast trajectories of these white-collar criminal activities.

Sor Juana Inés de la Cruz and Her Influential Indirect Challenge to the Catholic Church

Parker Elizabeth Green
Jaclyn A. Sumner, Ph.D.
Department of History

For this project, I have studied and observed the life of Sor Juana Inés de la Cruz, and her indirect challenge to the Catholic Church. Life during seventeenth-century Latin America was controlled by the social hierarchy inflicted by the Catholic Church. This hierarchy gave women different expectations based on the color of their skin, especially their sexuality. Sexuality, specifically purity culture, was how the Church controlled women, and these ideologies behind a women's role inspired nun Sor Juana Inés de la Cruz to challenge gender and social norms. To do so, Sor Juana Inés de la Cruz wrote numerous works that indirectly challenged the Church.

Rise Up: A Rhetorical Analysis of Pink Floyd′s Ukrainian Protest Song

Samantha Alexis Hauff
Philip Perdue, Ph.D.
Department of English

My research is a rhetorical analysis of the song, ″Hey Hey Rise Up″ by Pink Floyd. I am presenting the history of the Ukrainian folk song, as it has been used as a form of protest, and how the form of the Pink Floyd rendition is influenced by the context of its instance of political unrest. The original song, "Chervona Kalyna" or "Oh, The Red Viburnum in the Meadow," was written in 1914 but has been used as a protest song through various social movements and events of political unrest over the past century. The instance I am choosing to highlight, however, is the version by Pink Floyd, released near the start of the Russian invasion of Ukraine in 2022. "Hey Hey Rise Up" was the first new Pink Floyd recording to come out in almost three decades. Pink Floyd, a band known for political commentary through music, has displayed the ethos or credibility to release such a song. I intend to explore the form of the song, its lyrics, and its musical choices, and compare this to prior recordings or descriptions of the song at other instances of political unrest in Ukraine. I seek to ask, how does the form of the song match up to the moment of its specific context in time? My research will describe and analyze the political work the song, "Hey Hey Rise Up," is doing through the rhetorical scope of form and context.

How U.S. Media Misrepresents Male Human Trafficking Victims

Sarah Elizabeth Herring
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Department of Sociology

Human trafficking affects all people no matter skin color, or gender, but the media mainly represents female trafficking victims leading to male victims having no representation. This lack of knowledge can lead to the creation of stereotypes and the assumption that males cannot be victims of human trafficking. This paper explores how all kinds of U.S. media, including television broadcasts, books, newspapers, and etc., are misrepresenting male victims. A dataset has been created to look into the amount of representation in U.S. media. The sample size of this data is all 50 states and how many male victims were reported in 2021. The variables being taken into consideration in this paper are the percent of media representation of a male human trafficking victims in each state, what the most reported type of trafficking is in each state, and whether most victims are trafficked locally or internationally. A simple regression will be conducted to see if there is a statistically significant relationship between the number of reported male human trafficking victims and lack of media representation in each state. If the alternative hypothesis is accepted, then there is a correlation between the lack of media representation and reported male human trafficking victims.

The Dendroclimatic Signal of Quercus alba in the Blue Ridge Ecoregion Near Brevard, NC.

Eva Marie Hinkleman
Michael O. Rischbieter, Ph.D.
Department of Biology

White oak (Quercus alba) is a well-known proxy for the effects of changing climates using the science of dendroclimatology, which was established in the 1920's with the observation that tree ring growth patterns are affected by yearly differences in moisture and temperature in the areas in which the trees are growing. Several research projects at Presbyterian College have already established white oak's reliability in the Piedmont region of South Carolina, but similar studies of white oak have not been accomplished in higher elevation environments at the edge of white oaks natural environment. This study looked at the dendroclimatic signal of white oak from the Blue Ridge ecoregion of North Carolina, in a wooded forest near Brevard, NC. Standard dendrochronology techniques were utilized to extract cores from white oaks living in a varied topographic setting, which was also considered to be a variable of interest given the effects of water availability for trees living on a slope. Cores were taken to the lab and prepared for examination using a microscope and a Velmex computerized measuring system. Core widths were then compared to the Palmer Drought Severity Index (PDSI) which is a measure of water availability and has a historical record back to the early 1900's. The results from the trees sampled showed that white oak has a variable signal. During certain years, tree rings and the PDSI were very highly correlated (r=.93). During other growth segments, tree rings were well below acceptable correlation levels when compared to the PDSI. The particular area in which the trees were growing has a highly variable topographic profile, and this area in particular is also known to have a much higher rainfall rate than the NOAA moisture collecting site near Asheville NC. It may also be possible that the growth pattern for white oak is variable for other reasons that are not tied directly to the availability of moisture.

Biomechanics & Progressive Boxing Training

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Punching in boxing requires a sequence of force and velocity of the arm coupled with optimal synchronization of different body segments. Trunk rotation is a suggested component in delivering stronger punches because the lower extremity has more of a biomechanical movement than the upper extremity of the human anatomy. An untrained athlete will endure a boxing training program to understand the biomechanics and technique. However, much is currently not understood regarding the precise mechanical mechanisms in correlation to progressive boxing training. To provide more clarity to this phenomenon, this study investigates the biomechanical process and differences in different types of punching execution and to understand the impact of technical performance and the effectiveness of progressive boxing training. The untrained athlete was equipped with a boxing glove and asked to perform multiple trials of three standardized punch types: the jab, cross, and hook. Trunk rotation will be additionally measured. Force, angular velocity, acceleration, and velocity were computed by different methods. Taken together, our findings reveal that progressive boxing training will increase the punching force and execution of the athlete overtime.

