

HONORS DAY SYMPOSIUM

PRESBYTERIAN COLLEGE
APRIL 21, 2021



April 21, 2021

Dear PC Community,

I am tremendously excited to see the academic work and achievements of students take center stage during Honors Day. During the annual event, we recognize the exceptional work of students, and we celebrate the collaborative efforts that take place between students and faculty.

PC is certainly known for its academic rigor, but many students soar above and beyond classroom expectations, even despite the numerous challenges they faced during this unprecedented year. Involvement in this year's Honors Day is a particularly strong testament to their dedication, focus, and talent.

Our students have put their hearts and souls into their research and creative work. They've pursued their passions and satisfied their curiosity in the disciplines of the liberal arts. They've gotten up early and stayed up late, all in an effort to present the work you'll see. We couldn't be prouder of them.

Please join me in congratulating the students presenting during Honors Day. Congratulations, also, to the students receiving awards today and to the faculty who have mentored these diligent student researchers and artists.

Welcome to Honors Day!

Respectfully,

A handwritten signature in black ink that reads "Matthew P. vandenBerg". The signature is fluid and cursive, with a long horizontal stroke at the end.

Matthew vandenBerg, EdD



April 21, 2021

Members of the Presbyterian College Community,

Honors Day is a special time in the academic life of Presbyterian College. We are blessed to have the opportunity to highlight the particular academic and creative accomplishments of our students. Although circumstances prevent us from conducting these events in person, I am impressed by the commitment and creativity you will see across these virtual presentations, posters, performances, and programs. These culminating experiences reflect important work that students pursue with faculty mentors in the College of Arts and Sciences and the School of Pharmacy. In these endeavors, they enhance their academic abilities and develop the drive to succeed in their areas of interest. Students, congratulations – well done to all of you!

Students may participate in different research opportunities throughout the year. A capstone experience is required for all major programs on campus. The PC Summer Fellows program highlights the joint work of students and faculty outside the traditional curriculum. Honors research is, furthermore, an occasion for exceptional students in different disciplines to explore deeper issues within their majors. This Symposium, then, provides the forum for sharing these experiences and presenting the work of students to their classmates, their professors, and others in the PC family.

I also want to recognize the incredible work and dedication of our faculty, who are serving as mentors, advisors, and moderators for the symposium. They have done a remarkable job in working with our students under challenging circumstances so they present their best work. I want to particularly recognize Dr. Stefan Wiecki, Professor of History, and his team for their dedication in ensuring this 2021 Honors Day Symposium happens for our campus: without their diligence and commitment to student success, today would not be possible.

Enjoy the 2021 Honors Day Symposium - students, again you have done exceptional work – we are all proud of you!

Sincerely,

A handwritten signature in black ink that reads "Donald R. Raber II". The signature is written in a cursive style with a large, sweeping initial 'D'.

Donald R. Raber II, Ph.D. Provost

The Importance of School-Home Communication During the Pandemic That Turned Home into School

Shelby Lynn Allan

Julia Wilkins, Ph.D.

Department of Education

The purpose of this qualitative study was to investigate teacher communication and parental involvement in their students' education before and after schools closed due to the COVID-19 pandemic. I conducted phone interviews with six parents in five different states to gather data on the changes that occurred with the transition to distance learning. After each interview, I typed the interview transcripts verbatim. I then coded them using MAXQDA software to identify the themes. The themes that emerged were (a) parental involvement, (b) importance of teacher communication, (c) importance of maintaining routines, (d) challenges with home instruction, and (e) acknowledging teachers' efforts. The results indicated that teachers' communication with parents was more important during distance learning than ever before because parents were now assuming the role of the teacher.

Hollywood and Contemporary Racial Identity

Ashley N. Allen

Terry Barr, Ph.D.

Department of English

For my English Capstone, I have decided to address the issue of how Hollywood has changed its representation of black identity since the wake of the BLM movement. Is it more reverent? More complex, or more troubling? In order to tackle this question, I will be using resources such as how many black actors and actresses have won Hollywood's most prestigious award (the Oscar), as well as seeking various movie topics, journal articles, and even simple Google searches to discern how Hollywood, though ostensibly trying to do better, is still lacking a great deal in some areas. Overall, I am formulating the thesis that African Americans, though considered successful actors and actresses in America, are being limited to their background and not being recognized for the potential originality that they would bring to the big screen.

An Examination of What the Bible Has to Say About Race

Brittany N. Atkins

Terry Barr, Ph.D.

Department of English

There has been a historical trend of those in power using the Bible to defend acts of discrimination and violence against members of a different race. Unfortunately, these leaders and organizations have not provided any textual evidence, or they have clearly distorted the scripture to defend their claim that the Bible condones racism. Therefore, the goal of this research project is to examine what the Bible says about race, and consult the work of historians, English critics, and Biblical scholars to offer further insight into the meaning of the Biblical texts commonly cited by those who practice discrimination. The arguments of historical figures and literary characters, such as Doc Hines in William Faulkner's *Light in August*, will be contrasted with the values found within Scripture in order to defend the position that the Bible promotes unity and oneness among the only race created by God: the human race.

Anterior Cruciate Ligament Injuries in Female Athletes

Kristen Taylor Bane

James T. Wetzel, Ph.D.

Department of Biology

The prevalence of non-contact Anterior Cruciate Ligament (ACL) tears in female athletes is significantly higher than that noted in men's sports. This trend continues to increase as participation in women's sports is becoming increasingly popular. The purpose of my research was to explore the anatomical basis of why female athletes are more susceptible to non-contact ACL tears and to look at possible preventative therapies that might decrease the susceptibility of this at-risk population. In this research, I dissected a deer knee to review functional anatomy of the meniscus and ligament capsule, followed by a physical reconstruction of the human knee using modeling clay with emphasis on proper anatomical morphology and position. MRI scans of both male and female ACL tears and intact ACLs, were obtained to measure the physical ligament differences, as well as the degrees of trauma. Microscopy and photomicrography were also used to study the differences between connective tissue that supports biomechanical movement and provides stability to the knee, in particular movement as related to sports. All of this research into the functional anatomy of the knee leads to the ultimate goal of investigating the effect of estrogen or androgen on the collagen strength of the ACL with the hopes of directing future research on the hormonal treatment/prevention of ACL injuries pertinent to women engaged in athletics.

