



April 19, 2018

Dear Faculty, Students, and Guests:

The *Promise of PC* is our strategic plan to help students achieve their full potential in today's world. What better time to see the *Promise of PC* in action than on Honors Day, a day devoted to academics and student success? The writing assignments, presentations, and research that students work so hard show us how well we are accomplishing the mission of Presbyterian College. I'm proud of the standard of excellence put on display in the honors work that our students complete under the guidance of faculty mentors.

Honors Day is a time to celebrate our students' achievements. It's also an inspirational day of creativity and research. I hope each of you will join me in listening to our students present their work, ask questions, and evaluate responses. The day culminates with Honors Convocation, a time for us all to acknowledge the extraordinary academic achievements of students.

Congratulations to those who are presenting their work, those who are receiving awards, and those who have mentored them along the way. Each of you is a great example of what it means to be a Blue Hose.

We have numerous guests on campus today who are with us to witness and celebrate these accomplishments. To all, I extend on behalf of the Faculty of Presbyterian College a hearty welcome to Honors Day 2018.

Sincerely Yours,

A handwritten signature in black ink, appearing to read 'Bob Staton'. The signature is fluid and cursive, with the first name 'Bob' and last name 'Staton' clearly distinguishable.

Bob Staton '68

President



April 19, 2018

Members of the PC Family,

We are excited to highlight the particular academic and creative accomplishments of our students. The projects you see here highlight the intense and exciting work students pursue with faculty mentors in the College of Arts and Sciences and the School of Pharmacy. In pursuing these creative activities, students are enhancing their academic abilities and demonstrating the drive to succeed in their various pursuits.

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 provides the opportunity for exceptional students to explore deeper issues within their majors. This Symposium, then, gives us a unique opportunity to share these experiences, and all of the hard work that goes along with them, with all of you on this very special day.

Congratulations to everyone participating in the 2018 Honors Day Symposium, and that includes those of you who have served as mentors, supervisors, and guides for our presenters. Special thanks go to those faculty and staff who have organized today's events and compiled this booklet for your review. Without their diligence and commitment to the success of our students, this day would not be possible.

I hope each of you enjoys the 2018 Honors Day Symposium.

Sincerely,

A handwritten signature in black ink that reads "Donald R. Raber II".

Donald R. Raber II, Ph.D.  
Provost

# HONORS DAY SYMPOSIUM

PRESBYTERIAN COLLEGE  
APRIL 19, 2018

## William the Conqueror's Impact and Legacy

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**Matthew B. Abney**

Richard R. Heiser, Ph.D.

Department of History

William the Conqueror's successful invasion of England in 1066 marked the beginning of a wave of political and economic change in Europe that was entirely unintended. William I implemented small changes during his reign, but the consequences reached far and wide despite his best efforts to maintain old English practices. His relaxed attitude towards his English subjects allowed the Anglo-Saxon culture and language to flourish even after it had been subjugated by Norman invaders. William the Conqueror's legacy is often overlooked in Medieval history, but his impact on England and greater Europe had widespread ramifications that lasted generations.

## Secrets Beyond the Gate? Commonalities between the Conspiracy Theories of Area 51

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**Dalya J. Amer**

Michael A. Nelson, Ph.D.

Department of History

This capstone presentation is about the mysteries that lie behind the gates of Area 51. What is it about Area 51 that draws Americans to become crackpot conspiracy theorists? Area 51's secrets and military protection has many Americans wondering what could be so top-secret that it must be censored from the rest of the country. The affairs that take place in Area 51 have caused many people to congregate forming online communities to share facts and opinions on the function of this military base. These theories have taken a life of their own and have become a national phenomenon. Many citizens become conspiracy theorists because of their growing suspicion due to these top-secret projects (or "black projects") that are so heavily guarded. It is only natural that these conspiracies begin to surface as a result of their newfound paranoia and lack of trust from a government that has led us to believe they are protecting our best interests. The most common beliefs and theories among our country have correlated to projects pertaining to extraterrestrial beings and their technologies. The objective for this project is to look at the commonalities of the most widespread beliefs and theories of Area 51 and its extraterrestrial ties from beyond.

## The Value of Wilderness Therapy

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### **Ashlee C. Anderson**

Robert A. Bryant, Ph.D.

Department of Religion & Philosophy

The purpose of this project is to research wilderness therapy: what it is, the theories behind it, how it works, and what makes it different from traditional indoor therapy. Wilderness therapy uses physical activity, mentally engaging tasks, and social interactions in wilderness environments to enhance traditional counseling experiences. The benefits of using wilderness therapy are evident in improving the lives and well-beings of those who receive it. Sadly, wilderness therapy is not well known, nor is it understood why it works so effectively. Wilderness therapy can be cost efficient, typically costing less than traditional therapeutic programs. This research project investigates the techniques used in wilderness therapy and how it can be incorporated to improve traditional counseling and therapeutic programs. I hypothesize that wilderness therapy can be an effective alternative to traditional counseling and in some instances is superior.

## Isabella, She-Wolf of France: An Examination of Queenship and Power During the Middle Ages

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**Brenna B. Ashe**

Richard R. Heiser, Ph.D.

Department of History

Queenship during the High Middle Ages was a “fragile political institution,” where the queen’s position was contingent upon the strength of her connection to a male authority; this authority was commonly a close male relative, such as a father, brother, and/or husband. Few women in history have been able to manipulate this “fragile political institution” to their favor. Isabella, the she-wolf of France, was both queen consort and regent of England during her lifetime (1295- August 1358). The primary question this presentation aimed to answer was: how did this apparently young and naive woman both assert and keep her power during her time as queen? This presentation argues Isabella seemed to be able to effectively utilize her position through using the “traditional position” of a wife to her advantage, draw on the aid of her French royal family, and taking advantage of the political climate in England at various points during her reign. Isabella, the she-wolf of France, became a formidable woman over her time as queen of England and regent (during a period of her son’s minority).

## From Human Rights to Civil Rights: An Examination of MLK, Jr.'s Evolution and the Response of the FBI

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### **Reese F. Bates**

Michael A. Nelson, Ph.D.

Department of History

This research focuses on the evolution of Martin Luther King, Jr.'s goals and ideas from 1960 up until his assassination in 1968, and the responses made by the Federal Bureau of Investigation, FBI. The FBI became increasingly more interested in Martin Luther King, Jr. as his ideas changed and evolved. Theories surrounding MLK, Jr.'s death routinely accuse government agencies of being involved, specifically the FBI. Rather than focusing on the details of the assassination, I will consider the relationship between Martin Luther King, Jr. and the FBI eight years prior to the assassination. To answer my question, I looked at four defining moments in Martin Luther King, Jr.'s ideological evolution and mapped out the responses made by the FBI.



## The IRS & Taxes: A System Americans Love to Hate

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### **Katherine E. Bishop**

Karen R. Mattison, M.Acc., CPA

Department of Economics and Business Administration

Taxes are one of the certainties of life; yet, people have always disliked them. This attitude is prevalent in documents dated thousands of years ago up until today. The entity put into place to govern federal taxes in the United States, the Internal Revenue Service or IRS, has drawn a dislike among Americans as well. The questions to be answered in this research are: (1) Have opinions of the IRS changed over the last 100 years? and (2) Has the IRS become more respected or loathed? This research contains documents with people's attitudes beginning in the fourth millennium; it then takes a journey through Biblical times, the 1700s, the enactment of corporate and individual income taxes in the late 1800s into the early 1900s, and tax acts throughout the entire 20th century up until the Trump Effect. It ends with analyzing information from interviews with accounting practitioners. These interviews were conducted with professionals in both the private and public sectors of accounting. Though these interviews may seem biased, the researcher was not allowed by the IRS to interview their personnel. Based on the research performed, it can be concluded that opinions of the IRS have stayed consistent over the last 100 years. Though this research does not attempt to solve the problem of the animosity towards the payment of taxes nor the Internal Revenue Service, it does provide insight to the complaints and problems that American taxpayers and practitioners face.

## Measuring the Granular Density of Modes in 3D

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**Sydney A. Blue**

Eli T. Owens, Ph.D.

Department of Physics and Computer Science

Sand covering the earth, snow, and even plastic balls in a ball pit are all considered granular materials. Granular acoustics is the study of how sound travels through granular materials, which are made up of a collection of distinct, macroscopic particles. When these particles are packed together, they create a heterogeneous distribution of forces inside the granular material. This heterogeneous force distribution can cause the granular material to reach a jamming state, in which the materials encounter a phase change-like shift in behavior. Granular materials can act like a liquid while under low pressure, but as the pressure increases they enter a jammed state and act more like a solid. This study will focus on a measurement called the density of modes, which is a measurement modeled from density of states. The density of states describes the amount of energy states at each frequency, and is a property of a thermal system. Since granular materials are athermal, white noise can be utilized to vibrate the granular materials in a random way in which we can approximate the density of states of the material. The goal of this project is to use granular acoustics to find density of modes of various granular materials in order to learn about the jamming transition of granular materials.