Using Statistics to Create the Perfect March Madness Bracket

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The goal of this project is to intensely analyze Division 1 College Basketball statistics recorded during the regular season to help make predictions to make the perfect March Madness bracket. The data that I will be using is combined between two data sets; the first is statistics from the Pomeroy College basketball rankings and the second is from Kaggle using data from the College Basketball Statistics data sets. These statistics are used by analysts every year to try and predict the perfect college March Madness bracket using certain variable comparisons to hypothesize upsets during the tournament. My project will look at a few statistics such as Adjusted Offensive Efficiency, Adjusted Defensive Efficiency, Tempo, and 3pt percentage. Using these statistics, I will create a few analytical techniques including linear regression, resampling methods, and logistic regression to see which variables correlate the most with one another. In my project, I will be using the software Tableau to create descriptive and interactive visualizations that allow anyone to interact with the project depending on what statistics they will be looking for in this data. While looking at different variables, I will be comparing my results with the results of Sarah Downs who performed the "Using Statistics to Create the Perfect March Madness Bracket" project. This project uses statistics from the years 2016-2018; my goal is to test my data compared to Downs's results, but then see how it has changed over time and if any other statistics could be relevant and used 8 years later. After comparing my results, I will take more time to dive deeper into other statistics that are used by my analysts and have been proven to be true by historical data from previous years.

Memory and COVID-19

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Previous research suggests that long-term memory is divided into two types of memory: episodic and semantic (Tulving, 1972). Typically, memories form as episodic memories, which are memories of experiences, then fade to semantic memories, in which only the factual elements of the memory remain. Two processes that impact memory formation are the reminiscence bump and the living-in-history effect, which suggest different ways that memory formation is impacted during times of stressful transitions. COVID-19 and the global pandemic affected everyday life in dramatic ways. The reminiscence bump suggests that earlier COVID-19 memories would be enhanced. In contrast, the Living in History Effect suggests that a lockdown "dip" would allow for episodic memories not to be formed as distinctly (Brown, 2021). Taking these theories into consideration, this research uses a modified remember-know procedure (Tulving, 1985; Wais, Mickes, & Wixted, 2008) to explore the formation and storage of memories during the Covid Era.

A Toxicity Assay and Examination of the Size-Dependent Characteristics of CdS Nanoparticles

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This past decade has produced significant advances in the synthesis and applications of nanoparticles (NPs). NPs are materials with at least one dimension between 1-100 nm in size. These tiny materials have a wide variety of uses in biological and medical science including fluorescent imaging, gene delivery, and targeted chemotherapy. However, some of these NPs exhibit cytotoxic effects, one such example being cadmium sulfide (CdS). Specifically, CdS NPs have been shown to have mutagenic, genotoxic, and carcinogenic effects. The objectives of this study were to synthesize CdS NPs with varying levels of a stabilizing agent, to characterize the photophysical properties of these CdS NPs, and to conduct biotoxicity studies using a yeast viability assay and reactive oxygen species (ROS) staining. The hypothesis of this study was that the binding of a biologically friendly compound, in this case a polyphosphate stabilizer, would decrease the cytotoxicity of CdS NPs. To test this hypothesis, CdS NPs were synthesized by standard precipitation methods and subsequently characterized using UV-vis spectroscopy, photo-emission spectroscopy, and transmission electron microscopy. Yeast viability studies were conducted in the presence of various concentrations of CdS NPs to measure their cytotoxic activity by counting yeast colony forming units as well as the detection of ROS. The data generated from this research into the cytotoxic effects of CdS NPs will hopefully provide insight into potential biomedical applications such as fluorescent imaging and the targeted release of medicine.

Using a Molecular Systematics Approach to Explore the Endemic Nature of Ptilimnium nodosum

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The Janet Harrison High Pond Heritage Preserve (JHHP) in Aiken, South Carolina is home to numerous endemic plant species. In particular, JHHP is home to Ptilimnium nodosum (referred to as Harperella), a rare plant species that is only found in a few other areas in the United States. There is not much information as to why Harperella is found in this particular location, or how the plant moves from similar High Pond environments. To explore more about its endemic nature, we approached the phenomenon from a molecular systematics perspective to gain a better understanding of its phylogenetic relationships by examining differences in its ITS regions. Due to the endangered status of Harperella, we first created a method to ensure that we would be able to effectively analyze Harperella's DNA to minimize waste of these rare plants. Based on previous studies of the Apiaceae family, we found that comparing the DNA from Dacus carota (carrot), Oenanthe javanica (water celery), and Petroselinum crispum (parsely) would serve as a method of testing our DNA analysis technique, ultimately setting up a framework to use when samples of Harperella are collected in the future. DNA was extracted from the carrot, water celery, and parsley using the Qiagen DNeasy Plant Pro Kit, according to the manufacturer's instructions. Following the extraction of five samples from each plant, we ran PCR to amplify the ITS2 region, which was accomplished utilizing the ITS-3N primer that was used in previous studies. Gel electrophoresis of the product revealed an unexpected, yet consistent, PCR product; then, the product was prepped to be sent off for Sanger sequencing. Sanger sequencing results will be used to create phylogenies and analyze relationships between the carrot, water celery, and parsley to ensure that our techniques are effective and will allow for efficient future Harperella DNA analysis.

The Future of the New Information Systems and Controls Discipline on the CPA Exam

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Technology is rapidly changing and evolving, and this has led to changes in the accounting profession. In January 2024, the American Institute of Certified Public Accountants (AICPA) and the National Association of State Boards of Accountancy (NASBA) restructured the CPA exam to respond to these changes in technology, the exam's first major change since 2004. The exam has been standardized since 1917, and has undergone changes to adjust to the increasing use of technology overtime, such as allowing calculators, taking the exam on computers rather than on paper, and adjusting questions to be more relevant to current technologies. The new format provides an emphasis in technology on all of the core sections and added disciplines that each candidate will choose from, one of them being Information Systems and Controls (ISC). The context of this research is to look at how technology has modified the CPA exam in the past, and how technology will continue to reform the CPA exam in the future and what it means for the new Information Systems and Controls discipline.