Racial Identity in Queer Terms

Alexander M. Barrus

Terry Barr, Ph.D.

Department of English

From the late 1960's to the present, racially mixed drag artists and queer people of color have tried to navigate and embrace the barriers/reality of their racial identity to accept their own way of life. How successful and accepting of themselves have they been? To what degree is American society more accepting of them today? Through scholarly research, this essay will attempt to answer and provide analysis of these questions.

A Metabolic Array Showing Basal-Like Breast Cancer Cells' Ability to Metabolize Sugar Alcohols Differentially

Elayne M. Benson

Austin Young Shull, Ph.D.

Department of Biology

This study used a tetrazolium-based metabolic array consisting of a panel of varying carbon sources to determine whether the CSC-poor, luminal breast cancer cell line MCF7 and the CSC-rich, basal-like breast cancer cell line SUM159PT differentially metabolize certain carbon sources. We found that while both MCF7 and SUM159PT both readily metabolized various carbon sources, there were several carbon sources of interest in which MCF7 and SUM159PT greatly differed. As expected, MCF7 and SUM159PT both metabolized D- glucose, though SUM159PT appeared to metabolize at greater levels. Concerning their differences, MCF7 appeared to differentially metabolize glucose-1-phosphate, potentially reflecting some role with the glycogen pathway. Nevertheless, SUM159PT most interestingly differentially metabolized lactitol and meso-erythritol, both of which are known artificial sugars known as “sugar alcohols.” These artificial sugars are not typically metabolized by normal cells, yet both meso-erythritol and lactitol were two of the most highly metabolized carbon sources within the CSC-rich SUM159PT cell line based on optical density readings. In all, we discovered several carbon sources that MCF7 and SUM159PT were able to differentially metabolize, most notably the sugar alcohols meso-erythritol and lactitol in SUM159PT. Further studies are warranted to determine whether

other basal-like, CSC-rich cells differentially metabolize these sugar alcohols when compared to luminal cells as well as whether sugar alcohols are metabolically capable of stimulating growth in basal-like breast cancer cells.

Examining the Impact of Racial Ideology: Literary Characters, the Inner Narrative, and Self-Image

Marley A. Bickley

Terry Barr, Ph.D.

Department of English

This project aims to explore the influence that racial ideology and attitudes towards race, as shown through literature, has on characters in novels and other forms of written prose; including works such as *Caucasia* by Danzy Senna and *The Vanishing Half* by Brit Bennett. By understanding the struggle of being part of a racial minority or of a mixed race, readers can better understand how a character's inner narrative, sense of self, and viewpoints on their environment may be forced to change. Outside perspectives may also then be able to understand the desire of biracial or lighter-skinned races to “pass” into white society in hopes of a better life, what causes these driving forces, and the personal impacts on a person who leaves part of their identity behind to become white.

Yeast as a Model for Type 2 Diabetes: Characterization of the Glucose Transporter Hxt4p in *Saccharomyces Cerevisiae*

Kayla Elizabeth Bramlett

Evelyn Swain, Ph.D.

Department of Chemistry & Biochemistry

In mammalian cells, glucose uptake is performed via the family of facilitated diffusion transporters known as GLUTs, which are located in the plasma membrane. These GLUTs are known to exist in oligomeric complexes, which have been shown to increase glucose uptake efficiency. It is not known, however, whether the homologous hexose transporters, *HXTs*, in yeast, *Saccharomyces cerevisiae*, display similar oligomeric structures. The goal of the present study was to test the hypothesis that the glucose transporter Hxt4p forms oligomers in the plasma membrane and that this oligomerization is initiated by interactions among the N and C-termini. To do this, we used a combination of *in vitro* and *in silico* techniques whereby these potential oligomerization-promoting interactions were explored. We found oligomerization in Hxt4p may be initialized by intermolecular C-termini interactions and stabilized through disulfide-bond formation. Taken together, these results help elucidate the complexities of glucose transport in yeast, *Saccharomyces cerevisiae*, which helps further establish it as a model organism for studying Type 2 diabetes.

Different Views of Iberian Crusades from Western and Arabic Perspectives

Jacob Reeves Bridges

Rick R. Heiser, Ph.D.

Department of History

This project hopes to analyze significant differences between Western and Arabic soldiers, clergy, and nobles in response to increase religious conflict in the Iberian Peninsula during the Crusades period. The project includes historical context of Islamic Expansion into the peninsula as well as historiographic discussion. By comparing the different responses, I hope to synthesize primary and secondary sources to create a comprehensive look into the subject. Through this process, the project will fit into the current scholarly library by focusing on multiple perspectives from each world view and compiling sources together. Thanks to Dr. Heiser and the history department for supporting this project throughout the research and writing process.

Comparative Analysis of Functional Activity of SSD in NPC1 and NPC1-Like Proteins

Noah Dylan Burkett

Maryhata Petukh, Ph.D.

Department of Biology/Computation Biology

Human Niemann-Pick C1 Protein (NPC1) is a multidomain protein that is essential for transporting cholesterol (CLR) from late endosomes and lysosomes to the endoplasmic reticulum and other cellular compartments. It has 13 transmembrane helices, out of which helices 3-7 are forming a pore -- a sterol-sensing domain (SSD). It is speculated that SSD participate in direct transfer of CLR through the membrane. Mutations in NPC1 can cause Niemann-Pick, type C disease, a neurodegenerative disorder caused by an accumulation of CLR in the lysosome/endosome. Niemann-Pick C1-Like Protein (NPC1-L) is a known paralog of NPC1 and is involved in CLR transfer across the plasma membrane of the intestinal enterocyte. There are no documented disease-causing mutations in NPC1-L. Within silico investigation we compared functionality of SSD in NPC1 and NPC1L. Structural analysis show that both proteins can transfer CLR through the pore in a similar manner in terms of the orientation of the ligand inside SSD, and its path while moving across the membrane. Evolutionary analysis confirms that at “checkpoints” positions, the positions where CLR significantly slows down, the ligand interacts with conserved residues. We also compared the effect of Q775P, a disease-causing mutation, in NPC1 with the homologous Q787P, non-disease-causing mutation, in NPC1L. Data show that Q775P mutation significantly perturbs NPC1 activity, while Q787P mutation has less pronounced effects on NPC1L protein.