## Examining Bird Diversity at Musgrove Mill SC State Historic Site

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### **Tiffany C. Bogan**

Rachel M. Pigg, Ph.D.

Department of Biology

This research quantified bird diversity within Musgrove Mill State Historic Site and determined if woodpeckers are an environmental indicator for overall ecological health. Musgrove Mill State Historic Site is dedicated to preserving the land that hosted the Battle of Musgrove Mill during the American Revolutionary War. This land is home to an abundance of birds. Cavity nesting birds like woodpeckers provide benefits for other birds, increasing bird diversity. Woodpeckers have been identified in other ecosystems as an indicator species, meaning they are predictive of overall bird diversity. Monitoring an indicator species is a cost-effective, efficient gauging of sustainable biodiversity. Bird species at selected sites were tallied throughout the research project, and bird diversity was quantified using standard measures of biodiversity. Possible effects of geographic variables on bird diversity were also explored. My research provided specific metrics of bird diversity, which could aid park managers and park guests better understand the bird diversity within the park and hopefully provide more reasons to further influence the preservation of the land and the species that inhabit it.

## The Hussite Revolt

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### **Carl A. Burnett**

Rick R. Heiser, Ph.D.

Department of History

The Hussite Revolt, also known as the Hussite Revolution, was one of the strongest efforts for political and ecclesiastical reform in Bohemian history, but what exactly was the Hussite Revolt and was it truly revolutionary? This research project focused on how the Hussite Revolution challenged and redefined existing social structures in Bohemia in order to solve the problems presented by the religious instability of Western Europe. In addition, this project also analyzed the history leading up to this revolution, its authors, and the impact that this event had on Bohemian and European history.

## Physics of Braiding

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### **Brandt B. Cameron**

Chad L. Rodekohr, Ph.D.

Department of Physics and Computer Science

This project evaluates the construction of a braiding apparatus to further research in the field of braiding. The project concentrates on (1) the construction of a mount on an existing braiding apparatus designed to allow the machine to braid horizontally, (2) the mending of the spools and overall quality and condition of the machine, and (3) the creation and set up of a take-up wheel, which permits the ability to increase or decrease the rate of braiding and modifying the type of braid created.

## The Dendroclimatic Signal Found in Shortleaf Pine in the Piedmont of South Carolina

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**Victoria E. Cannon**

Michael O. Rischbieter, Ph.D.

Department of Biology

Dendrochronology is the science of using tree ring growth patterns to date archeological structures and track environmental changes. Dendroclimatology, a subcategory of this science, looks at how changing weather conditions affect ring width. For this study, cores were taken from shortleaf pines in areas near Clinton, SC, prepared and measured, then analyzed using climate data from various databases. Yearly/monthly precipitation and the Palmer Drought Severity Index (PDSI) were compared to yearly ring measurements. Cores from three environments were extracted using the Haglof Swedish Increment Boring Device. The DBH, an environmental assessment, and GPS coordinates for each tree were recorded. The cores were prepared following standard dendro protocols. Each core was measured using the Velmex System and data was entered into Measure J2X. The data was then entered into Excel to gather correlations, standardizations and produce graphs illustrating common trends. Two dendrochronology data packages, COFECHA and ARSTAN, were used to establish correct cross-dating and assess the impact of endogenous versus climatic effects on ring growth. Precipitation changes did not show high correlations with ring growth. PDSI values showed significant correlations with certain segments of rings. Based on these high correlations, shortleaf pine appears to be responsive to environmental variables and may be a candidate species for use in assessing climate change in the Piedmont of South Carolina.

## Refugees in Germany

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**Lauren B. Carrizales**

Patrick D. Kiley, Ph.D.

Department of International Studies

Immigration and refugees in Germany are not a new phenomenon, but the attention that this political issue has garnered in the 21st century has grown exponentially. The Muslim population in Germany is considered one of the largest in the European Union. The immigration process has created a considerable amount of controversy, especially in light of terrorist attacks. The responses towards this particular group have been varied across Europe. There have been calls for change in immigration and asylum laws from conservative groups in the Bundestag. A growing right-wing political party, called the Alternative for Germany, has risen in popularity due to their nationalist views. The atmosphere has shifted in Germany since the 20th century concerning this issue. The culture surrounding the immigration process has been hostile in nature, but there are other aspects to take into consideration. Besides the rise of nationalist views, the immigrants living in Germany have to find a balance between assimilating to appease their neighbors and to uphold their own culture. Our research will investigate both sides- the immigrants and the citizens- who live in Germany, and how they are reacting to the immigration process.

## Obtaining a Representative Sample to Assess Campus Climate: Sexual Assault

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**Margaret B. Childress and Gillie R. Smith**

Sarah C. Burns, Ph.D.

Department of Psychology

Sexual Assault on college campuses is a controversial issue in the United States. The current research is an effort to assess these kinds of concerns on PC's campus by developing a valid and reliable survey to collect data from PC's population on these issues. This approved, 20-35 min survey was created using Qualtrics and administered to the faculty, staff, and students of Presbyterian College during the Spring 2018 semester. Our goal is to obtain a large, representative sample using targeted emails and personal encouragement of participation. Following each email, we will analyze what demographic groups are not responding and target those groups on campus to ensure a large, representative sample. The data will then be used by Student Life to make our campus safer for all students.



## Regional Rural Counties: Unequal Report Rates of Rape and Sexual Assault

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**Alexandra V. Cook**

Carla H. Alphonso, Ph.D.

Department of Sociology

This research investigates the United States of America's reporting rates of rapes and sexual assaults in rural counties across the country. It has been discovered through research that rural counties underreport these two crimes more than non-rural counties. The question that lies is, what region of the country under reports these crimes the most? It is hypothesized that the southern region of America under reports more than anywhere else on these crimes. The results reporting rates of rape and sexual assault were discovered using the two national data bases from 2015: the Uniform Crime Report and the National Crime Victimization Survey.

## Domination in Graphs

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**Brandon N. Cook**

Kara L. Shavo, Ph.D.

Department of Mathematics

This project focuses on domination in graphs, a relatively new area in Discrete Mathematics with important applications in science and technology. We investigate both vertex and edge domination and graphs that are edge critical with respect to both types of domination. These are graphs such that the addition of any edge changes the domination number. We will focus on several special properties of 3-edge-critical graphs and characterize connected 3-edge-critical graphs of order less than 8.

## Victorian Britain and the North

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### **Madison E. Corthell**

Jerry Alexander, Ph.D.

Department of English

Despite geographic isolation, England has a rich history, full of interactions with other nations and people which have left their mark on England and influenced its culture in a myriad of ways. During the Victorian Age (1830-1900), a time of rapid advancement and change, the English people clung desperately to their roots, many of which had been shaped by England's association with other cultures. The Victorian Age was also a time of cultural eclecticism. Scandinavian influences in England flourished in music, poetry, prose, and drama. The composer Edvard Grieg was an immensely popular composer in England during the Victorian Age and even collaborated with the influential Norwegian playwright Henrik Ibsen to create *Peer Gynt*. Poets like Alfred, Lord Tennyson and Matthew Arnold drew upon Norse myths for inspiration while John Ruskin and others inundated prose with Nordic themes. The taste for the arts of the northern sea-faring nations of Iceland, Denmark, Norway, Sweden, and Finland influenced the arts of the small island nation by enriching the culture and imagery of their works. The significance of Scandinavian influence on Victorian England illustrates England's insecurity in a time of rapid social and technological advancement as well as exposes the diverse and enduring roots of English heritage.

## Modern Cultural Connections Between France and Scotland

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### **Madison E. Corthell**

Patrick D. Kiley, Ph.D.

Department of International Studies

On the surface, Scotland and France seem like two very different countries with little in common. Scotland is part of an island, a member of the United Kingdom, along with England, Wales, and Northern Ireland, speaks English as its official language, uses the British pound instead of the Euro, and has a Celtic, rather than Romantic, heritage. France is a large nation on the continent of Europe, maintains its own sovereignty, speaks French, is one of the main stabilizing forces for the Euro, and has a proud blend of Germanic and Romantic traditions, cultures, and heritages. Despite these differences, Scotland and France are connected by a long history that goes back over one thousand years. Scotland and France's old Medieval alliance against England, known as the Auld Alliance tied the two different kingdoms together against a common foe, cementing a bond connecting between the two. Despite the Auld Alliance and their modern membership in the European Union, Scotland and France would seem to have very little to do with each other. In fact, nothing could be further from the truth. Following the dissolution of the Auld Alliance, Scotland and France have maintained close cultural bonds that are reflected in everything from politics and the military to fashion, music, and language. Sometimes obscure and often subtle, these cultural ties between Scotland and France continue to shape the identities of both nations.