Behind the Veil: Nuns in Colonial Mexico and Gender Expectations

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Nuns in Colonial Mexico from the 16th to 18th centuries did not live passive lives that adhered to societal gender expectations. Instead, women were agents who helped to shape societal norms. By asserting their agency, nuns were able to impact gender expectations, social class, and racial dynamics. Drawing upon primary sources, including texts written by nuns, convent records, and other scholarly works, this research investigates how nuns shaped colonial society. Nunneries emerged in New Spain during the mid-16th century, serving as urban sanctuaries for women from diverse backgrounds, including widows, unmarried women, and those seeking refuge. Convents became pillars of colonial society, admired for their spiritual guidance, providing a model of Christian living, and the spirituality of nuns within convents shaping religiosity within their communities. Convents offered opportunities for education, social mobility to women, and alternative to marriage. Economically, nunneries played a prominent role, becoming significant financial centers and owning large amounts of land. Their financial autonomy enabled them to assert their agency and challenge male-dominated economic structures. Gender expectations both within convents and society emphasized purity culture, specifically traits like obedience, modesty, and chastity as desirable female traits. Nuns exercised agency through resistance to authority, alliances formed within convent communities, and by holding leadership positions. While some convents perpetuated racial and social hierarchies, others diverged from societal norms by admitting indigenous women and providing spaces for their spiritual growth. Portraits of "Crowned Nuns" symbolized both spiritual devotion and social status, showcasing the intersection of religious and societal expectations. Nuns' contributions extended beyond the convent walls, leaving a lasting impact on colonial society and its cultural landscape.

Nicotinic Acetylcholine Receptor CHRNA5 is Overexpressed in Head and Neck Squamous Cell Carcinoma Patients with a Recent Tobacco Smoking History

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Tobacco smoking is a major driver of head and neck squamous cell carcinoma (HNSCC) occurrence, and previous studies have shed light on the differences in molecular alterations in tobacco-related HNSCCs when compared to HNSCCs associated with other risk factors (ex: human papillomavirus/HPV status). In this study using The Cancer Genome Atlas (TCGA) RNAseq expression dataset, we performed a differential gene expression analysis in HNSCC cases with a recent smoking history compared to those with no recent tobacco smoking history (within 15 years) and revealed that the nicotinic acetylcholine receptor CHRNA5 is differentially overexpressed in tobacco smoking-related HNSCCs. From our results, CHRNA5 overexpression in these HNSCCs corresponds with a worse prognosis based on significant differences in progression free survival and disease specific survival. Additionally, CHRNA5 expression corresponded with higher expression in larynx-derived HNSCCs as opposed to HNSCCs from the oral tongue. Furthermore, based on Gene Ontology (GO) analysis of transcripts overexpressed in CHRNA5-high tumors, CHRNA5 high status positively correlated with a DNA repair expression signature while inversely correlated with an immune expression/infiltration signature commonly associated with better prognosis. Lastly, we observed that this CHRNA5 high expression signature correlated with an increased presence of positive surgical margins in HNSCC patients. From these results, our study highlights the potential role of the nicotine-activated CHRNA5 receptor in HNSCC progression and corresponds with other recent reports highlighting the potential role of nicotinic induction in cancer progression.

Embryology of the Trout Brain

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My research concerned the developmental stages of the brain in the rainbow trout, Oncorhynchus mykiss. Specifically I employed correlative microscopy (differential staining light microscopy and cryofracture Scanning Electron Microscopy) to document the morphology and spatial dimensions of the embryonic prosencephalon as it further emerges into the telencephalon (precursor of the Cerebrum) and diencephalon (precursor of the Thalamus as a relay point for sensory information to the Cerebrum). I then looked at the stages of development of the eye as the lateral portions of the diencephalon develop into Optic Vesicles and the Optic Stalk (precursor of the optic nerve). The Optic Vesicles are an 'inducer' that eventually contacts the epidermis of the head region. This results in the appearance of the Lens Placode and a double- walled Optic Cup which becomes the 3 layered sensory Retina. There is some evidence in recent fisheries literature (Science News, Nov.2018) that fish raised in environments that lack structures that would be typically found in natural habitat (rocks, branches, etc.) have less developed brains post-hatching. My research will serve as a data set of normal brain measurements at the critical early stages of development prior to hatching.

Examining the Impacts of Collegiate Football on Institutional Visibility

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This study examines the impacts of the "Flutie Effect" on institutions with Division I football programs, delving into the dynamics between collegiate football success and institutional interest. Through the use of IPEDs and analyzing win/loss ratios for a decade worth of data, this investigation employs a robust approach for including external factors that may also contribute to interest. By including these controls, the results of this study provide a clearer picture of the relationship between collegiate football and its impact on its institution.

Russians in Alta California: Encounters on the Edge of Empire

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Beginning in the latter half of the 18th Century, the Russian Empire, through its state-sponsored Russian-American Company, expanded into Alaska and established Fort Ross, roughly 90 miles north of present-day San Francisco. Seeking to exploit the northern California coastline's large sea otter population for use in the fur trade, Russia's territorial expansion conflicted with the Spanish Empire. Beginning in 1769, the Spanish also expanded toward Baja California, establishing the Presidio San Diego that same year and the Presidio San Francisco in 1776. Russian trappers in 1806 threatened the inviolability of Spain's colonial borders, as well as the Spanish colonial government's control over the sea otter populations in Alta California, which accounted for roughly 25% of the colony's revenues. This nascent rivalry would lead to an officially poor state of affairs between the Russian American Company and the Spanish colonial government. Yet, despite these condemnations, relations between Russian and Spanish settlers often flourished. Although the Russian presence in Alta California threatened both Spain's hegemony over the fur trade and the inviolability of its colonial borders, the harsh realities of frontier life and overarching political concerns in the Spanish and Russian metropoles sometimes forced Russian and Spanish settlers, as well as native tribes, to develop new patterns of cooperation despite official condemnations from colonial authorities. Official correspondence and travel logs indicate that trade often flourished between Russian and Spanish settlers, while official correspondence, personal reminiscences, and oral histories indicate that the Russians and native tribes initially maintained a fruitful and mutually beneficial relationship. Though the Russian presence in Alta California lasted for a mere 30 years, terminating with the sale of the settlement to Mexican businessman John Sutter in 1841, it left an indelible mark on the region.