Chemotherapy Resistance on Omeprazole Treated Cancer Cell Lines

Hailey Nicole Caswell

Christopher Farrell, Ph.D.

Department of Pharmaceutical & Administrative Sciences

The American Cancer Society estimates a 20% survival rate five years post esophageal cancer diagnosis. This poor prognosis is associated with chemotherapy resistance within cancer cells. A known mechanism for the chemotherapy resistance is overexpressed PGP. PGP encoded by ABCB1 is a transport protein that utilizes ATP for active transport of cytotoxins out of the cell. Studies have shown that the initiation of chemotherapy treatment causes PGP expression to increase, resulting in decreased drug effectiveness and patient prognosis. PGP overexpression prior to chemotherapy treatment also results in resistance. In vitro experiments have identified drugs that are PGP substrates and induce expression of efflux pumps in cells not treated with chemo. Our preliminary research explored the effects of the reflux drug Omeprazole (OM) on the transcriptome of chemotherapy resistant esophageal cell lines OE19 and OE33, as well as colorectal cell line Caco2. We verified with qPCR that ABCB1 was induced. Further expression and sequence analysis in collaboration with Novogene revealed significant expression differences of efflux pump ABCG2 in the presence of OM. ABCG2 encodes for BCRP and is another known ATP dependent transporter responsible for chemotherapy resistance. The effects of BCRP overexpression in chemotherapy naïve cells has not been fully explored. In this study we aim to further characterize the drug resistance in OM treated cells through ABCG2 by treating the three cell lines with a chemotherapy

agent that is an ABCG2 Substrate. qPCR and western blot results confirmed increased expression of ABCG2 in OM treated cells and cells treated with Methotrexate. The identification of chemo-resistant markers and alteration of expression following Omeprazole treatment suggests the involvement of reflux drugs in the development of chemotherapy resistance in esophageal cancer. These findings can lead to personalized treatment guidelines for esophageal cancer patients who take reflux drug medications.

Modifications to the Rope Braiding Machine at Presbyterian College

Brianna L. Cody

Chad L. Rodekohr, Ph.D.

Department of Physics & Computer Science

The Presbyterian College department of Physics has been conducting research on and making modifications to a rope braiding machine obtained from Auburn University. The machine is being adjusted to improve rope braiding performance and ease of use. The alterations being made during this research include redesigning a permanent circuit board with fewer wires and a new power supply, as well as creating a pulley system to decrease speed of the motor and increase the torque of the system.

A Longitudinal Examination of the Characteristics and Changing Political Engagement of Independents in the United States: 1952-2016

Serina Combs

Erin McAdams, Ph.D.

Department of Political Science

In 1940, nineteen percent of Americans identified themselves as politically Independent. Now, in 2020, that percentage has increased 36 percent. Clearly, the Independents of 1940 are not the same as those who comprise the electorate today, but how do they differ? Relying on a quantitative analysis of longitudinal survey data from the American National Election Studies (1952-2016), this Honors Research project attempts to understand how pure Independents, Republican-leaning Independents and Democratic-leaning Independents have evolved during the past six decades – not only in their demographics, but also in their political engagement levels, political attitudes and ideology, and voting behavior. The results suggest that the demographics of Independents have remained largely consistent over time, though political engagement, attitudes, and behaviors of this group have changed considerably. Specifically, the data suggest that “pure” Independents have significantly different attitudes and behaviors in comparison with “partisan-leaning” Independents.

The Syntactic Influence of the King James Bible on English Literature

John Harold Dover

John Justin Brent, Ph.D.

Department of English

This project evaluates the influence of the King James Version of the Bible (KJV) on later English literature. Such an evaluation is important because scholars such as Cleland Boyd McAfee, David Jeffrey, Hannibal Hamlin, and Norman Jones have claimed that the KJV has influenced English literature without providing much evidence to support their claims. Computer generated searches were used to locate specific types of phrases in digitized English texts written before and after the KJV and determine whether the KJV likely caused change between these two periods of texts. This project concludes that the KJV did not introduce these phrases into English literary texts but suggests that the KJV probably popularized several biblical idioms.

Investigating the role of zinc finger protein, ZF30C, in epigenetic repression of *Drosophila engrailed* gene

Jessica Escobar

Payal Ray, Ph.D.

Department of Biology

Polycomb group proteins (PcG) are conserved epigenetic regulators that serve to sustain the transcriptional repression of target genes by chemical modification of histones. Polycomb Repressive Elements (PREs) are DNA elements necessary to act as binding sites for *Drosophila melanogaster* PcG proteins to regulate target genes. *Drosophila engrailed* gene expression occurs in the posterior part of wing disks and is silenced in the anterior regions by PcG-mediated methylation of Histone 3 at lysine 27. Engrailed PRE is made up of multiple sites for DNA-binding proteins that function to recruit the PcG complexes to that locus. However, two of these sites bind to unknown factors. To address this, a DNA-IP coupled mass spectrometric screen was performed which identified Zinc Finger 30C (ZF30C) as a candidate protein. As a first step to validate this candidate, we performed computational modeling of Zf30C- DNA interactions and established a stable interaction of the former with the en PRE region. Subsequent experimental analysis using immunohistochemistry on polytene chromosomes, showed the ZF30C partially colocalizes genome-wide with the validated PRE DNA- binding protein Pho. To analyze the mechanistic role of ZF30C at the en PRE we performed Chromatin Immunoprecipitation (CHIP) and were able to conclude that ZF30C is present at engrailed PRE. Taken together, our data reports the identification of a novel DNA binding protein that binds the en PRE and regulates its expression.

