



# PRESBYTERIAN COLLEGE

COLLEGE of ARTS AND SCIENCES | SCHOOL of PHARMACY

## HONORS DAY SYMPOSIUM

2017





April 20, 2017

Dear Faculty, Students, and Guests:

At the start of each academic year, we look forward to Honors Day as the culmination of a central aspect of the academy. The performance of students on examinations, writing assignments, oral presentations, and research papers are all part of the evidence we gather to evaluate the success of our academic program. Excellence in this enterprise is most clearly discerned in the honors work and research projects that our students complete under the supervision of their faculty mentors.

Honors Day is set aside to celebrate the academic accomplishments of our students. We have the privilege of listening to students present their work, asking questions, and evaluating responses. The day culminates with Honors Convocation when we gather to acknowledge the extraordinary academic achievements of specific students.

It is my pleasure to congratulate those who are presenting their work, those who are receiving awards, and those who mentored them in their achievements. 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 2017.

Sincerely Yours,

A handwritten signature in black ink that reads "Bob Staton". The signature is written in a cursive, slightly slanted style.

Bob Staton '68  
President



April 20, 2017

Members of the Presbyterian College Community,

Honors Day is special for Presbyterian College, and we are proud to highlight the particular academic and creative accomplishments of our students. The projects you see in this booklet reflect important work that students pursue with faculty mentors in the College of Arts and Sciences and the School of Pharmacy. As students engage in research and creative activity, they enhance their academic abilities and develop the drive to succeed in whatever they pursue.

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 provides a place to share these experiences with classmates, professors, and everyone on campus.

Students participating in the Symposium deliver papers, engage in performances, present in shows, and compose publications. Students both celebrate different achievements and receive critical review of their work by experts in their respective fields. Such interactions are essential to the academic or artistic development of any scholar or practitioner.

Congratulations to everyone participating in the 2017 Honors Day Symposium, and many thanks go also to those who have organized today's events and compiled this booklet for your review. Without their diligence and commitment to student success, this day would not be possible.

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' and a double underline at the end.

Donald R. Raber II, Ph.D.

Provost

# HONORS DAY SYMPOSIUM

PRESBYTERIAN COLLEGE  
APRIL 20, 2017

## The Evolution of Dystopian Fear

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### **Olivia J. Aldridge**

J. Justin Brent, Ph.D.

Department of English

Over the past two decades, popular fiction has become increasingly centered on alternate dystopian realities. However, popular series like *The Hunger Games* have roots in literary fiction of the highest order: the seminal classics *1984* by George Orwell and *Brave New World* by Aldous Huxley. Both depicted the development of authoritarian world states in which strict social order was upheld through mental conditioning. However, Orwell forecasted oppression through pain and fear, while Huxley predicted a sort of voluntary oppression through over-indulgence in pleasurable distractions. As the twentieth century progressed, the dystopian canon expanded, notably with Margaret Atwood's *The Handmaid's Tale*, which followed in Orwell's tradition. However, at the turn of the century, dystopian fiction shifted as authors like David Foster Wallace, M.T. Anderson, and David Mitchell refocused their concerns on threats posed by corporations. This shift is also evident in Atwood's work; her dystopian trilogy *MaddAddam* centers on the apocalyptic consequences of unchecked corporate rule. With increased focus on overindulgence in a world of plenty, this new class of dystopia finds its antecedent in Huxley, not Orwell. This presentation will outline the evolution of dystopian literature, and will ponder the reasons for dystopia's shift toward the Huxleyan. Finally, it will pose the question of whether Orwellian dystopia will again rise in prominence as demagogic regimes emerge around the globe.

## *The Fawn Years: Essays for a Place*

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### **Olivia J. Aldridge**

G. Terry Barr, Ph.D.

Department of English/Creative Writing

*The Fawn Years* is a collection of Creative Nonfiction essays that center on the author's hometown of Monticello, a small town of about 2500 people in rural Georgia. In these essays, the author discusses the influence of the town on her burgeoning adulthood through childhood reminiscences on family, tragedy, and Monticello's tumultuous racial politics. From probing into her scholarly father's long career on a poultry farm to recalling a near-riot in her middle school after the 2008 election of Barack Obama, the author poses the universal question of how we learn to both embrace and overcome our origins in order to become individuals in our own right. This presentation will include background information on the project at large (which earned departmental Creative Writing Honors credit), and a short excerpted reading from the collection.