The Role of Medial Prefrontal Cortex Corticotropin-Releasing Factor in Alcohol Use Disorder

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Alcohol Use Disorder (AUD) is characterized by impaired control over alcohol intake and negative emotional states during abstinence, and stress is a common trigger for relapse. The medial prefrontal cortex (mPFC) plays a critical role in AUD, with altered volumes and glutamatergic transmission due to ethanol exposure. The corticotropin-releasing factor (CRF) system is implicated in AUD development and stress responses. This study investigates the interaction between the mPFC, CRF, and parvalbumin (PV) neurons in the context of stress-induced alcohol-seeking behaviors. Mice were subjected to chronic intermittent ethanol (CIE) exposure with or without stress, and changes in neural physiology within the mPFC, specifically the prelimbic cortex, were examined. Additionally, the molecular phenotype of CRF neurons was examined to determine their degree of co-expression with PV. Our findings shed light on the intricate interplay between CRF, PV neurons, and mPFC circuitry in response to stress and alcohol exposure, providing potential insights for the development of pharmacotherapeutic interventions for managing AUD.

In Tune With Hunting: Discovering the Subsistence Practices of Native North America

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This project is a historical summary of the Native peoples and the animals they hunted from 15 thousand years ago to where conservation stands in the present day. This review of the past focuses on many of the major players from different regions across North America. Including Great Plains tribes such as; the Comanches, Apaches, Sioux, and Cheyenne. Southeastern tribes such as; Timucua, Ocmulgee, Waccamaw, and Cherokee, and many more. I discuss hunting practices and how they adapted over time from upgraded weapons, to horses and camouflage. All of this builds into the modern-day realm of conservation practices and the importance of preserving America's great natural resources.

Studying the Relationship of Opponent and Performance-Based Variables to Home Collegiate Basketball Attendance

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The purpose of this study is to analyze the effect of opponent and performance-based variables on attendance for home collegiate basketball games. This study focuses on home basketball games for the Presbyterian College Blue Hose men's basketball team over fourteen seasons between 2009 and 2023. I will use multiple forms of regression analysis to study the correlation and relationship between these variables focused on their correlation to attendance. My hypothesis is that division one opponents that are closer in distance, larger in undergraduate populations, and have a higher recent rank and higher number of conference championships will correlate to higher attendance. I predict that the closer location will offer easier opportunities for visiting fans to attend, as well as potential historical rivalries due to location. I also predict that fans will be more likely to go to games against opponents that are known for being more successful, especially during years when the home team is also successful. Lastly, I predict that a higher population of undergraduate students will correlate with higher attendance due to there being more potential fans. My hope is that the findings of this analysis will be beneficial for Presbyterian College as well as other, similar mid-major sports programs. This information will be informative for college sports marketers and can help Presbyterian College and other programs make decisions on marketing and advertising decisions to maximize game attendance.

Histone Proteomic Profiling of EMT-Transformed MCF10A Breast Cells Demonstrates a Loss in Novel Histone Arginine Methylation Sites Through Dual p53 and PTEN Deletion

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Metastatic potential of basal-like breast cancers typically is initiated by genetic alterations that lead to a process known as epithelial-mesenchymal transition (EMT). However, much is currently not understood regarding the role of epigenetic modifications that lead to invasive characteristics and EMT phenotype of metastatic breast cancers. Based on the previous notion connecting epigenetic changes to breast cancer metastasis, we performed DIA-based mass spectrometry of isolated histones from an isogenic panel of MCF10A breast cell lines where the tumor suppressor genes TP53 and PTEN were silenced and induced EMT. With this approach, we determined which histone modifications were differentially enriched in the non-EMT and EMT-induced MCF10A cell lines. From approximately 72 histone modifications identified and annotated from our mass spectrometry results, we were able to identify 5 histone events that were differentially enriched in our MCF10A cell line panel. Two events of note were histone H3 lysine-14 acetylation ($H3K14ac$) significantly increasing and histone $H4$ arginine 55 dimethylation ($H4R55me2$) significantly decreasing in our EMT-transformed MCF10A p53-/PTEN- cell lines when compared to the parental, non-tumorigenic MCF10A cell line, showing these events are differentially affected during the EMT process in breast cancer cells. Furthermore, significant arginine demethylation of $H4R55me2$ & $H3.1R83me$ in the EMT-transformed MCF10A p53-/PTEN- cell lines corresponded with JMJD6, an established histone arginine demethylase, being overexpressed in basal-like breast cancer cell lines as well as basal-like breast cancer patients from The Cancer Genome Atlas (TCGA) and METABRIC datasets. Based on histone proteomic profiling of our isogenic cell line model, the loss of specific histone arginine methylation events corresponding with JMJD6 overexpression could highlight the potential for a targetable epigenetic mechanism in breast cancer metastasis.

An Analysis of Poebrotherium wilsoni Microwear Patterns as a Proxy for Climate Change During the Eocene-Oligocene Transition in the Badlands of Wyoming

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The transition from the Eocene to the Oligocene Epochs (EOT) in North America (between 33.9 and 33.4 million years ago) was marked by a change in climate which led to a shift from a warm, moist greenhouse climate (Eocene) to a cool, dry climate. The vegetation at the time adapted to this change in the environment which likely led to a change in the diet of the herbivores. The fossil teeth which were studied were found in the White River Formation, a series of sedimentary rocks in the badlands of Wyoming. The molars of a small herbivore of the badlands, Poebrotherium wilsoni (often called a camel) were chosen due to their morphology, which indicated that they were browsing-type herbivores that would have been eating the shrubs and trees when these animals first evolved in the Eocene. Poebrotherium survived through the Eocene/Oligocene climate change, and with the vegetation having changed significantly to a more grass dominated ecosystem (based on previous studies of the pollen), the expectation was that the choice of plants would have also changed for the camels. A way to assess this hypothesis was to look at the microwear patterns on the molars of Poebrotherium fossils collected below and above the transition, and to quantify in particular the number of pits (indicating a diet of leaves and twigs) vs. the number of grooves (indicating a diet of grass). A modern deer molar was also prepared to act as a control for microwear given our understanding of their normal dietary habits.Teeth were extracted from the fossil jaws and prepared for scanning electron microscopy (SEM) using standard techniques. The SEM produces high quality micrographs of the chewing surfaces that were the basis for the analysis of pits vs. scratches and grooves. The molars examined from the Eocene had a higher percentage of pits vs. scratches or grooves, indicating a diet of leaves and twigs, and possibly seeds or other hard fruits. Molars that were observed from about the EOT continued to have a higher