## Hemispheric Lateralization of Pun Processing

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### **Abigail L. Crisp**

Kate A. Godwin, Ph.D.

Department of Psychology

The purpose of this study is to better understand the way the brain processes specific kinds of speech information that could be interpreted in multiple ways. More specifically, previous literature has suggested that different kinds of speech require different degrees of laterality to be processed correctly. For our study, we will be assessing the laterality of pun processing through a dichotic listening task. Participants will begin by completing an Edinburgh Inventory to assess their degree of handedness, as handedness has been shown to influence laterality. Following the inventory, participants will move on to complete the dichotic listening task, with each trial consisting of either two neutral sentences or one neutral sentence and one sentence containing a pun. The participants' task will be to identify whether or not a pun was present. For this test, the participant will first be presented with a practice block of 12 trials, followed by two blocks of 192 trials each. Finally, an online questionnaire will be used to collect relevant demographic and health information.

## Myoelectrically Controlled 3D Printed Prosthetics

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**Katherine A. Crosby and Andrew P. Rhodes**

Eli T. Owens, Ph.D.

Department of Physics and Computer Science

For this project, we developed a low-cost prosthetic hand using surface mounted myoelectric sensors and 3D printing. The loss of a limb can be a traumatic experience for a person, but prosthetics can restore the functionality of the limb, and confidence to the user. However, insurance often does not cover the cost of prosthetics, and entry-level prosthetics can cost over \$10,000. This motivates the need for low-cost prosthetics. We have designed and built a low-cost, highly-functional, myoelectrically controlled, 3D printed prosthetic. We use surface electrodes paired with a signal processing circuit of our design to sense healthy muscle contractions. We then use the electrical signal from the healthy muscles to naturally control the prosthetic hand. The circuit uses multiple electrodes to differentially measure independent muscle contractions. The muscle contraction signals are compared to a reference point on the elbow where little to no muscle movement is made. We use machine learning to help the controller modify the movement based on user input during a startup routine. This startup routine learns the user's muscle habits and modifies variables in the code to make the muscular profile unique to the user.

## The Epigenetic Role of Rrp1 in *Drosophila melanogaster*

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**Justin W. Davidson**

Payal Ray Ph.D.

Department of Biology

During development in flies, selective silencing of homeotic genes allows for the specialization needed in the formation of different segments of the fly body. In *Drosophila melanogaster*, Polycomb group proteins are responsible for the selective silencing of different homeotic genes through the formation of Polycomb Response Complexes (PRCs) which are recruited to specific elements (PREs) on the genome where they regulate transcription through histone modification. The exact mechanism of recruitment of the PRCs to PREs is unknown. To identify the DNA-binding proteins essential for the function of a single PRE from the *Drosophila* engrailed gene, a previous study performed a DNA oligomer-based affinity pull down coupled with mass spectrometry (MS), using a fragment of the PRE which identified 25 candidate proteins to the PRE, the most abundant being Repair Recombination Protein 1 (Rrp1). Rrp1 acts as an endonuclease and has been shown to be involved in the DNA repair pathway of *Drosophila*. If it was found that Rrp1 acts in both pathways, it would demonstrate a possible interaction between the mechanisms of gene silencing and DNA repair. Our study has found through the use of polytene chromosome staining that there is a colocalization of Rrp1 and known PRE associated protein Pho which suggests its involvement with PcG recruitment. Current studies are being undertaken to determine genome wide localization of Rrp1 through ChIP and bioinformatics work is also being conducted.

## Does Light Affect Gold Nanoparticle's Catalytic Ability During Topoisomerase I Induce DNA Relaxation?

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**Bardin T. Davis**

Latha A. Gearheart, Ph.D.

Department of Chemistry

When visible light interacts with gold nanoparticles (AuNPs), the AuNPs can “absorb” specific wavelengths, thus exciting a surface plasmon resonance (SPR) and extending an energetic electromagnetic field near a NP's surface. The amount and wavelength of light absorbed depends on the NPs' size and shape and directly affects the SPR. In this research, we examine if different sized AuNPs exposed to light affect the catalytic ability of topoisomerase I (TOPO I) to relax DNA. Our hypothesis is that AuNPs absorbing more light will provide energy for this biochemical process, thus increasing the reaction rate.



## Quantifying Cytokines of Human Cervical Mucus Using IL-17 Proteins and Proximity Ligation Assay

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**Trevoria J. Dendy**

Amy Messersmith, Ph.D.

Department of Pharmaceutical and Administrative Sciences

This project is designed to determine the role of TH17 cytokines in HPV clearance or persistence using the proximity ligation assay. Human Papillomavirus (HPV) is the leading cause of cervical cancer. Although HPV plays a large role in cervical cancer, the virus is not the only factor in carcinogenesis. Cervical cancer is rare after HPV infection because the most common outcome of HPV is clearance followed by type-specific immunity. The quantification of certain cytokines present, such as TH17, would greatly improve the understanding of HPV persistence followed by carcinogenesis. Our goal is to design and validate the proximity ligation assay for the quantification of IL-17 in human mucus samples. The use of the proximity ligation assay allows us to receive accurate and highly sensitive results using small quantities of mucus samples. By quantifying IL-17 proteins in cervical mucus samples, we can validate the importance of IL-17 producing TH17 cells in HPV persistence or clearance. TH17 cytokines are important in the regulation of immunity at mucosal surfaces, but whether this cytokine aids in the persistence or clearance of HPV is unknown. This work will lead to an understanding of the role of TH17 cytokines and cervical cancer caused by HPV.

## Multivariate Comparison of DNA Methylation Events in Breast Cancer Stem Cells

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**Caroline E. Dyar**

Austin Y. Shull, Ph.D.

Department of Biology

Breast cancer is the second most common type of cancer diagnosed amongst women. Recent evidence suggests that breast cancer aggressiveness is associated with a cell subpopulation known as cancer stem cells (CSCs), which are understood to have different epigenomic patterns. Thus, the aim of this project was to analyze DNA methylation genome wide across 19 breast cancer samples to determine if DNA methylation events correspond directly with enriched CSC populations. Unsupervised PCA and matrix dissimilarity analysis revealed three distinct groups that appear to cluster independently based on CSC enrichment. From this analysis, we determined that the methylation events in the gene body correlated more closely to CSC enrichment when compared to promoter DNA methylation events. To determine which specific methylation events defined the 3 identified clusters, we performed differential methylation analysis using ANOVA. Interestingly, the differentially methylated promoter probes tended to be hypermethylated in the CSC-enriched cluster, while the differentially methylated gene body probes were more hypomethylated. Through these tests, we found that gene body methylation events detail a closer progression with breast cancer aggressiveness compared to the promoter methylation events. Thus, these results could help with earlier prognosis through sequential tracking of gene body methylation events.

## Analysis of Omega-3 Fatty Acid Content in Fish Oil Products

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### **Robin Fischer**

Eileen D. Ward, Pharm.D., BCACP, TTS

Department of Pharmacy Practice

The objective of this research was to determine how many fish oil products contain appropriate amounts of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) per serving necessary to lower cholesterol and to quantify serving sizes and EPA and DHA content of fish oil products. Available products were identified through the National Institutes of Health's Dietary Supplement Label Database using the search term, "fish oil." Product labels were reviewed for EPA and DHA content. EPA and DHA content listed on the labeling was added to determine the amount of EPA and DHA per serving. The number of units, such as capsules, gummies, or milliliters, necessary to obtain a total of at least 2000 mg of EPA and DHA was also evaluated. Of 493 products identified, 231 products were analyzed. Three (1.3%) products, all of which were liquid formulations, contained at least 2000 mg of EPA and DHA in the standard serving size listed on the labeling. The total amount of EPA and DHA per serving ranged from 60.2 mg to 2684 mg with an average of 697 mg. The number of servings necessary to achieve 2000 mg of EPA and DHA ranged from 1 to 34 servings with an average of 5 servings. Gummy formulations had the lowest EPA and DHA content and required the most servings to reach 2000 mg compared to other formulations.