## Sound Propagation through Granular Material

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### **Edgar L. Alford**

Eli T. Owens, Ph.D.

Department of Physics and Computer Science

In this research project, the overall goal is to study acoustic propagations through granular materials in order to better maximize the efficiency of sound coupling. This investigation will be done by sending sound waves through a granular material composed of sand while varying the interface placed in between the speaker, the sandbox. By doing this variation, one will be able to analyze how the size of the interface affects sound propagation through a granular material. The resonate frequencies of the speaker and sensors will also be studied. The piezoelectric sensors used in this experiment are very sensitive, and any kind of resonate frequency, electrical or mechanical, will affect the reading of each sensor. We use piezoelectric sensors to study the effects the size and shape the interface has on sound amplitude in a granular material. By studying these resonate frequencies, one will be able to characterize the data more accurately.



## 3D Veterinary Prosthetics

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**Nicole E. Alleva** and **Sydney L. Ronzulli**

James T. Wetzel, Ph.D.

Department of Biology

Veterinary prosthetics has quickly become a new means to assist handicapped patients, but prosthetics are mainly constructed for patients who have a working joint. Few studies have been done on patients who lost the entirety of their limb. The routine surgery for an amputation consists of removal of the entire damaged limb, which hinders the future use of a prosthetic. Although patients can functionally adapt to using three limbs, there is significant damage to body conformation, an increased effort for movement, and greater stress placed on joints, leading to arthritis and tendinitis. Fitting a prosthetic quickly after the surgery is imperative to decrease muscle loss and facilitate rehabilitation. Ideally, a biomedical implant would enhance the likelihood of a positive outcome; however, this is not widely used in veterinary medicine. The use of 3D printing has recently revolutionized the medical field to produce custom-made biomedical devices for patients. The aim of this research is to construct several prototype prosthetic limbs for a six-month-old cat that has lost its right front limb up to its scapula due to trauma. Our prototype was constructed using a Zeus 3D printer. Our research aims to make prosthetics readily available and affordable for pet owners and offer an alternative to full limb amputation. This will ultimately increase the quality of life of patients.

## Electrochemical Applications of Deep Eutectic Solvents

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### **Musashi J. Briem**

A. Craig Powell, Ph.D.

Department of Chemistry

This project focuses on synthesizing deep eutectic solvents and investigating their electrochemical properties. Several different methods were used in attempting to produce these deep eutectic solvents. Application of these deep eutectic solvents to cyclic voltammetry and electroless deposition methodologies was investigated.

# What Really Guides Hospital Transfer Decisions? Probabilistic Multiple Regression Model to Locate Trends Between Hospital Stays and Transfers and Socioeconomic Factors, Hospital Characteristics and Comorbidity Metrics

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## **Ryan W. Brown**

J. Tobin Turner, Ph.D.

Department of Economics and Business Administration

Healthcare is a field that inherently collects data. As is such, there is an abundance of opportunity within it for analysis. Hundreds of millions of observations and measurements are continuously collected, containing information on everything from socioeconomic class to various binary indications of health risk. In this study, we will look at trends between hospital stays and transfers, and various explanatory variables. We will use explanatory variables from three different categories: socioeconomic factors, hospital characteristics, and comorbidity levels. Our goal is to generate a comprehensive, probabilistic multiple regression model that encapsulates the essence of what truly guides, or is correlated with healthcare stays and transfers. We will use data from 2007 to 2010 from the National Emergency Department Sample (NEDS) for our raw data. We will also use R's 'medicalrisk' package to create comorbidity indices for each patient. Our methodology will consist of using excel, SPSS, and R statistical software to first collect, combine, and organize the data. Then we will use R to evaluate the data statistically. Our final product will be composed of our comprehensive probabilistic generalized linear models (GLM's), as well as various charts and matrices that present our findings simply and aesthetically. Our diagrams will be accompanied by an in depth written analysis that follows a basic journal format.

## Rhetoric Versus Reality During the Crusades

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### **Seth Brown**

Richard R. Heiser, Ph.D.