percentage of pits, but there was a noticeable number of scratches and some grooves, indicating that grasses were becoming a part of Poebrotherium′s diet, given their overall smaller percentage in the flora. The molars from Poebrotherium teeth that were collected higher in the stratigraphic column, up to nearly 5 meters above the EOT (indicating a time span of around one million years) had microwear shifting into an very high percentage of scratches, indicating a shift to a grass-dominated diet, although there were still significant numbers of smaller pits. Based on an early analysis, changes in microwear patterns of Poebrotherium molars do reflect changing plant communities at the EOT in the Badlands of Wyoming.

Comparing Embryonic Development of Lytechinus variegatus in Artificial Sea Water (ASW) and Natural Sea Water (NSW)

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Studies on the early development of organisms show that the crucial stages of embryology are highly sensitive to environmental factors. Specifically in marine organisms the salinity of seawater can be the ultimate factor of determining survival. In this study, we used the sea urchin species, Lytechinus variegatus, and induced fertilization to observe embryonic development up until gastrulation. We compared the effects of natural versus artificial sea water on the embryonic development of Lytechinus variegatus. Natural seawater includes beneficial microorganisms and ions that artificial seawater does not. To compare these effects, we counted embryos as they developed and calculated survival rate in each condition. The result of our study using both optical and scanning microscopy indicated there was no significant difference between development up until gastrulation between the conditions.

HBOT: Video Games to Teach Programming Concepts

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In recent years, the integration of technology and education has become increasingly vital. As students navigate the digital era, their learning preferences have shifted. They seek engaging, interactive experiences that go beyond traditional lecture-based methods. Within this paper, we synthesize research on four themes which include: (1) coding concepts, (2) making abstract concepts concrete, (3) engaging learning environments (video games), and (4) emerging future learning methodology. This paper also provides implications in our process of creating our very own STEM game for young adolescents.

Reducing Secondary Earner Bias Within U.S. Tax Code and Its Impact on Female Labor Force Participation

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Women are secondary earners within the vast majority of marriages in the United States, causing their labor to be generally more elastic than men's labor. This also leads to their labor participation being especially connected to policies that affect secondary earners. Prior research has shown that U.S. tax policies such as dual-income taxation and the Earned Income Tax Credit (EITC) result in a negative secondary earner bias and have a detrimental effect on the labor force participation of married women, yet a clear solution to this issue has yet to be identified from the several proposed possibilities. In this study, we examined different suggested changes to U.S. income taxation policy and their potential impacts on the Earned Income Tax Credit, secondary earner bias, and female labor force participation. Introducing a secondary earner deduction is shown to encourage women to increase their labor force participation and provide married women incentives, rather than disincentives, for their additional work. The deduction would not directly affect the Earned Income Tax Credit since eligibility for means-tested benefits such as the EITC are based on income before deductions. Other proposals, such as partial individual taxation or an additional filing option of married individuals filing under separate assessment, involve significant changes to the U.S. system of tax filing statuses. The introduction of these policies would greatly reduce the current penalties faced by secondary earners because they would have the ability to be evaluated separately from their spouse's earned income and incur tax liabilities from their own income. However, a significant overhaul to both the EITC structure and overall U.S. tax system would be necessary to accommodate these policy proposals. Our findings show that each proposal presents different benefits and changes, but a secondary earner deduction is the most feasible solution within the U.S.'s current tax system and political landscape.

Psychiatric Drugs Can Induce Overexpression of ABCB1 in Caco-2 Cells

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While chemotherapeutics have shown success in treating colon cancer, the survival rate was lower in certain cases. A major obstacle that chemotherapy faces is multidrug resistance (MDR). Overexpression of the ABCB1 transporter, which codes for P-glycoprotein (P-gp), can lead to MDR. Certain chemotherapeutics are substrates for P-gp and can induce MDR through upregulation of P-gp, leading to poorer treatment outcomes. Additionally, previous research has shown that cancer mortality is higher in patients with comorbid mental illness who are likely receiving treatment with putative P-gp substrate drugs. In this study, we investigated whether certain psychiatric drugs could induce the overexpression of ABCB1 and the MDR phenotype in human adenocarcinoma cells, isolated from colon tissue (Caco-2). We treated the Caco-2 cell-lines with a low and high dose of each psychiatric medication for over 80 weeks. Quantitative Polymerase Chain Reaction (qPCR) reflected upregulation in the expression of ABCB1 across all drug treatments. Cytotoxicity assays showed lower percent cytotoxicity in each drug treatment group in cells treated with 5,000nM docetaxel when compared to cells treated with vehicle for the same number of passages. Overall, our study showed that Atomoxetine, Levetiracetam, Olanzapine, and Vilazodone can induce overexpression of ABCB1 which can lead to the expression of the MDR phenotype in Caco-2 cells. Future research will explore the resistance to additional chemotherapeutic drugs and the potential involvement of additional ABC transporters.

Unveiling the Tactics: A Deep Dive into Jose Mourinho′s Communication Style

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This research explores the dynamics of communication in the context of football coaching, with a special focus on the career of well-known coach Jose Mourinho at Tottenham Hotspur. By studying a few of Mourinho′s lectures, mostly from the Amazon series ″All or Nothing: Tottenham Hotspur,″ this study aims to identify the fundamental themes and communication techniques he uses. It also explores the significant influence Mourinho′s communication style has on team spirit, player motivation, and overall performance. Through the use of qualitative research methods, this study offers insightful information about the potential for change of good communication to impact team dynamics and promoting success in the highly competitive sport of football. In the end, this study advances our knowledge of the importance of communication in sports coaching and has benefits for players, coaches, and sports organizations that aim for high standards both on and off the field.