## The role of SCFAs of the Gut Microbiota in Autism Spectrum Disorders

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**Kelty M. Fletcher**

Evelyn J. Swain, Ph.D.

Department of Chemistry

There is growing evidence based on research studies that links autism spectrum disorders (ASD) and the human gut microbiome. This review focuses primarily on the studies in the population of children with ASD to determine a possible etiology. Current investigations focus heavily on the role of the microbiota-gut-brain axis in connecting processes in the gut with the activities of the central nervous system (CNS). The products and composition of the gut microbiota contribute to various neurological processes such as behavior. Metabolites of the gut microbiota such as short-chain fatty acids, specifically propionic acid, have profound affects. Alterations in the composition of the gut flora have been shown to have detrimental effects, with severity depending on developmental stage of the individual. Abnormalities of the gut microbiome after the first two years of life contribute to the symptoms and severity of ASD but is unlikely to be the sole cause of the condition. However, these irregularities may prompt regressive autism given by indications from the studies based on GI disturbances. The research studied suggests the possibility that some cases of ASD are due to an abnormal gut microbiome in the first two years of life affecting normal neurodevelopment.

## The Mafia's Involvement in the Assassination of John F. Kennedy

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**Jon C. Forbes, Jr.**

Michael A. Nelson, Ph.D.

Department of History

My research centers around organized crime and its involvement in the assassination of President John F. Kennedy. There is still a great deal of speculation about the assassination of President Kennedy, which has led to numerous conspiracy theories surrounding just about every aspect of the assassination. Centering around key figures in organized crime, such as Santo Trafficante, Jr. and Carlos Marcello, this research focuses not on speculation over who pulled the trigger, but on who ordered it to happen, examining the credibility of different theories, and exploring how these theories have changed over time as more information has become available.

## La Place des écrivaines

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### **Elizabeth A. Fowler**

Julie C. Commans, Ph.D.

Department of Modern Foreign Languages

While the account of history has predominantly been told through the lenses of men, this is not to say that women have never given their input. In fact, many of society's greatest developments can be found reflected in the written works of women. By immersing myself in the works of several female French authors over the centuries, I am identifying unique themes and what they can tell us about the woman's relationship with society at the time of their development and how these relationships have changed, or not changed, since. Commonalities exist and reverberate in many ways. The title for my research is inspired by *La Place*, a novel written by celebrated female French author, Annie Ernaux. I was struck by the title and desired to use it in order to discover how other French women made (and are making) their place.

A good starting point is Louise Labé from the 16th century, since she was one of the earliest known female French authors. Next, I turn to Madame de La Fayette of the 17th century, focusing on her novel *La Princesse de Clèves*, followed by Germaine de Staël of the 18th century with her work, *Delphine*. After, I discuss George Sand from the 19th century and her novel *Lélia*, then 20th-century author Simone de Beauvoir and *Le Deuxième Sexe*, concluding with Marie Ndiaye of the 21st century and her novel *Trois Femmes Puissantes*. Surveying France's past through the eyes of a historically marginalized group is allowing me to observe and expose echoes of their audacity.

## The Paleopalynology of the Eocene/Oligocene Swan Lake Locality, Douglas Wyoming

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**Kassandra L. Glover**

Michael O. Rischbieter, Ph.D.

Department of Biology

The White River Formation is known for the exceptional fossil preservation of Eocene and Oligocene mammals and reptiles, which has helped scientists interpret the paleoecology in central Wyoming during this transitional time when climates were changing from warm-moist to cool-dry. Fossils of the animal remains, including well-preserved skulls and teeth, have helped establish the ecological relationships amongst the plant eating animals, and the carnivores that utilized them as a food source. One aspect of this formation that has not been studied, due to a lack of fossil material, is the actual plant groups that were inhabiting this ecosystem. Swan Lake is a locality of the White River Badlands that was discovered in 1999 and has been found to contain a rich assemblage of the terrestrial plant life that once surrounded this freshwater lake. Although the plant macrofossil remains do help us understand the plant life growing in and around the lake, it does not help in identifying more regional plant types growing away from this lacustrine habitat. The pollen and spores, on the other hand, hold the potential for identifying plants that might have been growing some distance from the lake itself. In this study, we used light microscopy to examine a series of prepared sediment samples to look for diagnostic pollen and spores. We have found a large number of spores and pollen grains, including grass, pine, and others, which supports the idea of a shift to a colder, drier climate.

## Obtaining a Representative Sample to Assess Campus Climate: Diversity and Inclusion

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### **Tamia Hayes**

Sarah C. Burns, Ph.D.

Department of Psychology

Presbyterian College is conducting an online survey which will analyze the diversity of enrolled students as well as their perceptions of inclusiveness. This data is being collected to ensure PC can fulfill its renewed diversity aspirations of having a campus which is more representative of varying cultural backgrounds. The goal of this research is to attain the largest and most representative sample of PC's campus. This objective will be achieved through a four-step progression of targeted e-mails and personal encouragement. The initial survey will surge through the entire campus, via e-mail, on March 25. After waiting three days, another, targeted e-mail will be sent to the class whose response rate was the lowest. Once the responses are analyzed, the other demographics with the lowest response rates will receive an e-mail, with a maximum of four e-mailed surveys per student. To enhance response rates, there will also be personal approaches to varying clubs, sports and organizations on campus. Following each attempt, we will analyze the impact of the approach to inform future data collections.



## Differential DNA Promoter Methylation of the Mitochondrial Glycerol-3-Phosphate Dehydrogenase Gene GPD2 in Breast Cancer Stem Cells

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**Nicole L. Hudson**

Austin Y. Shull, Ph.D.

Department of Biology

Metastasis of breast cancer cells is one of the defining characteristics of aggressive breast cancers and one of the primary concerns when designing a course of treatment. Recent reports have shown that two major factors that drive metastasis are the expansion of cancer stem cells and the adaptation of Warburg metabolism. Based on preliminary results, we observed that DNA methylation in the promoter of glycerol-3-phosphate dehydrogenase (GPD2) promotes metastasis. This project studies the effects of promoter methylation on gene expression as a differentiating factor between aggressive breast cancer lines, such as SUM159, and non-aggressive breast cancer cell lines, such as MCF7. We hypothesize that the hypermethylation of the GPD2 promoter mediates metastasis in aggressive breast cancers, in contrast with the hypomethylation of the GPD2 promoter in non-aggressive breast cancers. We used qPCR, Western Blot analysis, and lactate production assay to measure the differences in gene expression and Warburg metabolism between these two cell lines. Based on our results, we were able to observe that GPD2 expression was suppressed in SUM159 cell lines, which corresponds with promoter hypermethylation. Based on these observations, we can infer that differential expression of GPD2 may play a role in the Warburg phenotype of breast cancer stem cells.

## Skin Reactions with Antiepileptics, Mood-Stabilizers, and Psychotropics

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### **Anderson Isaac**

Erika E. Tillery, Pharm.D., BCPP, BCGP

Department of Pharmacy Practice

The goal of this systematic review is to gather valid and effective literature regarding antiepileptics, psychotropics, and/or mood stabilizers concerning Stevens-Johnson Syndrome (SJS), Dermatological Reaction with Eosinophilia and Systemic Symptoms (DRESS), and Toxic Epidermal Necrolysis (TEN) development. From this literature, the information will be utilized to form a comprehensive guideline to identify patients that are at risk of developing such reactions and highlight proper medical intervention. Articles selected focused on DRESS, SJS, and/or TEN development in patients treated with antiepileptics for seizure control or medications for psychiatric disorders. Of the selected articles, lamotrigine was the most causative agent, and DRESS was the most frequently reported cutaneous drug reaction. From review, patients who developed skin reactions had discontinuation of the causative agent and were not rechallenged with similar drug classes until the condition was resolved. The patients were treated pharmacologically with systemic steroids, immunoglobulins, and/or supportive care; these treatments were patient-specific based on clinician and level of systemic involvement. Upon review, clinicians noted patients in most cases developed reactions due to genetic predisposition, improper drug titration, and/or the metabolic profile of combination therapy. Further in-depth evaluation is warranted as current literature does not propose a definitive protocol for screening or treatment.

## The Impact of Breast Cancer Awareness Education

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**Missouri M. Jenkins and Hillary E. Stamps**

Christopher L. Farrel, Ph.D.