Department of History

This research project examines the relationship between the religious rhetoric that served as a catalyst for the Crusades and the extent to which that rhetoric was brought to fruition in the actions of the Crusaders. It seeks to accomplish this by establishing the standards set in medieval rhetorical discourses, and then holding the actions of Crusaders as revealed in the chronicles and various histories of the Crusades accountable to those standards. The research reveals that there is evidence that supports the notion that there were many instances in which Crusaders failed to live up to the rhetoric of the time, but these instances do not outweigh the preponderance of individuals whose devotion was within the rhetorical parameters of the time.

## The Northern Crusades: Glorified Border Wars or Actual Crusades?

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### **Carl A. Burnett**

Richard R. Heiser, Ph.D.

Department of History

My capstone presentation is on the Northern Crusades to the Baltic regions. My question primarily revolves around the concept of whether the Northern Crusades were true crusades, how they compared to the crusades to the Holy Land, and if they were successful. I will also discuss the motivations and interests of Church and State during this enterprise, the role of military orders in the Baltic, and how the outcome of this movement determined the overall success of the Northern Crusades.

## Yeast as a Model for Type II Diabetes: Examination of Terminal Ends of HXTs Through Circular Dichroism

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**Hayden C. Caraway**

Evelyn J. Swain, Ph.D.

Department of Chemistry

For the purposes of biochemical/biomedical research, manipulation of the yeast species *Saccharomyces cerevisiae* can be used as an effective means of analyzing glucose uptake via hexose transporter proteins (HXTs) that are homologous to glucose transporters (GLUTs) observed in *Homo sapiens*. Depending on the environment in respect to the amount of available glucose, regulation of specific HXT proteins has been shown to take place via distinguishable pathways where some HXTs are used primarily in high glucose scenarios while others function under circumstances of low glucose concentrations. In this project, terminal end polypeptides of HXT 1, 2, 3, and 4 will be analyzed through circular dichroism in order to identify secondary structure. The reason for taking these analytical measures is to prove/disprove whether these HXTs play a pivotal role in glucose signaling in addition to the scientifically accepted claim that they are essential for glucose transport. The primary hypothesis for this research project is that these HXTs do in fact play a major role in glucose signaling because the exposed N and C termini that are extended from the plasma membrane of the cell are predicted as intrinsically disordered regions. For significance of this project, the comparison between glucose signaling and transport in *S. cerevisiae* is an ideal model for mirroring the dysfunction in signaling and transport of glucose for patients diagnosed with Type 2 Diabetes.

## Induction of P-glycoprotein in Caco-2 cells and Chemotherapy Resistance

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**Catherine R. Christaldi, Rebecca L. Howell,  
and Taylor K. Servais**

Christopher Farrell, Ph.D.

Department of Pharmaceutical Sciences

The purpose of this study was to (1) evaluate if the P-gp substrates losartan and fexofenadine would induce P-gp overexpression in Caco-2 cells, a colorectal cancer cell line and (2) assess whether these chemotherapy naïve Caco-2 cells show resistance to P-gp substrate chemotherapy agents. Caco-2 cells were cultured in EMEM, grown until they were 80-90% confluent, and then subcultured following ATCC protocol. Cells were given either losartan (5, 50, 100  $\mu\text{M}$ ) or fexofenadine (25, 75  $\mu\text{M}$ ). Negative control cells were not given a drug, and positive control cells were given 10 nM vinblastine. Expression of ABCB1 was analyzed using quantitative-PCR (qPCR) and normalized to eEF1 expression. A cell proliferation assay was performed according to manufacturer protocol, with the MTT Cell Proliferation Assay kit. Losartan and fexofenadine treated Caco-2 cells were seeded in a 96 well plate. Same seeding was done for the positive and negative control. Absorbance was recorded at 595 nm. Real-time PCR analysis showed overexpression of P-glycoprotein in the Caco-2 cells treated with losartan and fexofenadine. Positive control cells, cells treated with 100  $\mu\text{M}$  losartan, and cells treated with 75  $\mu\text{M}$  fexofenadine had an increase in the ratio of ABCB1 expression to eEF1 expression compared to the negative control. The MTT assay showed that when the chemotherapy naïve, losartan and fexofenadine treated cells were treated with a chemotherapy agent, the cells showed resistance to the drug.