The Future of the Pet Industry

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The pet industry has witnessed remarkable growth in recent years, driven by evolving consumer lifestyles and a growing emphasis on pet well-being. This research paper aims to provide a comprehensive examination of sales trends within the pet industry, shedding light on key factors influencing market dynamics. This research paper delves into the historical trends of the pet industry in the United States, offering a detailed examination of its evolution before, during, and after the introduction of pet superstores, as well as the impacts of the COVID-19 pandemic. The research begins with a thorough exploration of market size and segmentation, considering various product categories such as pet food, live animals, vet care, and services. Utilizing historical sales data and statistical models, the study identifies underlying patterns, seasonal variations, and emerging market segments. Furthermore, it investigates the impact of external factors such as economic conditions and technological advancements on the industry's sales trajectory. Additionally, the paper explores the role of e-commerce platforms and digital marketing strategies in shaping expanding consumer choices within the pet industry. By providing a detailed understanding of the sales trends in the pet industry, this research contributes valuable insights to industry stakeholders, marketers, and policymakers. The findings aim to guide strategic decision-making, foster innovation, and support sustainable growth in an increasingly dynamic and competitive market. The scope of this paper will cover pet ownership, superstore, and ecommerce trends over the last 25 years. Using this data, this paper will make predictions about the future of the pet industry including the trajectory of the independent pet store.

Breaking the Mold: Hollywood's Portrayal of Autism Spectrum Disorder and Its Impact on Audience Perception

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This is an English honors research prsentation drawn from from a directed study during the fall of 2023. The topic is Hollywood Film's stereotypical representation of Autism Spectrum Disorder and the way it affects an audience's understanding of the disorder.

Creative Writing: Senior Portfolio

Kiersten Nicole Phillips
Robert E. Stutts, M.F.A.
Department of English

Students in Creative Writing: Senior Portfolio revise previously written pieces for a professional portfolio.

Reactive Oxygen Species (ROS)-Triggered Carbon Monoxide (CO) Prodrugs for Targeted Delivery

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Carbon monoxide (CO), an established endogenous signaling molecule, shows huge potential as a gaseous therapeutic, with demonstrated ability to slow inflammation, defend tissues from oxidative stress, and protect against various disease pathologies. However, making CO-based therapeutics available in the clinical setting is hampered by the inherent challenges associated with the controlled and targeted delivery of a gaseous drug. Currently, there is no targeted CO delivery approach for diseased states such as osteoarthritis characterized by high levels of reactive oxygen species (ROS), specifically hypochlorite. The goal of this study is to design a chemical strategy wherein the CO prodrug is stable during storage and under normal conditions but would release CO in response to elevated ROS levels in a biological system. In our design, we leverage the reactivity of pyrrole rings to ROS. Installing an alkyne arm proximal to an ROS-sensitive pyrrole ring primes the system for a cascade of intramolecular Diels-Alder followed by retro-Diels Alder leading to the cheletropic release of CO. The synthesis of the prodrugs was achieved via a carbodiimide conjugation strategy. Five CO prodrugs of varying electronic properties and linker lengths were successfully synthesized (25 - 80% yield). The prodrugs were purified using column chromatography and partially characterized using 1H NMR. To study the utility of the designed chemical strategy, preliminary NMR studies of hypochlorite-mediated oxidation of the pyrrole ring were complicated with solubility issues of the prodrugs and hypochlorite in CD_3CN/D_2O. Alternatively, fluorescent carbon monoxide probes have been synthesized and characterized. Both test tube- and cell-based fluorescence assays are currently on-going. The optimized one-step synthetic approach was key in growing our compound library of potential CO prodrugs. However, NMR-based assays for structure-activity (CO release) relationship studies have been challenging because of solubility issues. The pivot to fluorescence-based assay is expected to eliminate

solubility problems, and therefore provide a definitive measure of CO release from the synthesized prodrugs. Research reported in this publication was supported by the National Institute of General Medical Sciences of the National Institutes of Health under Award Number P20GM103499. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Divergent Perspectives: Parent and Teacher Views on 4- and 5-Year-Old Children's Mobile Device Use

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The purpose of this study was to investigate 4- and 5-year-old children's use of mobile devices. Data were gathered from parents (n=46), teachers (n=4), and a speech-language pathologist from one preschool in South Carolina. Of the 46 parent respondents, only 2 had children who did not use mobile devices. Overall, 61% of 3- to 5-year-old children possessed their own device; the remaining 35% had regular access to a device owned by someone else, such as a parent or sibling. It was also found that 72% of children began using their devices at the age of 3 or younger. The most popular platform that students used was YouTube and the most popular online activity was streaming videos. Parents described the academic benefits of their children using devices, such as developing math skills, letter recognition, phonics skills, and learning new words. However, the teachers expressed concerns about children's speech development, fine motor skills, and their ability to focus in class. Overall, this study confirms a worldwide trend of early mobile device use among children, and revealed conflicting interpretations by parents and teachers regarding the benefits and disadvantages of this early use.

HBOT: Video Game to Teach Programming Concepts

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As technology becomes more integrated into daily life, the need to encourage computational thinking skills in young students has become increasingly important. As educators and students are challenged with the learning curve present in mastering programming concepts, there is a growing need for innovative instructional approaches. Traditional methods of teaching programming, reliant on lectures and explanations, often fall short in engaging young minds and fail to accommodate diverse learning preferences. To address these challenges, educators have turned to alternative, more captivating avenues, such as game-based learning. This research paper explores the effectiveness of using video games as an instructional tool for teaching programming to elementary and middle school-aged students. Recognizing the appeal and relevance of video games to today's youth culture, our study explores the potential of using interactive gameplay to demonstrate abstract coding concepts. Drawing upon the widely-used game engine Unity, we have developed a custom-designed game tailored to illustrate the concept of assignments between variables and values. Through experimentation, this study examines one possible game-based approach in fostering understanding and retention of programming principles among young learners. Our game seeks to generate enthusiasm and proficiency in programming from an early age.