Department of Pharmaceutical and Administrative Sciences

According to the CDC data results in 2014, female breast cancer has the highest incidence rate in the United States compared to all other cancers. From recent data through the American Cancer society, this incidence rate has continued to rise in new diagnosed cases and breast cancer-related deaths in 2017. Poverty, lower education, and lack of health insurance are all factors that are associated with a decreased survival rate with breast cancer. This is due to patients often times having progressed to a later stage by the time they seek medical assistance. Therefore, there is a need for increased awareness by medical professionals within underserved communities on potential signs, outcomes, and resources available for patients of this demographic. The objective of this study is to prepare pharmacy students to become breast cancer educators for the local community in order to aid in reducing the number of new cancer cases, as well as the illness, disability, and death caused by cancer. We conducted 2 workshops between 2016 and 2017 to prepare students from Presbyterian College School of Pharmacy to educate the community on breast cancer risk, prevention, and treatment. A pre-and post-survey was completed by each student before and after the workshops respectively and collected to assess the overall success and efficacy of the workshop. Both workshops were successful in preparing students to educate the community about breast cancer, promote healthier choices, and empower their role in healthcare.

## Join the Conspiracy: Illuminati in American Culture

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### **Andre D. Jeter**

Micheal A. Nelson, Ph.D.

Department of History

The “Illuminati” is a mysterious group that has been accused of many heinous crimes, from the assassination of President Kennedy to taking over Hollywood. The group has definitely made the conspiracy watch list, and being supposedly comprised of very elite and affluent individuals, this group is definitely makes intriguing. People often fear things they do not understand and though most conspiracies can be neither confirmed or denied, it is possible to showcase the findings. Join the conspiracy, and see how the group evolved from being kicked out of Europe to appearing on the back of the U.S. dollar to taking over Hollywood and reshaping American culture.

## Whiskers and Acid

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### **Lee A. Johnson**

Chad L. Rodekohr, Ph.D.

Department of Physics and Computer Science

The goal of this research is to understand what combination of sulfuric acid concentration and time exposure leads to the best tin whisker growth. Tin whiskers often grow on circuit boards that use tin rich solders as opposed to a eutectic tin-lead mixture. The tin rich solders grow tin whiskers at some point; and as these whiskers function as exposed wires, they can cause short circuits. These short circuits cause computer failures. Control of tin whisker growth will thus enable design of better machines or improve the lifespan of new ones. In this project, various acid concentrations will be applied to the tin to enhance whisker growth, and application time will be evaluated. Later, images will be acquire using the electron microscopy to observe which combination resulted in the best tin whisker growth both qualitatively and quantitatively.

## Suspicion Surrounding the Assassination of Martin Luther King, Jr.: Unforeseeable Tragedy or Conspiracy?

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**Vidalo M. Kabiya**

Michael A. Nelson, Ph.D.

Department of History

On April 4, 1968 Martin Luther King, Jr. was shot and killed on the balcony of the Lorraine Motel in Memphis, Tennessee. It was reported that King was killed by a single shooter, James Earl Ray. My research, focuses on the assassination of Martin Luther King, Jr., more specifically on how certain events and incidents that took place prior to and following (and ultimately during) the assassination of Martin Luther King, Jr. led to American citizens questioning the validity the House Select Committee's official report of the assassination. Furthermore, I examine a number of conspiracy theories concerning the assassination of Martin Luther King, Jr. and discuss how those arose based off of the information the public did and did not know.

## *Born This Way in the USA: A Playwright's Discovery of College LGBTQ+ Students*

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**Bryce G. Karlek**

Robert E. Stutts, MFA

Department of English

*Born This Way in the USA* is a two-act verbatim and meta-theatre piece that centers on a playwright's discovery of what it might mean to be part of the LGBTQ+ community. The narrative of the play will be composed of two parts; the first part will be the Playwright character struggling to create a play about LGBTQ+ college students with the Conscience character. The second part will be composed of the stories of the interviewees that have been interviewed for the corresponding Honors Project. The piece will tackle various issues in the LGBTQ+ community (higher suicide rates, "coming out" to family and friends, and religion's relationship to the interviewee), and tackle the idea of the Playwright character properly representing the LGBTQ+ students. The play will end with the Playwright not fully understanding the community, but looking to continue better understanding the LGBTQ+ students. The presentation will include the writing process the playwright went through, what research aided in the playwright's writing, and the interview process.

## Sabbath as Civil Disobedience

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**Jacob D. Kennedy**

Kirk J. Nolan, Ph.D.

Department of Religion and Philosophy

Sabbath is the spiritual practice of reserving specific times during a person's or community's life for rest or reflection by abstaining from exercises that are common in a normal week. Sabbath is experienced through the commonality of worship and reflection on the world that surrounds individuals or communities. Civil Disobedience is the practice of utilizing planned arrest, marching, and speaking in order to bring to light a problem that is plaguing society and oppressing individuals or groups. In previous works done by social theologians, a correlation between these two practices has not been written about. However, there are clear conclusions that this study can draw between these two spiritual disciplines. Through the experience of practicing Sabbath, the peace that is experienced should be spread throughout the entire world through the practice of civil disobedience. This is not the only way this peace can be found, but it is certainly one of many. The purpose of this paper is to provide the scholarship of why adopting the practice of Sabbath inspires people to commit acts of civil disobedience. It is hoped that through this research, individuals and communities in religious contexts will begin to adopt the practice of Sabbath within their own lives so that they might experience the peace that is found and spread it throughout the world via civil disobedience.



## The Production of a Synthetic, Bacteria Resistant Surface Material Based on Shark Skin Morphology

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### **K. Joseph Kern III**

James T. Wetzel, Ph.D.

Department of Biology

In healthcare environments, it is crucial to maintain optimal hygiene to prevent healthcare-acquired infections. The formation of bacterial biofilms on surfaces in these environments may increase the probability of gastrointestinal, respiratory, and skin infections in patients or employees. To possibly decrease the likelihood of obtaining one of these infections, a Sharklet synthetic surface may be utilized to reduce bacterial adhesion. Sharklet technology is based on the pattern of shark denticles, which create turbulence near the edge of the shark's body while swimming, therefore reducing frictional drag. However, the patterns of these denticles also inhibit the ability of bacteria to adhere to shark skin; with this knowledge, a Sharklet synthetic surface is produced based on the denticle patterns of Gulf Coast sharks such as *Sphyrna tiburo* and *Rhizoprionodon terraenovae*. The patterns are retrieved using scanning electron microscopy (SEM), and the SEM files are converted into STL files using mathematica. From these STL files, a synthetic copy of the sharkskin is produced using 3D printing and is tested for its degree of bacterial inhibition.

## Rediscovering the Heritage of the Methodist Class Meeting in the Twenty-first century

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**Joseph D. Kovas**

Craig A. Vondergeest, Ph.D.

Department of Religion and Philosophy

In the Christian churches of today as well as in the Methodist denominations, there are Christian groups that meet weekly apart from the Sunday service known as small groups. The small group movement has become a way for churches to participate in discipleship ministries. Small group ministries are not a new concept to the Methodist Church. In the eighteenth century, John Wesley developed discipleship small groups called the class meetings which were the “core” and the “distinctive” characteristic of the Methodist movement. This study proposes the small groups of today are spiritual descendants of the Wesleyan small groups that foster discipleship development and evangelism through Christian accountability. The project studies and observes United Methodist Churches’ discipleship small group ministries in the South Carolina Annual Conference and places them in conversation with the eighteenth-century class meetings. Scholarship on this project will provide ways for laity and clergy in the Methodist tradition to utilize their own heritage of small group ministries to help Christians grow as disciples of Jesus Christ and to impact people’s lives surrounding their community.

## Rediscovering the Heritage of the Methodist Class Meetings in African Methodism

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**Joseph D. Kovas**

Craig A. Vondergeest, Ph.D.

Department of Religion and Philosophy

In the eighteenth century, John Wesley developed discipleship small groups called the class meetings, which were the “sinews” of the Methodist movement. Although the class meetings were the foundation for the Methodist movement, the class meetings began to decline in the mid-19th century and by the 20th century they were almost extinct. However, the African Methodist church communities have preserved the spiritual practice and ministry of the class meetings. This study proposes the class meetings and class leaders have continued to be an effective means of pastoral oversight by engaging the laity in ministry. The project studies and observes class meetings in African Methodist church communities and places them in conversation with today’s Methodism. Scholarship on this project will provide ways for laity and clergy in the Methodist tradition to utilize their own heritage of class meeting ministries to help Christians grow as disciples of Jesus Christ and impact the spiritual lives of church communities.

## Motivations Behind Two Narcissistic Subtypes: Grandiose and Vulnerable Narcissism

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**Alex S. Lykou**

Stephanie D. Freis, Ph.D.