## The Poetry of Louise Glück: The Search for a Feminine Self

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**Allison R. Cooke**

Kendra Y. Hamilton, Ph.D.

Department of English

This essay looks at the poetry of Louise Glück for how the figures of the young woman/daughter and the mother struggle with and for their self-identity in relation to each other and to themselves. Drawing from the philosophy and literary theory of Jacques Derrida, Julia Kristeva, and Margaret Homans to develop my framing concepts of chora, potential capability, creative self-destruction, and paralanguage, I argue that these two feminine figures demonstrate difficult and traumatic transformations into what it means to be a woman, to have a woman's body, and to find a space of meaning in that identity.



## Campus Climate Research

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### **Sarah R. Fossett and Geena E. Griffith**

Sarah C. Burns, Ph.D.

Department of Psychology

In researching the campus climate of Presbyterian College's peer schools, there are concerns regarding sexual assault and inclusion on the campuses of other small, liberal arts colleges. 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. Once the survey is developed and approved by the Institutional Review Board, it will be administered to the faculty, staff, and students of Presbyterian College in a pilot survey, likely during the fall semester of 2017. The survey will be created using Qualtrics and will likely take between 15 and 20 minutes to complete. It will be sent via email to be taken by participants online, confidentially. As well as developing this survey, the outline of a long-term action plan will be developed to address the potential concerns that arise based on the data from the survey. This action plan will aim to improve the campus climate of Presbyterian College for students, faculty, and staff by making it a safer and more inclusive environment.

## STEM Majors Have a More Positive Opinion of Modern Curriculum and Pedagogy in Introductory Biology

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### **Kassandra Lee Ann Glover**

Rachel M. Pigg, Ph.D.

Department of Biology

As one of the primary general education courses required by Presbyterian College, the course of Biological Concepts (Biology 105) is a valuable asset to the education of those who take it. Within our own Bio 105 program, a new innovative way of teaching is being tested that is student-based that actively engages students in what they are learning. This setting is not purely based on memorizing facts, but also on teaching logical and creative problem solving. The purpose of this experiment was to consider whether or not students feel that they have benefitted from the skills learned in Bio 105 and if their perception has changed over the course of time. For the past few years, students have been surveyed on their opinion of the Bio 105 and Bio 112 courses. A new survey was developed and sent to all students who have taken Bio 105 in previous years and who have taken the surveys. From these surveys, analysis was conducted to infer whether there is a significant change in opinion based on the amount of time passed since taking Bio 105 and if the skills learned in the course helped throughout the rest of their college career.

## Acoustic Investigation of Buried Objects

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### **William M. Grismore**

Eli T. Owens, Ph.D.

Department of Physics and Computer Science

Granular materials are ubiquitous. However, sound propagates through these materials in a nonlinear, poorly understood fashion. Acoustic waves may provide a non-invasive means of investigating granular materials. This project uses acoustic waves to investigate objects buried in a granular material composed of sand, with either a concrete or lead brick buried in the middle. Piezoelectric sensors are placed throughout the granular material; these output a voltage directly proportional to the sound amplitude. The frequency response of the system, with and without the buried object, is studied. We find that the lead and concrete interfaces suggest acoustic reflection, with the lead interface exhibiting more reflection than the concrete interface. We also found that at frequencies below approximately 2000 Hz the sand systems attenuates the acoustic waves better than the concrete or lead systems do, although this is not the case at frequencies higher than 2000 Hz. At these higher frequencies, sound penetrates lead less than concrete, and concrete less than sand alone. We find that the power spectrum qualitatively scales with the interface density at these higher frequencies, but does not scale with the interface modulus or sound speed.

## The Crusades' Other Influences

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### **William Hackney**

Richard R. Heiser, Ph.D.

Department of History

Even though historians agree that religion was the main cause of the crusades, were there other factors that led up to the Crusades, and if so what were they and what effect did they have on the crusades? I look at economic and social realities as well as earlier crusades to see what kind of people and/or events could have influenced the Crusades. The Crusades are a lot more complex than people believe them to be.