How Do Income and Race Inequalities Affect People in the Workplace?

Kristopher Jordan Evans-Williams

Carla Hall Alphonso, Ph.D.

Department of Sociology

The main goal of this project is to explain the challenges that income and race inequalities have on people in the workplace. This project uses three important techniques in SPSS, which are descriptive statistics, correlation, and regression. By performing these analyses, we can obtain exact and correct information about the relationship between income and race inequalities in the workplace. The information will be compared through four multiple regression models. For example, model one will focus on race/minorities, model two will focus on education, and model three will focus on the comparison between race/minorities and education. Lastly, model four will compare all three, race/minorities, the amount of education, and with region as a control variable. The tested hypothesis for this proposal is “states with a higher percentage of minorities attending college will have higher incomes.” When minorities have a higher education, the amount of money that they earn yearly increases, and this could possibly decrease the amount of inequalities in the workplace because everything would be even as far as who did certain jobs. Most of the data dealing with minorities percentages with an education and their incomes will come from the United States Census Bureau from 2019.

Forgotten Things

Caeley Olivia Golla

Robert E. Stutts, M.F.A.

Creative Writing/English

This collection is titled *Forgotten Things*, a series of nonfiction essays about observations. I am discussing how much importance small things have. As a collection of information that would easily be overlooked, the goal is to give light to the beauty and power of small observations and small moments. This series of essays includes observations about a fellow student, notes on the stories behind collected items, and information about crows, their intellect, and how they pick favorite things and people.

Transposon-based Mutagenesis in *Acidovorax avenae*

Hyland Chantal Gonzalez

Austin Young Shull, Ph.D.

Department of Biology

Acidovorax avenae subspecies *avenae* is a bacterial plant pathogen that devastates cereal crops. Strains of this bacterium and other of its genus live in the soil but also infect various significant commercial and horticulture crops. At the present time, not much is known about this genus or how its pathogenic variants cause disease. The purpose of this Honors research is to characterize strains of *Acidovorax avenae* subspecies *avenae* with novel mutations in order to better understand the pathogen and how its genetic mutations can affect virulence factors, connecting genes to phenotypes, with the overall goal of characterizing the individual mutant colonies in attempts to capture a holistic view of the mechanisms potentially responsible for its growth in acidic and high salt soil environments. Twenty-four *Acidovorax* mutants previously created using transposon mutagenesis and actively selected for phenotypic mutations were grown up and underwent DNA isolation. The DNA was then ligated and transformed, and the plasmid containing the transposon was isolated along with the gene next to it. This sequence was then amplified using PCR and sent off to be sequenced. Using the genetic sequences collected, various bioinformatic tests were performed, and this information was catalogued for practical use and to contribute to increasing knowledge about *Acidovorax avenae* subspecies *avenae*.

The Mexican Revolution and Women in Post-revolution Mexico

Hyland Chantal Gonzalez

Jaclyn Ann Sumner, Ph.D.

Department of History

The Mexican Revolution (1910-1920) was a significant event in Mexican history that impacted millions due to the social and political changes that resulted from it. Women were deeply involved in the revolution in a variety of roles as soldaderas, nurses, propagandists, and soldiers. While the fighting stopped, revolution lived on in reforms and the 1917 Constitution, considered one of the most progressive of its time. Yet, their effects on women varied based on region, race/social class, and occupation. This project focuses on the avenues I investigated to develop my research question: how and in what ways did the Mexican Revolution affect societal perceptions of women? In my presentation, I examine the historical background of women's roles within the revolution and post-revolutionary interactions between women, politics, and society. Then, I discuss the historiography of women's involvement in the revolution, where I place my research within the historiography, and the primary and secondary sources I used. In conclusion, Mexican women created new societal roles for themselves as revolutionary citizens with their participation in building the revolutionary state, moving beyond perception in traditional roles as only wives and mothers. As a result of women's negotiations with the state and society, society created new stereotypes of Mexican women, both positive and negative.

What Sets Entrepreneurs Apart?

Jonas David Ha

James Tobin Turner, Ph.D.

Department of Economics & Business Administration

What makes an entrepreneur? Several works in the field of entrepreneurship have examined the features that entrepreneurs share, whether that be actions, personality traits, or life events that shape them. In this study, I build upon these works by studying the obituaries of entrepreneurs featured in either the *Walls Street Journal* or the *New York Times* during the years 2015-2021. Using this corpus and natural language processing, I analyze 8,280 obituaries, of which 323 are for entrepreneurs. I find that obituaries place a heavy emphasis on the facts of an entrepreneur's life and background, such as their work and early life, but place little emphasis on their personal characteristics simply as characteristics. Furthermore, I find that more than 72% of entrepreneurs in my sample come from a background where neither parent has a high-status position. Interestingly, I do not find evidence of common personality traits between entrepreneurs within my corpus.

Spiritual Fervor and Military Tactics in the First Crusade

Grayson Andrew Horton

Rick Heiser, Ph.D.

Department of History

With the conclusion of his sermon at the Council of Clermont in 1095, Pope Urban II could hardly have fathomed the reaction that was to ensue. Decrying the sinister acts of evil men in opposition to the church, Urban called on the devout Christian to avenge the desecration of his brethren and the Holy Land in what would become known as the First Crusade. Examining the significance of spiritual zeal and military prestige in the First Crusade, the presentation will evaluate what role the two factors played in the First Crusade, to better understand the phenomenon as a whole. Furthermore, a variety of secondary and primary sources are incorporated to build a better understanding of the historical context, historiography, and to ultimately facilitate an argument regarding the significance of military tactics and spiritual fervor.

Educational Challenges Faced by Hispanic Students and Solutions for Schools

Vanessa Huerta

Julia Wilkins, Ph.D.