Department of Psychology

This study aims to expand trait narcissism theory in non-clinical populations by investigating grandiose and vulnerable narcissism. Individuals high in grandiose narcissism (GN) are self-centered, extraverted, entitled, and feel superior. Individuals high in vulnerable narcissism (VN) are also self-centered and entitled but hold negative self-views and lack confidence. Historically, narcissism theory focuses on narcissists' self-enhancement motivation to bolster their self-esteem but fails to describe VN behavior. The Distinctiveness Model of The Narcissistic Subtypes (DMNS, Freis, 2017) offers new motivational understanding of trait narcissism: both GN and VN have excessive need for distinctiveness, but orient toward that need differently, focusing on achieving more distinctiveness or protecting current distinctiveness. This study tests the DMNS. We randomly assigned 350 online participants to read a distinct or non-distinct product advertisement. Participants then answered a series of self-report questionnaires. I predict individuals high in GN or VN will have more positive attitudes for the distinct product, be more upset if they cannot own this product, and be willing to pay more for it. I also predict individuals high in GN will want to own the product to increase their distinctiveness, whereas individuals high in VN will want it to secure their distinctiveness.

## Survey of Stream Pollution from Roads along the Enoree River in Musgrove Mill Park

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**Ryne W. Maness**

Rachel M. Pigg, Ph.D.

Department of Biology

The objective of this project is to determine the level of impact that roadways have on waterways, like the Enoree River. Drainage from developed areas and soil erosion put the river at risk of eutrophication. The increase in nutrients can lead to an algal bloom. This phenomena results in a large accumulation of algae, effectively blocking sunlight from phototrophic organisms below. Dead algae are broken down by bacteria that decrease the amount of dissolved oxygen in the water. If large enough, this decrease in dissolved oxygen can lead to macrovertebrae death. We utilized two sites at Musgrove Mill State Historic Site (the Enoree River and Cedar Shoals Creek), in order to compare a larger waterway to a tributary. Ten sites approximately 100 feet apart beginning at areas directly beside bridges (i.e., road-stream crossings) were sampled. Measurements of pH level, stream velocity, dissolved oxygen concentration, turbidity, algal cell count, and absorption spectra were taken at each site. We hypothesized that areas within close proximity of road crossing would see an increase in algal abundance and lower levels of dissolved oxygen. According to our results, areas of high turbidity and high algal cells and low dissolved oxygen were best explained by a combination of distance from road and the velocity of the stream. High pH level was also found to be associated with distance from road. Results from the Enoree river require a broader scale of study in order to detect a distinct pattern.

## The Media's Flawed Coverage of the 2000 Election: The Validity of Conspirators' Arguments

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**Paul M. Mauer**

Michael A. Nelson, Ph.D.

Department of History

This research project examines whether the conspirators who believe that Al Gore was the actual winner of the 2000 U.S. Presidential Election are correct to believe that the media poorly covered (1) the issues encountered during the election, (2) the recounts that followed the election, and (3) events occurring afterwards. This project draws from conspiracy sources that make this case, and compare the arguments made by these sources with what the media actually said at the time. The project establishes that several of the important arguments made by these conspirators have validity, but that some of the other arguments are misguided due to underestimating the complexities surrounding the election and recount. The results of this project indicate that there are plenty of reasons to question the ability of the media to properly cover flaws of American democracy, especially when it comes to elections.

## Unique Factorization: Bridging the Gap

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**Robert W. McAbee**

Brian D. Beasley, Ph.D.

Department of Mathematics

This talk will explore the concept of unique factorization of elements and ideals in various contexts. In rings of algebraic integers in complex number fields, unique factorization of elements into products of irreducibles is not guaranteed. However, in these rings, factorization of ideals into products of irreducibles will always be unique, up to order. This presentation will show examples and results in both of these situations.

## Yeast as a Model System for Mitochondrial Dysfunction and Mitochondrial Dysfunction as Possible Causes for Autism Symptoms

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**Kendall R. McDill**

Evelyn J. Swain, Ph.D.

Department of Chemistry

Autism is a poorly understood behavioral and neurodevelopmental disorder. There has been extensive research on the disorder; however, there is no conclusive cause for the disorder. Recent studies have suggested that mitochondrial dysfunction could play a role in autism either as a cause or as a continuing risk factor in autistic patients. Oxidative stress also has a role in the autistic patients' mitochondrion as a vicious cycle forms where mitochondrial dysfunction leads to more oxidative stress which leads to abnormalities in the mitochondria. This oxidative stress has been linked to both genetic/biological and environmental causes. In this research, the role of mitochondrial dysfunction in autistic patients will be reviewed as well as possible causes for the oxidative stress that leads to the continuous cycle of dysfunction.



## Estimating Heterosis of the Maize Phyllosphere Microbiome

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**Kristin N. Miller**

Stuart G. Gordon, Ph.D.

Department of Biology

The mutualistic relationship between humans and microbes (the microbiome) has been extensively studied, but the plant microbiome has received less attention. The plant microbiome provides the plant with fixed nitrogen, hormones, and pathogen suppression. It is thought that the microbiome can be influenced by the plant during abiotic stress to provide the plant with what the environment cannot, and this ability could be utilized to increase crop production worldwide as water and nutrient shortages decrease food security. Maize is at the forefront of this research as it is one of the most widely grown and economically important crops. We hypothesized that hybrid maize lines will have a more stable microbiome when exposed to abiotic stress than their inbred parents. To test this, we grew three maize genotypes (B73, MO17, and their F1 hybrid) under control, drought, or nutrient stress conditions to observe the effects of abiotic stress on maize microbiome composition. The phyllosphere (leaf surface) microbiomes were monitored through an initial and final bacterial sample collection. Using 16s amplicons, the samples were sequenced and classified into operational taxonomic units. Significant differences between treatments and genotypes were measured by alpha and beta diversity statistical analyses.

## The Death of General Patton: The Conspiracy Ignored by History

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**Brandon L. Morrow**

Michael A. Nelson, Ph.D.

Department of History

On December 21, 1945 General George S. Patton Jr. was killed in an automobile accident in Heidelberg, Germany. While his death appeared to be accidental, the events surrounding his death were highly suspicious. Commanding the Third Army following the Allied invasion of Normandy, General Patton was one of America's top generals, having been instrumental in the Allied campaign into Germany. Patton's outspoken nature and gruff leadership style garnered respect, criticism, and importantly; enemies. Surprisingly, following his death in 1945 the majority of news outlets reporting his death did not suspect foul play. Analysis of the automobile accident that lead to his death results in more questions than answers. Such as, how did the two people in the car with General Patton walk away uninjured in a crash that killed General Patton? Why was the driver of the truck that veered into his car not detained? Was Douglas Bazata, an OSS officer, ordered to kill General Patton as he later claimed? This research is not intended to prove these questions or to back a specific conspiracy, but to analyze the many different conspiracies that are out there regarding this event, and the circumstances surrounding his death. This research analyzes the facts regarding the death of General Patton, the many different conspiracies surrounding his death, and the common themes presented among these many different conspiracy theories.

## Beyond the Lone Gunman in the Assassination of President John F. Kennedy

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**Madison P. Reynolds**

Michael A. Nelson, Ph.D.

Department of History

This research project examines the assassination of President John F. Kennedy, and the conspiracy of the presence of more than one gunman involved in his death. Particular focus is placed on the witness testimonies that recount what happened on that November day in Dallas, the forensic details of the case, and the physics behind the magic bullet theory that seems to seal the case of a lone shooter. This research reveals existing evidence supporting the notion that there was in fact more than one gunman, and the assassination plot extends beyond just a lone gunman who hated the president.

## Analysis of Choline and its Up-regulation in the Plasma of ASD Patients: Literature Review Report and Yeast Model of Choline

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**Ashley M. Roberts**

Evelyn J. Swain, Ph.D.

Department of Chemistry

There is a distinct choline correlation between children with autism and children without the disorder. From the heat map of mass spectrometry data generated by the Greenwood Genetic Center, it can be seen that choline is upregulated in the plasma of autistic patients compared to that of the control patients. Thus, the objective of this research is to determine why choline is elevated in the plasma of Autism Spectrum Disorder (ASD) patients, what biochemical pathways are aberrant, and how to remedy the defect. ASD is a general term for a group of complex disorders of brain development that affects 1% of the world's population; therefore, it is important to find a way to eliminate the side effects associated with this disorder. In order to undertake this research, a thorough literary search will be carried out to examine the chemistry and biochemistry of this metabolite along with the metabolic pathways it impinges on. Questions to be asked are: where is choline, how stable is choline as an analyte, where does choline fit in with metabolism, and what role does the compound play in the relationship between endothelial cells and blood cells in the body. Understanding the chemical, physical, and biochemical properties of choline will help to explain why choline behaves the way it does and what functions these special properties play in the symptoms associated with autism.