## Playing with (and Analyzing) Postmodern Narrative: Novel Intertextuality

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### **William G. Hobson**

G. Terry Barr, Ph.D.

Department of English

Attempting to explain, contextualize, or even define the phenomenon of Postmodernism is extremely difficult. Frequently attempted, this challenge often results in the phenomenon being oversimplified or restricted to only one sphere of knowledge. However, the reliance on a definitively objective and monolithic description-narrative of Postmodernism is borderline impossible and should be openly discouraged as the very structure of postmodern knowledge and narrative is centered on the action of decentering. In this manner, it is far more helpful for postmodern studies to focus on the connections that manifest in the process of fragmentation that is so characteristic of Postmodernism. In this fellowship project, I am attempting to detail these connections in fragmentation by studying the manifestation of intertextuality in postmodern works of prose fiction. Through this research process, I am focused on closely reading postmodern texts in an attempt to make connections as to the largely prominent presence of intertextuality in this area of narrative. I will compare and refine my findings with literary theory and critical evaluations of intertextuality as it relates to postmodern fiction. By doing so, I hope to be able to flesh out one aspect of Postmodernism that helps explain its almost indescribable structure. Additionally, I aim to detail postmodernism's intertextuality by utilizing a comprehensive multimedia presentation form in order to use intertextuality in my research.

## Unintended Consequences of Corporate Average Fuel Efficiency Standards

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### **Tyler P. Hogan**

Suzanne J. Smith, Ph.D.

Department of Economics and Business Administration

One of the ways legislators in the United States try to lower greenhouse gas emissions, oil consumption, dependence of foreign oil, and gain a multitude of other benefits is by applying corporate average fuel efficiency (CAFE) standards to automakers. CAFE standards are laws that mandate automakers have to produce vehicles that are able to achieve a set average fuel efficiency. This research project gives examples of how manufacturers mined for legislative loopholes from around 1990 through the early 2000's and shows many of the unintended consequences of this legislation. Some manufacturers moved final vehicle assembly to another country, reclassified a passenger car as a light truck by changing the vehicle base, built more SUVs which were not classified as cars and not subject to gas guzzler taxes, added flex-fuel vehicles that could also run partially on gas mixed with ethanol, and added weight to a vehicle to change its classification. The paper examines added costs to consumers and suggests market-based alternatives to these standards.

## Theatrical Politics and their Result on Elizabethan Society

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### **Peri Imler**

Richard R. Heiser, Ph.D.

Department of History

For many historians, Elizabeth I's significance lies in her unshakeable nature as a fierce monarch and headstrong Queen who was able both to protect her country from its foes and encourage a thriving sociopolitical culture throughout her reign—that is, a culture that was deeply influenced by the social interactions and ceremonies Elizabeth shared with her people. The evidence presented in this work shows that the Queen's relationship with her subjects was strengthened by intentional theatrical politics throughout her rule. Major examples of theatrical politics include ceremonial events throughout Elizabeth's reign, the Queen's progresses across England, and the religious propaganda through which Elizabeth was able to act as both monarch and friend to her people.

## The Cuban Stationary Bandit: Why Raúl Castro Cannot Afford to Restrict Economic Freedom

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### **Charles W. Inclan**

Jody W. Lipford, Ph.D.

Department of Economics and Business Administration

Since the Cuban Revolution, its leader and former Cuban dictator, Fidel Castro severely restricted economic freedom on the island. As power has shifted into the hands of Raúl Castro, the current leadership in Cuba is showing signs of allowing more economic freedom. To begin, this research includes historical background information from the Cuban Revolution to the fall of the Soviet Union. Additionally, this research project suggests key differences between the Castro brothers and their respective leadership styles, numerical evidence of increased economic freedom under Raúl and the incentives for him to allow more economic freedom. This increase in economic freedom has not led to a decrease in political freedom. Finally, in this research, I studied the effects of increased economic freedom on economic growth and the importance of this form of freedom in small business on the island. The positive effects of economic freedom for Raúl Castro coupled with his retention of political power, suggest the incentives are in place for Raúl Castro to further increase economic freedom for the Caribbean nation.



## The Analysis of SEM and Light Micrographs to Determine the Paleodiet of Hypertragulids of the White River Formation

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### **Allison L. Jenkins**

Michael O. Rischbieter, Ph.D.