Department of Education

In this presentation, I discuss challenges faced by Hispanic students and their parents in the United States. Hispanic students face many educational challenges that are often more pronounced for new immigrants, such as adjusting to the U.S. education system, language barriers, cultural barriers, low expectations from teachers, and lack of parental involvement in school. Studies have shown that parents do not feel valued and welcomed in the schools, and teachers often do not have an understanding of the different cultural backgrounds of Hispanic students. Based on the research findings, I provide recommendations for teachers to help remove some of the barriers to Hispanic students' educational success.

Seeking Equality through Sound: How African American Artists Transcended Race through their Music

Mary Katherine Kelly

Terry Barr, Ph.D.

Department of English

African American artists have embraced many challenges concerning racial genres and music. With the help of certain artists, many have crossed over genres and even created new sounds that were different from the mainstream “pop.” This presentation will analyze key artists who not only crossed over with their music but transcended racial barriers in the music industry.

The Effects of Dietary Iron on the Taxonomic Composition of the Gut Microbiome in Zebrafish, *Danio Rerio*

Mattie Elizabeth Kennedy

Stuart Gordon, Ph.D.

Department of Biology

Sequencing advancements have allowed for the characterization of unculturable microbes like those found in the gut microbiome. Specifically, 16S rRNA sequences can be used to identify and classify microbes to construct a taxonomic profile of the microbiome. This taxonomic profile can reflect gut health where imbalances can be measured by changes in the microbiome taxonomic composition. As iron is a limiting nutrient for growth in the microbiome, varying levels of dietary iron may have an impact on the taxonomic composition of the gut microbiome. Hypothesis: Taxonomic composition and phenotypic profiles of the Zebrafish microbiome will differ in response to high and normal levels of dietary iron determined by sequencing.

To test the hypothesis, zebrafishes were separated into two groups and fed a normal or high iron diet. DNA was isolated from the gut contents and used to generate 16s sequences. The sequences were trimmed, and quality filtered to increase the quality of the reads. Alpha and beta diversity were then measured within QIIME2 to determine intra- and inter-sample diversity between normal and high iron groups, respectively. Then, p-values were calculated using a PERMANOVA to determine statistical significance of the alpha and beta diversity. For taxonomy, QIIME2 uses an ASV-picking method to classify sequences where the reference

genome was the Silva_99 rRNA database.

Preliminary results suggest statistically insignificant changes in the alpha and beta diversity between normal- and high-iron levels as indicated by the PERMANOVA completed within QIIME2.

Factors Associated with E-cigarette Use in College Students

Rachel Kestin

Eileen Ward, Ph.D.

Department of Pharmaceutical & Administrative Sciences

There are growing concerns for the number of young people who have started using e-cigarettes. From 2018 to 2019, the percentage of high schoolers who report using an electronic cigarette device in the last 30 days increased from 20.8% to 27.5%, according to the National Youth Tobacco Survey.

The purpose of this research is to describe factors associated with e-cigarette use or avoidance in college students at Presbyterian College (PC). The survey explored various concepts such as patterns of use and exploring concerns that prevent use or prompt quitting.

An electronic survey was sent to all degree-seeking, undergraduate PC students, age 18 years and over, seeking to identify if participants had ever used an electronic cigarette and what other factors may be associated with use or avoidance. The survey was available for 4 weeks, with a gift card incentive for participation. Descriptive analyses were performed.

262 participants completed the survey and were included for analysis, with 132 (50.4%) stating they have vaped before, deemed “vapers,” and 131 (49.6%) stating they have never vaped before, deemed “nonvapers.” Few vapers (7.9%) were daily users of e-cigarettes while a majority (55.9%) vaped less than once monthly. Health concerns and expense of vaping were predominant concerns

among vapers while nonvapers noted a lack of interest and fear of health issues as reasons to avoid vaping.

We concluded that vaping is prevalent on the PC undergraduate campus, which could lead to addiction, health problems, altered academic performance, and other issues. Future research could explore interest and feasibility of cessation programs for students.

Effects of Increased Dietary Iron On the Functional Potential and Taxonomic Composition of the Zebrafish Gut Microbiome

Kobie J Kirven

Stuart Gordon, Ph.D.

Department of Biology

Iron is an essential nutrient for both humans and most bacteria. For humans, inadequate iron levels can lead to iron-deficiency anemia (IDE), which affects hundreds of millions of people annually. Many places around the world use dietary iron supplementation as a treatment for IDE; however, these supplementations have been shown to increase the level of pathogenic bacteria and decrease the levels of beneficial bacteria in the gut microbiome. It is not known whether increases in dietary iron causes changes to the functional potential of the gut microbiome. Here, we sought to determine if increases in dietary iron levels cause changes to the functional potential of the gut microbiome using zebrafish, *Danio rerio*, as a model organism. We show that dietary iron supplementation leads to decreases in several pathway abundances associated with purine metabolism and nucleotide sugar metabolism. These results help to further elucidate the complexities of iron metabolism in the gut microbiome that can be beneficial in developing safe and effective treatments for IDE.

Disguising the Nude in Art: Images of Venus from 15th to 19th Century Europe

Sophie Rose Krist

Laura Crary, Ph.D.

Department of Art History

What makes one female nude risqué while another is considered beautiful? Why was Titian's reclining nude perceived as beautiful while Manet's nude was judged adversely and surrounded by controversy? The subject of female nude originated with the popularity of the Greek goddess Aphrodite, also known as the Roman goddess Venus, and her Venus imagery has underlain the tradition of the female nude throughout Western art history. Venus, the goddess of love, fertility, beauty, and sexuality, not only was significant to the Romans or Greeks, but her image also played a significant role in how the female nude was perceived and critiqued by the Western art public. The subject of Venus allowed art containing the female nude to have protection from charges of impropriety and allowed it to be viewed with acceptance and reverence. New ideas of the Renaissance sparked a renewal of the female nude genre, leaving behind the typical heroic male nudity from biblical scenes. The Renaissance gave birth to the growth of the pagan female nude subject matter and association of beauty by name and its impacts are evident throughout not only Italian Renaissance artists' works such as those by Sandro Botticelli and Titian, but also French Rococo artist François Boucher and Impressionist Édouard Manet. Every female nude is not a "Venus," but by naming their works similarly to that of the goddess and having a Venusian influence, the viewers see a common subject matter differently.