The Caribbean Flashpoint: 1660-1805

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This project asseses the Caribbean during the period between the Restoration of the British Monarchy and the Battle of Trafalgar as a flashpoint for conflict between European powers. The Caribbean contained several trade routes that ran between the Americas and the Atlantic. This, coupled with a major cash crop in the form of sugar, led the major colonial powers to focus foreign and naval policy on the region. This led to continental conflicts starting within the region, continental conflicts expanding to the region, and development of naval innovation to better enforce colonial policy in the region.

The Effect of Human Development on GDP

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This study explores the relationship between governmental styles and economic well-being, specifically comparing democratic and non-democratic countries. The research question aims to investigate whether citizens of democratic countries experience better economic well-being compared to those in non-democratic countries. The sample comprises 175 countries, with data sourced from the Democracy Cross-National Dataset, encompassing various political, economic, ethnic, religious, and demographic characteristics. The key variables include the Human Development Index (HDI) as the independent variable, measuring the level of development from 0 (least developed) to 1 (most developed), and GDP per capita as the dependent variable, measured in US dollars. The research employs descriptive statistics, bivariate analysis using Pearson correlation, and multivariate analysis through multiple regression.Findings indicate a strongly positive correlation (Pearson correlation coefficient of 0.624) between HDI and GDP per capita, suggesting that higher HDI corresponds to higher GDP per capita. Multiple regression analysis identifies HDI and the globalization index as statistically significant predictors of GDP per capita. The globalization index exhibits a greater influence on GDP per capita than HDI. However, other controlled variables such as ethnic diversity index and urban population percentage show no significant influence.The study supports the hypothesis that higher HDI correlates with greater economic prosperity, emphasizing the importance of factors such as life expectancy, education levels, and standard of living. While limitations include missing data for some countries, the findings underscore the significance of economic, political, and social goals for developing countries.

The Racial Progression of Lyon, France

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Frantz Fanon was a revolutionary psychoanalyst and philosopher that was born on the small West Indian island of Martinique in 1925 and died in Maryland of leukemia in 1961. Martinique was a dominion of France at the time Fanon grew up, allowing him to receive a French education throughout his youth and early adult school years. During the Second World War, Fanon served in the Free French Army under General Charles de Gaulle. While the Free French Army was the most united French resistance force, there was significant racial tension and discrimination as well within the French army seen in terms of sleeping quarters and attitudes towards black volunteers in the force. After the war, Fanon traveled to France and attended the University of Lyon and completed his studies in medicine and psychiatry. After his time in Lyon, he served as head of the psychiatry department of Blida-Joinville Hospital in Algeria, where he studied racism and post colonial effects on the oppressed. Lyon long after Fanon's passing has had a number of racial uprisings and continues on to be a leading city in Europe for racial diversity. This presentation aims to explore the works of Fanon and similar works to show the progression of racial tension in Lyon, France.

Medicaid Expansion and Children with Asthma: Improving Health Outcomes and Reducing Disparities

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In the landscape of healthcare access across the United States, I will shed light on the impact that Medicaid expansion has had on low-income individuals, specifically adolescence. Fully grasping the question: Do children with asthma exhibit improved health outcomes in states that have chosen to expand Medicaid, in contrast to states that have not expanded Medicaid across the United States? Medicaid holds the potential to assist vulnerable populations in need, not only in terms of healthcare accessibility but also affordability, which also enables this government covered health insurance extend to individuals with low income and hospital facility spending. However, Medicaid is not without certain disparities and challenges when seeking quality healthcare, including limitations related to healthcare providers, medications, and comprehensive treatment and care. Furthermore, the research incorporates socioeconomic factors, such as the percentage of children that are in poverty and minority populations, to highlight the significant impact of Medicaid expansion. This research aims to provide insights into the effectiveness of Medicaid expansion in addressing healthcare disparities and improving health outcomes for vulnerable populations, particularly children with asthma, across the United States.

Differentiation of Good-Form and Bad-Form

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When lifting weights, a lot of times people are working out without proper direction or teaching. This is a concern because they could either hurt themselves with incorrect form or they won't see any results due to their poor form. Therefore, we aim to show people how to get the most out of their workout by measuring good form versus bad form from the voltages generated by their muscles. For this project, we have chosen to study the differentiation between voltage reading when doing a good form rep compared to a bad form rep during weightlifting. With this project, we are able to show that with each muscle repetition, it is being used at its fullest potential. This way, whether you are an athlete or just someone trying to stay in shape, you do not have to worry if you are getting the best out of your workout. This was accomplished by using the bicep muscle and the front delt, by applying the electrode pads on the muscles to measure the voltage coming from the bicep and front delt during each good and bad rep. The electrode pads were connected to a circuit board and oscilloscope to collect the output data needed for this project. Once the data was collected, we used Python and Fourier transform to differentiate the data, make graphs, and measurements to determine our results for this project. With our results, we programed the Arduino to determine if the rep done for the bicep curl was with good form or bad form with a display stating so to the user.

How Mental Trauma from Abuse in Cults Can be Treated with Therapy

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This paper seeks to answer the question of how effective are certain therapy options at aiding those who have experienced mental trauma at the hands of cult-like organizations. The dataset that is used for this paper is based on data from the paper Ritual Abuse Survivors in the United States. Additionally this paper discusses various other papers which have done similar research in the past. Based on this research it has been determined that there is a distinct lack of research into this particular topic. To analyze the data various testing methods will be used such as descriptive statistics, bivariate hypothesis testing, and multivariate analysis for the hypothesis. The outcome of this research should determine the extent to which various methods of therapy might affect the mental well being of those who have suffered mental trauma at the hands of cult-like organizations.