## Effects of Stimulants on Cardiovascular Activity Over

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### **Amanda Smith**

James T. Wetzel, Ph.D.

Department of Biology

Heart rate is controlled by the sinoatrial node of the right atrium. Impulses generated from this neuroganglia initiate atrial contraction and set the pace for ventricle contraction through relay to the atrio-ventricular node. The sinoatrial node can be influenced by the sympathetic nervous system. Stimulants, like coffee and sugar, can influence this system by overstimulating the cardioacceleratory center sympathetic neurons, which results in an increased heart rate. Caffeine has three major cardiovascular effects: constriction of blood vessels, increase of epinephrine, cortisol, and norepinephrine production, and acceleration of metabolism. The release of norepinephrine onto the sinoatrial node stimulates the node to fire faster increasing heart rate. Sugar takes effect through increasing metabolic processes occurring in cells. As these two stimulants have different mechanisms of action, we hypothesized that sugar would cause a quick and dramatic effect on heart rate while caffeine would cause a prolonged elevated heart rate. To test this, we monitored EKG readings of subjects before and after consumption of either coffee or sugar. We measured their heart rate every fifteen minutes for two hours. These data were then used to determine the extent and length of the stimulant's effect on heart rate.

## Monitoring DNA Unwinding with Quantum Dots

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**Chasmyn K. Smith and Jonathan Gardner**

Latha A. Gearheart, Ph.D.

Department of Chemistry

A nanoparticle is an ultrafine particle with lengths in two to three dimensions greater than one nanometer and smaller than one hundred nanometers. Nanoparticles have been used in a variety of applications including: synthesizing microwave heating, the production of solar cells, and in light dependent resistors. The objectives of this research are to synthesize cadmium sulfide nanoparticles, characterize their visible light emission properties, and determine if different topoisomers of DNA adsorb differently to the nanoparticles. This will be monitored using the emission spectrum of cadmium sulfide assuming DNA-binding will quench the nanoparticle emission differently as a function of DNA topology.

## Lincoln's Proclamation and the Military Intent

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**Mikaela R. Springer**

Michael A. Nelson, Ph.D.

Department of History

On January 1st of 1863, Abraham Lincoln used his presidential power to pass Proclamation 95, more commonly known as the Emancipation Proclamation. Over the years, the passage of this act has come to be known as the freeing of the slaves and seen as one of Lincoln's biggest steps towards equality in America; however, over the past 150 years, both the true wording and true intentions behind both the preliminary Proclamation of 1862 and the final Proclamation of 1863 have been misconstrued.

This research focuses on the true intentions Lincoln held when he wrote and passed the Emancipation Proclamation. The Emancipation Proclamation was no simple civil rights move; it was Lincoln's first true use of total warfare against the rebelling Southern states. This research argues that Lincoln was strongly motivated by military means when writing and editing the Proclamation and how from the beginning of 1863 the North began to lead an increasingly aggressive war campaign, backed by Lincoln's allowance of total warfare and endowed with a sense of moral righteousness with the thought of emancipation on the minds of the young soldiers fighting the campaign. This research examines Lincoln's political rhetoric, biographies on Lincoln as well as his cabinet, military campaigns, and documents and books on emancipation and the effect it had on the war and the nation. It is the hope of this research to challenge the well-known view of our 16th President and his most famous Presidential Order.

## Glenohumeral Joint Anatomy

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### **Ashton A. Stewart**

James T. Wetzel, Ph.D.

Department of Biology

Due to its great mobility and natural instability, the glenohumeral joint is extremely susceptible to injuries. The heavy dependence on soft tissue structures and muscular control through a large range of the motion forces substantial demands on these structures, which results in acute and chronic injuries. A common injury to the glenohumeral joint is a SLAP tear, Superior Labrum Anterior and Posterior, which is an injury to the posterior of the labrum. This research studies the diagnosis, treatment, and post-surgical therapy of a SLAP tear. The dissection of rabbit and mink glenohumeral joints were used to understand mammals' musculoskeletal anatomy and intervention of this joint. Non-invasive imagining techniques, such as an MRI, were studied to detect SLAP tears because they are commonly used to diagnosis this condition. Clay modeling was then used to physically reconstruct the glenohumeral joint - showing the associated ligaments, muscles, and nerves. Rehabilitation techniques following surgical SLAP tear reconstruction were studied and compared to rehabilitation techniques without surgical repair. The study of musculoskeletal anatomy, MRI techniques, and physical therapy techniques provide a better understanding of glenohumeral injuries and how they can be treated.



## Comparing Regional State Government Funding for Public Libraries

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**Kaysie G. Tulanian**

Carla H. Alphonso, Ph.D.

Department of Sociology

The high prevalence of public libraries provides a great opportunity for positive impact on communities in the United States. Since the impact these libraries are able to have will depend in part on funding, this research will investigate funding for public libraries regionally in the United States focusing specifically on state government funding. Due to high levels of poverty in the South and an educational correlation with poverty, I hypothesize that public libraries in the southern region of the United States are expected to have less state government funding than other geographical regions in the U.S. Data used for this research was taken from the 2015 Public Libraries Survey. This existing dataset represents 9,251 public libraries.

## Etchant Accelerated Tin Whisker Growth

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### **Jonathan W. Turnley**

Chad L. Rodekohr, Ph.D.

Department of Physics and Computer Science

Metal whiskers are single crystalline filaments that grow out of the surface of thin films of some types of metals. These whiskers are typically 1-5 mm in diameter and 1-500 mm in height. The prevalence of tin (Sn) based solder means that most of the whiskers that have damaged electronic devices have been Sn whiskers. Examples of devices that have failed because of Sn whiskers include satellites, military radar and missiles, heart pacemakers, computers, and nuclear power plants. While research has historically focused on preventing whisker growth, the high strength and conductivity of whiskers means they could be of use in microelectronics. In order for this to happen, Sn whiskers must be grown quickly and in a controlled manner. This study is part of a series of projects that investigate etchant accelerated Sn whisker growth. Previous results have shown that partial chemical etching of a thin Sn surface sputtered on brass with hydrochloric acid or hydrofluoric acid leads to the development of whiskers in a matter of days. This particular study seeks to accomplish three goals. The first is to develop a method to reliably create samples for Sn whisker studies at Presbyterian College. The second is to attempt to grow whiskers on small islands of Sn as a way to control the location of whisker growth. The final goal is to explain how partial etching of a Sn surface causes rapid whisker growth and to consider popular whisker growth hypotheses in light of these discoveries.

## Transition Metal Dichalcogenides for Application in Supercapacitors

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**Jonathan W. Turnley**

Gurpreet Singh, Ph.D.

Department of Mechanical and Nuclear Engineering,

Kansas State University

Supercapacitors are an emerging class of energy storage devices that help bridge the gap between capacitors and batteries. Nanomaterials have been a major area of study for supercapacitor electrode materials because their large surface area allows for increased kinetics and energy density. Transition metal dichalcogenides (TMDCs) are a group of two-dimensional, layered nanomaterials taking the form  $MX_2$ , where M is a transition metal and X is a chalcogen (sulfur, selenium, or tellurium). TMDCs have been shown to have a wide variety of properties, including good electrical conductivity and mechanical strength, depending upon the combination of transition metal and chalcogen atom. Because of this, certain TMDCs have been suggested as possible materials for supercapacitor electrodes. This research sought to understand the relationship between the choice of transition metal and chalcogen atom on the effectiveness of the TMDC as an electrode material.

## An Analysis of the Economic Impact of Presbyterian College on Laurens County, SC

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### **Sela Claire Vaughan**

Norman M. Scarborough

Business Administration

The objective of this research was to measure the economic impact of Presbyterian College (PC) on Laurens County, SC by quantifying the dollar value and employment return that is created by the existence of Presbyterian College. Data collected from student and faculty/staff surveys on expenditures, employment data from PC, volunteer/internship hours collected from PC, and financial expenditure data from PC will be plugged into IMPLAN software to measure the economic impact that PC has on Laurens County. The results should help explain the direct, indirect, and induced effects of faculty/staff and student spending, operating expenditures of the school, and other factors that are used in the model to determine the overall economic impact of the college on Laurens County. It is important to note that while being able to validate the economic impact that Presbyterian College has on Laurens County, its local economy is very helpful in supporting existence and operations of the College. Improvements to the project will be explained here as well.

## Statistical Patterns of Ant Movements

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### **Brien T. Washington**

James A. Wanliss, Ph.D.