The Effects of Complex Sphingolipid Pathway Mutations on Regulated Cell Death in *Saccharomyces Cerevisiae*

Madison Mikayla Ladines

Evelyn J Swain, Ph.D.

Department of Chemistry & Biochemistry

Regulated cell death (RCD) in *Saccharomyces cerevisiae* is homologous to the cell death response (CDR) in mammals known to be responsible for certain chronic illnesses and diseases. Sphingolipids, consisting of a sphingosine attached via an amide bond, a fatty acid tail and head group, are known to be vital structural and signaling molecules within cells. Little is known about the effect complex sphingolipids have in the regulation of RCD; however, there is preliminary evidence based on ceramide that sphingolipids are in fact involved in this regulation pathway. This study seeks to use gene deletions within the complex sphingolipid pathway to determine downstream effects of RCD in *Saccharomyces cerevisiae*, which is a model organism for humans. Cell viabilities, microscopy techniques using various fluorescent stains, and oxygen consumption assays were used to study the effects of these various deletes on RCD induced by acetic acid. This data could be used to work towards a more complete understanding of how to control and model CDR in humans in relation to chronic illness and disease.

From Loved to Loathed

Michael Robert Malinovsky

Richard Heiser, Ph.D.

Department of History

The Knights Templar and their purpose during the twelfth through early fourteenth centuries has been a heavily researched topic among historians. However, what seems to be less expounded on is how the order began as a widely accepted confraternity of men, but ultimately ended up being ostracized and ultimately loathed by almost all of Christianity. This capstone looks to discern how the Knights Templar began as a pillar for Christian ideals and protection, and then became an order strewn with charges of heresy and corruption. Furthermore, this capstone hopes to add to the historical conversation about the Templars' spectacular downfall.

By Any Other Name

Ian Grant Kent Owens

Robert E. Stutts, M.F.A.

Creative Writing/English

By Any Other Name is a series of short stories all set in star-spanning universe plagued by war and destruction. Overall the stories will communicate the horrors of war, dealing with those uprooted from their homes, innocents caught in the crossfire, the dehumanization of soldier, etc, all with a space opera twist to them. At the same time, though, this will be a character-driven project, as all of the protagonists come to terms with the Grand War of Silence and its far-reaching effects.

Poverty Vs. Education

Keith Lamont Pearson Jr

Carla Hall Alphonso, Ph.D.

Department of Sociology

For years poverty has been a major issue within society. This study focuses on the idea that poverty affects educational performances of students in our society. Moreover, I hypothesize that school districts with a larger number percentage of students living in poverty are expected to have lower national achievement test scores. The null hypothesis is that school districts that have a high percentage of impoverished students do not have significantly different national achievement scores of students. For this study I use math, reading, and science scores, which lead me to using a multiple regression model. The scores that are used, as well as the percentage of impoverished students, come from eighty-one districts throughout the state of South Carolina. The data used in this study has been recorded from the year 2020. Achievement test scores represent the DV, and the percentage of individuals under the poverty line will represent the IV. Through this I run my data results using descriptive statistics since the data is continuous. Also, the scores being used will range from 1-40.

The Effects of Abuse and Neglect on Student Behavior and Learning

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The purpose of this research is to investigate the effects of abuse and neglect on student behavior and learning. I reviewed twenty-six empirical studies from nine different countries. In all studies, participants had experienced different types of abuse and neglect. The main findings from this research were that abuse and neglect lead to social, emotional, and behavioral problems. In addition, students experienced attention and learning problems, which were often a result of physical differences in the brain of abused and neglected individuals. These behaviors can often lead into an adulthood resulting in mental health problems and risk-taking behaviors. It is important for teachers to become more aware of the outcomes of neglect and abuse on students' behavior and educational difficulties. When teachers can recognize the symptoms of abuse and neglect, they can intervene, which will help to develop positive behavior and emotional responses that will increase students' success in the classroom and mitigate the effects of negative adult outcomes.

Cancer Stem Cell-Specific DNA Methylation Changes Correspond with Worse Clinical Prognosis in Breast Cancer

Paris Langley Rizzo

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Department of Biology

Cancer stem cells (CSCs) are thought to be a self-propagating cell subpopulation in bulk tumors. These cells serving as the source for tumor growth can demonstrate worse clinical characteristics, such as chemoresistance and metastasis, and can be clonally selected for during replate. Therefore, identifying the presence and progression of these cell types within a patient tumor would be highly beneficial from a prognostic standpoint.

The goal of this study was to use the 450K DNA methylation profile of isolated cancer stem cell populations from the cell line MCF10A p53- /PTEN- and compare it to its non-cancer stem cell subpopulation counterparts to identify the genes that contain the most abundant CSC- specific DNA methylation changes. From our candidate gene panel, we then compared how the differentially methylated genes affected prognosis in The Cancer Genome Atlas (TCGA) breast cancer dataset.

In our analysis that isolated genes containing differentially methylated probes in both CpG-rich and poor regions, we created a list of 292 candidate genes that changed within CSCs. Based on this list, we compared how DNA methylation changes in these genes corresponded with certain clinical characteristics and found that 60 genes corresponded with worse progression-free survival, 44 genes with overall survival, and 27 genes that corresponded with both parameters (logrank p-value <0.05). For these genes, almost

all reflected worse prognosis when the average DNA methylation levels decreased, due to many of the changes occurring within the gene body of these genes. Examples within our overlapping 27 gene panel included OVOL1, DOK7, RBM47, and PLEKHA7, all of which demonstrated low expression in basal-like breast cancers as compared to luminal cancers.

Our analysis reveals a panel of genes whose CSC-specific DNA methylation changes correspond with worse clinical prognosis, thus providing candidate epigenetic biomarkers for predicting disease progression. The prognostic and functional consequences of these differentially methylated genes should be further investigated.