The Analgesic Effects of Arnica montana Extracts on Post-Operative Pain

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Arnica montana (AM) is an herbaceous perennial plant that has been traditionally used in treating trauma, bruises, inflammation, or tissue injuries. However, the molecular mechanisms of Arnica's medicinal properties are largely unknown. One objective of this study is to evaluate the effects of AM extracts on post operative pain in an in vivo model. The extracts were made by mixing Arnica powder with one of the following solvents: 100% ethanol, ethanol:water (7:3, v/v), methanol, and acetone. The extracts were dried at room temperature and mixed in PCCA VersaBase gel at 1% by weight, with or without 1% of resveratrol. The analgesic effect of AM extracts was tested in a post-operative pain model in CD-1 male and female mice. Mice were treated with gel alone, gel with 1% AM extract, or gel with 1% AM extract + 1% resveratrol (a generally recognized as safe compound) for one hour under anesthesia after the paw incision surgery. After recovered, the von Frey assay was performed at 3, 5, 24, and 48 hours after surgery. We found that all AM extracts exhibited analgesic effects to reduce the post-operative pain. However, the co-treatment with resveratrol only enhanced the activity of ethanolic aqueous (7:3) extract and acetone extracts. The tissues around the incision were harvested for measuring the concentration of pro-inflammatory mediators, such as interleukin (IL)-1β, IL-6, and tumor necrosis factor alpha (TNF-α) using Western Blot and ELISA. We found that treatment with AM acetone extract reduced IL-1β, but not TNF-α concentration by ~50%. These findings further confirm the activity of Arnica on pain relief. We hope to take an in vitro approach using BV-2 cell lines to understand the molecular pathways behind AM and observe the impact of the AM extracts in the activation of proinflammatory cytokines.

NIL Revolution: Rhoback's Social Media and the Financially Empowered College Football Player

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After the NCAA's 2021 ruling allowing college athletes to benefit from their Name, Image, and Likeness (NIL), the landscape of college sports has immensely changed. While many college athletes are benefiting from this ruling, this research essay focuses on how sponsorship posts by the athletic clothing brand Rhoback reshape what it means to be a college football player today. An analysis of three social media posts from Rhoback's Instagram will be grounded in the scholarship of Maurice Charland's theory of constitutive rhetoric to illustrate the process behind creating a new identity for college football players. Traditionally, college football players have lived out a narrative of "student-athlete," but in that narrative athletes cannot be compensated for their efforts. With the introduction of NIL there are new requirements for student athletes that fall outside of the "student-athlete" umbrella, hence why it is necessary for a reconstitution into a new narrative, one that encapsulates the ability for financial compensation.

Industry Potential Unleashed: A Guide for Business Graduates

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Business majors make up a high percentage of students in undergraduate studies compared to other disciplines, including myself. Many business majors are not informed on which the best industries are to pursue a career in. I am wanting to see what is the best industry a business major can go into regarding growth and compensation. This is important to many individuals that are going into college, in college, and at the end of their schooling to see what industry best fits their needs, including myself. Using various techniques throughout my undergraduate experience such as data visualization, data analysis, and dashboards to see if the data presented will show the best industry a business major should focus their efforts into. I expect to find that the healthcare industry and or IT will yield the results I am looking for. If my hypothesis is accurate, my results will show the best industry to go into is healthcare as a business major. If my hypothesis is incorrect, any other industry besides healthcare and IT will be the industry a business major should focus their efforts into. This will help inform business majors on a specific industry to pursue their career in, and drop any stereotypes into industries that business majors usually aren't educated on potential of having a career in.

Queues in Retail Customer Service

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This research investigates the operational dynamics of a retail pet store, honing in on the challenges of a typical busy Saturday. Through conscientious data collection, the study establishes average arrival and service rates, confirming their adherence to the Poisson distribution. Subsequently, a simulation is executed to test the system's response to increased customer arrivals due to growing demand. The study initiates by characterizing the retail pet store's operational position during peak hours, revealing key metrics of customer arrival and service rates on busy Saturdays. Statistical analysis validates the Poisson distribution pattern, setting the stage for a simulation model. Utilizing means that were derived from the established distribution, the simulation mimics the dynamic store environment during peak customer activity. The primary objective is to assess the impact of increased customer arrivals on wait times and server resource demand. This test aims to uncover operational bottlenecks and vulnerabilities within the business. Simulation results provide crucial insights into the system's resilience and adaptability during surges in customer traffic. Analysis of wait times reveals the store's operational coping mechanisms and identifies potential areas for improvement. Additionally, evaluating server demand highlights the delicate balance between customer service efficiency and resource allocation. This study not only benefits the specific retail pet store but also extends insights for operational management in retail settings, dealing with fluctuating customer demands. By emphasizing statistical distribution analysis and simulation modeling, the research offers practical strategies for enhancing customer service and overall operational performance in dynamic retail landscapes. The findings aim to inform strategic decision-making, providing a roadmap for optimizing efficiency in similar settings.

The Effects of Synthetic Estrogen on the Gonadal Development in the Viviparous Fish, Poecilia sphenops

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There is a substantial research record on the effects of synthetic and environmental estrogen on the gonadal development in various species of oviparous fish (Luzio et al. 2015). However, very little research has been conducted using live-bearing fish such as the Molly, Poecilia sphenops, as a model system. Our study addresses this gap by applying the same research principles to determine if synthetic estradiol affects gonadal development in males of viviparous species. To accomplish this, a solution of synthetic estradiol was applied to a tank holding both male and female Molly pups. After several weeks of growth, the gonads of both genders were examined. Following treatment, it was determined the male gonads were not developing into testis as they normally would, but instead, the gonadal cells remained undifferentiated. There was no significant effect on the gonadal development in the female subjects. Based on these results it was determined that synthetic estrogen may affect viviparous species of fish in a similar manner as oviparous fish.

My Supply Chain Internship at Gateway Terminals LLC in Savannah, GA

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During the summer, my internship at Gateway Terminals at the Port of Savannah Georgia allowed me to work in Management and Operations, Safety and Security and Accounting. I saw how there are many important aspects of getting a shipment to and from Savannah from all over the world. There are so many things that need to be considered before ships can be unloaded or loaded: ship size and type, the space needed at the dock, the number of workers, the size of the crane or other equipment, etc. Current sea level also determines when ships can enter or leave the port. This internship helped me to understand how the supply chain process works.