Department of Physics and Computer Science

Ants are known for their tenacity and cohesiveness. These characteristics allow each ant to perform the everyday tasks in order to keep each respective colony operational. Said tasks include, but are not limited to scouting, scavenging, hunting, larvae care, and reproduction. Each ant follows specific patterns when accomplishing their role to the colony. These patterns can be pheromones each ant follows or natural instincts. Needless to say, every pattern requires each ant to move with purpose. However, when given enough time and under specific guidelines, ants will follow a specific path. This path is known as Langton's ant. An ant is placed on a grid with simple rules that leads to a complicated process: 1.) Every time the ant leaves a square on a grid, said square changes from a lighter color to a darker color. 2.) When, or if, the ant returns to that same square and then leaves the square, said square returns back to its lighter color.

These simple rules themselves are known as a cellular automaton, and thus make Langton's ant applicable to computer software. The Langton's ant simulation has allowed us to accurately track random ant motion and relate said motion's statistics to common statistical data. The ant's simulated random motion is significant due to ant's natural ability to follow patterns, thus making their natural motions non-random. One common statistical system we related the random motion to was the stock market.

## Central Economic Planning, Trade, and the Adjustment from a Planned to a Market Economy: A Look at East Germany

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**Alina J. Weismann**

Jody W. Lipford, Ph.D.

Department of Economics and Business Administration

The ideals of the German Democratic Republic (GDR) were full employment, no misery, high literacy rates, and gender and worker equality. These universal goals appeal to many people and even today many people want to work towards them. Central to the attempt to attain the socialist ideal was a centrally planned economy in which the authority determined production, distribution, consumption, and manipulating trade. The idea of a plan that figures out what everyone needs and how to provide for their needs is a huge part of idealistic, futuristic utopian thought. Nonetheless, a utopia can become a dystopia, and undirected trade has always been part of human civilization. In the end, these “ideals” led to the collapse of the GDR and impoverishment of its people. This paper concentrates on this topic and describes the how and why those ideals led to the end of socialist East Germany.

## Internalizing, Externalizing, Communal and Protective Behaviors in Champs Students

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### **Stephanie A. Wilson**

Brooke C. Spatta, Ph.D.

Department of Psychology

Throughout adolescence, relationships with peers become increasingly important and behaviors demonstrated within these peer-groups can serve as an indicator of an individual's psychosocial adjustment. In the current study, a sample of 29 students taking part in the CHAMPS program completed a Peer Nomination Inventory reporting the social behaviors of their peers over three consecutive years from 7th to 9th grade. Using a Peer Nomination Inventory to assess social behaviors eliminates issues associated with social desirability that plague studies that rely on self-report measures. This method of data collection provides information from multiple respondents for each student, increasing the likelihood of an accurate representation of each student's behavior. Analyses to assess significant changes over time in internalizing, externalizing, communal, and protective behaviors will be conducted separately by grade and sex. Based on previous research, we expect to find a significant increase over time for all students across all 4 peer-group behavior categories being studied, with girls demonstrating significantly higher levels of internalizing and communal behaviors than boys at all 3 time points and boys demonstrating significantly higher levels of externalizing and protective behaviors than girls at all 3 time points. Results from this study will provide valuable insight to the CHAMPS organization as they strive to tailor the program to meet the needs of new generations of students.

## The Effect of Grain Shape on Confined Granular Flows

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**S. Clay Wright**

Eli T. Owens, Ph.D.

Department of Physics and Computer Science

Granular materials are collections of macroscopic particles, such as corn, rice, and peas. Confined granular flows are a complex phenomenon that are subject to disorder due to the position of the grains and distribution of internal forces. It has long been observed that the pressure at the bottom of a specific confined granular flow system, the silo, is not proportional to the fill height of grain in the silo, as would be expected classically. We studied the force build-up on the side-walls of grain silos from materials of different aspect ratios, specifically corn, peas, and rice. The model silo used in the experiment was constructed out of sheet metal pipe 121 cm in length and 15 cm in diameter held in place by a frame constructed of aluminum. Four force sensors were evenly spaced vertically at the bottom of the silo and used disks of sheet metal approximately 2.54 cm in diameter screwed into the sensors' internal load cells to evenly distribute the applied force. Our work found that rice exhibited more irregular force build-up, while corn and peas were more regular. This model silo is a statistical system in which different events can occur in different trials. To provide a statistically relevant data set, a larger amount of data was collected than in previous work. Understanding the behavior of confined granular flows with respect to grain shape will provide insight into grain shape's effect on natural phenomena like avalanches, as well as its effect in other granular systems.



## Senior Art Exhibition

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### **Ruth Elizabeth Boggs**

Mark R. Anderson, M.F.A

Department of Art

Simple shapes are what I love to draw and look at. When drawing these shapes in my notebook I noticed that there was pressing emotion in the shapes, which is one of emptiness, void, and hollowness.

The shapes are empty. When looking into the forms one can question why there is this hollowness and empty feeling but the questions cannot be answered. Another question one may ask is what are these organic shapes trying to become. The only way to relate the shapes back to one another is by their color and their emptiness, they are then a unified conglomerate.

This semester I have been working on paintings on both paper and canvas. I try and use complementary colors to make one color contrast to the other. In my art, I hope to show another perspective in the story of the interaction between the simple cell-like forms. Drifting apart or touching one another without breaking is an interesting choice. As an artist I am trying to show the different dimensions of bubble cells when they touch. For each I am using a blending technique which uses the lightest possible amount of pigment and the most available hue. I am working on using the shapes to see the interaction between their sizes and contour. I hope to make larger paintings with various colors, not just one or two. This would show the progression of light on the surface and how it would alter the cells/ bubbles.

When changing what goes on the inside of the cells, I try and make them varied and organic. These shapes are designed to be contrasting colors to the back ground. Van Gogh inspires me to use a wider variety of color but sometimes that doesn't work well with the type of forms I am using in my paintings. Other artists that inspire me are Frank Stella and Georgia O'Keeffe. Frank Stella uses minimal shapes to explore color and dimension. Georgia O'Keeffe uses a blending technique which is subtle. I try to imitate their technique in my forms and space.



*Encapsulation*



*Cloud Nine*

## Senior Art Exhibition

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### **Kaitlynn E. Campbell**

Mark R. Anderson, M.F.A

Department of Art

Calling upon memories of the old farmers working the land their entire lives, a child running through the fields without a care in the world, or one collecting oysters along the sandy beaches, treasuring each as if they are more prized than a pearl, just as I did when I was a child... these became my focus for the works here on. I start by simplifying an object, such as an oyster or a cotton field, with the hopes they would trigger similar memories in others. I chose to simplify agricultural resources of the rural south that have been used as food sources, constructive materials or even just grown for a profit. The earthy tones of the cotton fields were picked to help draw the viewers closer to nature. I also aim to keep a very similar color scheme in many of my pieces that would only further relate to the natural and earthy tones of the rural farmland.

Nature and printmaking both share the common theme of repetition. Through printmaking, I am able to rapidly reproduce multiple prints, such as oyster shells, to easily show the recurrences in nature but also the compulsiveness that repetition can cause. Oysters have an echoing design they rhythmically grow into their gnarly shapes in clusters. I wanted to focus on these repetitive clusters in not only a flat, two dimensional way but also in a three dimensional way. While I created oyster reefs with printed oysters and tulle, I also wanted to produce larger scale individual oysters using wire and tulle to give them the same repetitive nature as the prints. Each oyster is different due to the bending of the wire base yet they still retain their similar banding of the natural oysters.

I have always been fascinated with art. Growing up, artists such as Andy Warhol and Keith Haring inspired me. Warhol inspired me to become a printmaker, which was a passion I found in college. Haring inspired me to create more simplified versions of art, such as my printed oysters.

Alex Peyton-Levine from Chicago, who was doing an artist's residency at Harper Gallery last fall, inspired me to include fabric in my work as well as supporting my idea of placing works on the floor. She also introduced me to the artworks of Kara Walker; another artist who does works relating to the south. Walker's works are much more controversial than mine, which are more familiar memories. Because of Alex's influence, I was able to find more confidence in my work as an artist as well as create work I truly enjoy.



*Oyster Reef*





*Still Life*

## Department of Music Honors Recital Students

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<b>Harris Banks</b>	<b>Sophomore, Physics/Music</b>
<b>Brook Huggins</b>	<b>Senior, Business/Music</b>
<b>Padgett (Trey) Johnson</b>	<b>Junior, Music</b>
<b>Collin McKinnon</b>	<b>Junior, Physics/Music</b>
<b>Paul Peart</b>	<b>Junior, Music</b>
<b>Emlynn Shoemaker</b>	<b>Senior, Music</b>