The Effects of Dietary Iron on the Taxonomic Composition of the Gut Microbiome in Zebrafish, *Danio Rerio*

Kaitlin Alice Roberts

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Department of Biology

The microbiome is important to the health of a host because it supports many physiological functions. It aids in digestion of food, supports immune function, and drives metabolic processes. Iron is an essential mineral that encourages microbial growth. The question of how the gut microbiome of zebrafish would be affected by increased dietary iron levels was tested experimentally by feeding two groups of zebrafish different amounts of iron, high (experimental) and normal (control). It was hypothesized that there would be a significant difference in the gut microbiome taxonomic composition based on 16s rRNA sequences. It was also hypothesized that the taxonomic composition of the microbiome would be similar whether 16s sequences or total metagenomic sequences were compared. Preliminary results suggest that there was not a significant difference between the gut microbiomes of zebrafish that were fed a high iron diet and those that were fed a normal diet, though the species composition was not correlated between the exp. and control. Comparison between 16s and total metagenomic data showed similar results. These results suggest that although iron can encourage microbial growth, it is not the driving force in determining gut microbiome composition in zebrafish.

Microfossils of the Pee Dee Formation in Florence, South Carolina

Riley Swindell

Michael Rischbieter, Ph.D.

Department of Biology

Microfossils are calcium carbonate remains of microscopic organisms commonly found in marine sediments such as those underlying South Carolina's Coastal Plain, a region of the state stretching from the Fall Line to the Atlantic Ocean. Because the geologic history of the Coastal Plain is largely the result of the advance and retreat of the ocean coastline across the span of millions of years, many marine fossil localities can be found in the state, ranging from the early Cretaceous Period to the later Quaternary Period. One such site can be found at the famous upper Cretaceous Burches Ferry locality along the Pee Dee River near Florence, SC. This site was made famous in the early 1960s when fossil belemnites discovered there were used to standardize mass spectrometers for use in isotopic studies. The objective of this project was to isolate and identify microfossils of the Pee Dee Formation from matrix samples previously collected at the Burches Ferry locality to gain a better understanding of the diversity and frequency of microfossil taxa in these Upper Cretaceous sediments. Matrix samples were crushed and fine sieved with a Gilson #18 brass sieve. Samples were then placed in a 70 micron sieve to separate the microfossils from the finer rock sediments. Samples were allowed to dry and were then sonicated in an alcohol bath to clean surface calcium deposits

from the microfossils. Microfossils were then isolated under a dissecting microscope and placed on an SEM stub, which was then sputter coated for SEM observation. A variety of microfossils, including many species of foraminifera and ostracods, were identified and catalogued.

Breaking the Cycle: Women Surviving and Escaping the Cult Environment

Riley Swindell

Terry Barr, Ph.D.

Department of English

Cults are distinct from mainstream religion in that they often take the accepted religious canon and adapt it in ways considered to be unusual and unconventional, if not a little alarming, by outsiders. Though some turn to proselytizing to sustain their membership, most cults tend to rely heavily upon the continued subjugation of their most vulnerable members: women and children. This cycle, rooted in childhood indoctrination and unwittingly perpetuated by those it aims to keep down, disempowers and disenfranchises women, marking them as 'less than' and relying upon their own internalized guilt and resentment to keep them under control. Therefore, breaking this cycle in order to bring about large-scale change must begin on an internal level; to liberate the body, the mind must first be freed, and this arduous process can take several paths, the scope of which this project aims to explore while understanding how it is that these systems continue to function to begin with.

The Effects and Influence of African American Religious Music During the Civil Rights Movement

Amber M. Trammell

Terry Barr, Ph.D.

Department of English

African American religious music was deeply embedded in in the Civil Rights movement. Freedom songs motivated people during the Civil Rights movement and brought about change in the culture. Understanding the origins of freedom songs and the way African American Music was used in the Civil Rights Movement helps us to understand the place and emphasis of music on this aspect of America's road to equality.

Interpreting Myoelectric Signals via Machine Learning Algorithms

Marigordon Rae Varner

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Technological advancements in the medical field have created a gap that is created based on the quality/cost ratio associated with using these advanced medical solutions. Similarly, low-cost and open source prosthetics often sacrifice much of the natural mobility that a more expensive prosthetic could provide. Our goal is to develop upper prosthetics that are both low-cost and provide natural control functionality for the user. Using an open source 3D printed prosthetic hand combined with electronics of our own design to measure and interpret the myoelectric signals generated by the user. These myoelectric signals are used to control the prosthetic giving the user intuitive operation. As we studied these signals, we observed that flicker noise was dominating the recorded signals. However, this noise is removed in Fourier space, leaving a cleaner data set from which we determine a machine learning algorithm and features. The decision tree algorithm had the highest predictive power with the features such as maximum and minimum voltage, and the dominant frequency component of the myoelectric signal. Through this work, we move towards the creation of a low-cost but high functioning upper prosthetic that will enable many upper amputees to live a life of confidence and mobility.

Space Weather and Physiology

Grace Eun-Hye Wanliss

James Alexander Wanliss, Ph.D.

Department of Physics & Computer Science

There is a strong connection between space weather and fluctuations in technological systems. There are also chronoastrobiological connections -- for instance, the obvious circadian rhythms. The strongest space weather phenomenon are magnetic storms, also known as space storms. DST, the disturbance storm-time index, is the most closely examined of all space weather metrics. It provides an excellent measure of the intensity and development of space storms. The goal of this research challenge is to determine any correlations between physiology, using a decadal scale series of human physiological measurements, in comparison to DST.

Carbon Footprint Changes due to Football Conference Transitions: Presbyterian College as a Case Study

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Department of Economics & Business Administration

To determine the carbon footprint of PC football through time and over different levels of play, I gathered data on modes of travel, schedules, and venues from the PC athletic website, gobluehose.com, and the archives at Presbyterian College's James H. Thomason Library for the years 1971-72, 2005-6, and 2016-19. Additionally, I created mock schedules for Fall 2021 and 2022, based off of the Spring 2021 football season. I applied these figures to carbon calculators for both motorcoaches and airplanes to determine the CO₂ emitted for the respective years. The calculations show a substantial increase in carbon emitted from the PC football team's travel as it changed athletic divisions and conferences.

FGF19-mediated Expression Signature in Tobacco Related Head and Neck Cancers

Sara Rylee White

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Department of Biology

Head and Neck Squamous Cell Carcinoma (HNSCC) is the sixth most common cancer worldwide and has poor treatment options. Smoking is a known risk factor, and tobacco-associated HNSCC has been proven to have a worse prognosis. However, little is understood regarding the mechanisms that cause HNSCC cancers to be biologically different. Recent evidence shows a gene, fibroblast growth factor 19 (FGF19), is upregulated when HNSCC cancer is exposed to tobacco. To further explore this, we compared the expression of FGF19 high HNSCC cancer patients versus basal expression and saw a difference in genes involved with xenobiotic metabolism. These signatures are seen to be enriched in patients with current smoking history. Expression analysis of HNSCC cancer cells treated with FGF19 revealed eighteen genes with clinical correlations associated with tobacco use, anatomical site, and survival through their similar metabolic function designed to maintain a homeostatic state when challenged with xenobiotics, such as tobacco. Therefore, our evidence demonstrates a connection between metabolic induction and FGF19 for preventing cell death in tobacco-challenged HNSCC cancers, indicating a potential chemotherapy resistance phenotype.

Women in the Crusades

Tanner Moore Wilhelm

Richard Heiser, Ph.D.

Department of History

The topic of women in the Crusades is one that has been largely left in the shadows of the crusader's history book. However, through examining primary documents, we can see that women were included and considered in the crusading era. What is less clear is the specific roles women occupied during this era, and whether women could affect the crusades from these various roles. This capstone seeks to understand the specific roles in society women played during the crusades, and to understand if women held any agency to affect the crusades, either directly or indirectly.

Food Safety Over the Whole World

George Ethan Williams II

Carla Hall Alphonso, Ph.D.

Department of Sociology

This study explores food safety cross-nationally, as well as the safety and health security risk given globally. How do different countries' food safety and wealth impact how food is made and produced? I will collect my information by using an aggregate data set and putting the information I find to help show my independent and dependent variables in the quantitative data. My independent variables are GDP (in billions) and safety of food (out of 113 countries); my dependent variables are life expectancy for males and females. I also include a control variable of global health security index scores to show the preparedness in food safety. The analysis includes descriptive statistics along with a multiple regression for my IV and DV, as well as a Pearson's correlation to display the connection between the variables that will all be completed using SPSS. The sample size used in my project is fifty countries that have been selected randomly over the 113 countries to choose from. My data comes from the World Health Organization 2017, as well as Global Food Security Index 2019 and Global Health Security index 2019. My hypothesis, as tested, is that as food safety improves, life expectancy increases as well.

Paleopalynology of the Eocene/Oligocene transition in the White River badlands of WY

Jaden Michelle Kar-Yun Yam

Michael Rischbieter, Ph.D.

Department of Biology

The White River Formation stretches across South Dakota into Wyoming and terminates in Colorado. This formation contains well- preserved vertebrate fossils in sedimentary rock strata, extending from the late Eocene to the early Oligocene. During this period, there was a worldwide climate change event that caused a shift from warm-moist in the Eocene to cool-arid in the Oligocene. Pollen and spores were well preserved in this strata and have been used in studies in nearby localities (Colorado and Nebraska) as a proxy for various environmental conditions. If climatic conditions were changing, then the pollen and spores should similarly have been changing to reflect new plant groups that were moving into this area and emerging as dominant flora. This palynological research served to fill in the gap left from the lack of plant megafossils in the area. Based on standard palynological procedures, more than fifty-two taxa of pollen and spores were identified, including pine, alder, birch, asters, grasses, and several fern species. The pollen and spore data collected is indicative of an environment that was temperate with moderate rainfall. The delayed cooling in the Douglas, Wyoming locality may be attributed to microenvironmental differences due to the proximity to the ancient North Platte River.

Creative Writing: Senior Portfolio

Debby Simpson Young

Robert E. Stutts, M.F.A.

Creative Writing/English

“A Bad iSongs Love Story” is a fun way of combining my love of music with poetry. My other poems honor my family and love of reading. My short story “The Ransom” is the tale of a kidnapped princess who realizes she is being ransomed in order to force her father to sell an unused plot of land to a dying kingdom so the people there can survive and thrive. Once freed, she appeals to the Seer of her kingdom, who sees justice is carried out on the island. This act finds her in the midst of a battle that may create an enemy of her own family. “Mirror Mirror,” a re-telling mix of classic fairy-tales, is the story of a young princess whose fairy godmother has her navigating her way through mirror-lives as a maid, a mouse, and a frog in order to become a more thoughtful and mature person. My novella, “Wobniar, The Weather Girl,” is the story of a young women learning to handle her newly developed powers while negotiating changes in her everyday life. She eventually emerges a stronger, more confident, and content person.

Grit and its Relationship with Athletic Performance in Female Collegiate Athletes

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Department of Psychology

Grit, describing one's perseverance and passion for long-term goals, has been identified in prior research as an effective predictor of performance in a wide variety of environments. In the current study, the relationship between grit and athletic performance was examined. The Short Grit Scale (Grit-S; Duckworth & Quinn, 2009) was administered to each player on a collegiate Women's Basketball team to establish baseline scores. As a proxy of athletic performance, individual Player Efficiency Ratings (PER) were calculated from the team's 2019-2021 seasons. Power analyses suggested a larger sample size could be needed for the strong negative correlation between baseline Grit-S scores and '19-'20 PER ($r(7) = -.287, p = .454$) to reach statistical significance. Next, we developed and facilitated multiple intervention sessions targeting research-informed strategies for improving grit. Data regarding the players' perceptions of the sessions were gathered and analyzed as formative and summative assessments of the intervention's quality and utility. Finally, post-intervention Grit-S scores were collected in order to analyze the relationship between change in grit and PER ($r(7) = .555, p = .121$). Recommendations for the further exploration of grit with larger, more diverse sample sizes will be discussed.

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