Department of Biology

Since the 1800's, the White River Badlands has attracted the attention of many paleontologists. This fossil bed was once an alluvial flood plain environment, which allowed for the ideal conditions that facilitate the preservation of multiple mammalian species, such as the Hypertragulids on which this research is focused. For this project, we analyzed the microwear patterns of fossilized teeth of the four Hypertragulid species of the White River Formation from the Eocene/Oligocene time frame. This analysis was done to determine the paleodiet of the four taxa, *Hypisodus*, *Hypertragulus*, *Stibarus* and *Leptomeryx*. The interest of this study was to determine the palodiet of the four previously mentioned taxa. The microscopic wear on the teeth is what affects the masticatory ability to reduce the size of food particles. These patterns are made by the collision of the teeth while chewing during feeding. These marks that appear on the teeth allows one to understand how the organism's jaw moves and the size and toughness of what is being consumed. Micrographs of the microwear patterns were taken and analyzed to determine what was likely the diet of the four taxa. We hoped to be able to determine the paleodiet of the four previously mentioned taxa based on the microwear patterns on the fossilized teeth. The microwear patterns were then compared to that of modern day animals in order to determine the paleodiet of the four taxa: *Hypisodus*, *Hypertragulus*, *Stibarus* and *Leptomeryx*.

## An Examination of the Effects of Abiotic Stress on the Phyllosphere Microbiome Composition of Maize Seedlings

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**Sarah E. Jennings**

Stuart G. Gordon, Ph.D.

Department of Biology

The mutual influence that plants and microbes exert on each other is well established. Plant growth is improved by helpful microbes, primarily through the production of plant-active hormones, fixed nitrogen, and the suppression of potential pathogens. The plant modulates its surface environment in various ways to encourage specific microbes to colonize it, thereby forming its microbiome. We hypothesized that the phyllosphere (leaf-surface) microbiome composition would be significantly altered by abiotic stress, including low water (drought) and low nutrients as compared to normal conditions. We aimed to characterize the taxonomic composition of the maize phyllosphere microbiome in response to abiotic stress by sequencing 16S (small subunit ribosomal RNA) amplicons, classifying them into operational taxonomic units, and testing for significant differences in composition across treatments. We also aimed to quantify the culturable microbes from the phyllosphere by colony forming unit assays using different growth media.

## The Children's Crusade of 1212: Aspiring Crusaders

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### **Shamyra L. Jordan**

Richard R. Heiser, Ph.D.

Department of History

This presentation looks at the Children's Crusade of 1212 and how the Church used it to promote and propagandize for the Fifth Crusade. Based upon my research, I argue that the Children's Crusade of 1212 was a crusade whose failure resulted from a lack of military strategy and experience, as well as papal aid. This Crusade has importance today because it shows and reinforces the Church's definitive power instead of those seen as less significant or laymen's authoritative capability.

## Research of Optical Physics: The Schlieren Effect

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### **Malachi I. Koenig**

Eli T. Owens, Ph.D.

Department of Physics and Computer Science

The Schlieren effect is a phenomenon in which a gradient index of refraction in a transparent material, such as air, allows for light to be refracted in such a way that optical differences can be observed under certain conditions. Using a light source, a spherical mirror, and heat source, a thin object such as a razor blade, and a camera, the Schlieren effect can be recorded under the following set up: A light source aimed at a spherical mirror provides light, while the spherical nature of the mirror reflects the light rays back to the focus of the mirror a set distance away. The heat source between the light source and mirror creates a gradient of index of refraction in the air, and as the light is refracted, and then reflected by the mirror, these light rays are not able to be focused at the same point. By placing a thin blocker at the focus of the mirror, and camera behind the blocker focusing on the mirror, optical differences can be observed, and a visual representation of heat flow can be seen.

## Master Chronology of *Quercus Alba* (White Oak)

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### **Haleigh E. Mauldin**

Michael O. Rischbieter, Ph.D.

Department of Biology

Dendrochronology, the science of studying and dating annual tree growth rings, is used to determine the weather patterns and climate of the tree's location. Annual tree growth rings can determine the amount of precipitation the tree received that year, but it also can be used to detect major climate changes, such as forest fires. The purpose of this research is to use the dendrochronology of multiple samples of *Quercus Alba* from Clinton, South Carolina, and surrounding areas to construct a Master Chronology for this area. From the data, it was hypothesized that the measurements would portray growth patterns that reflected the climate within the area, and *Quercus Alba* could be used as reliable predictor for climate in the region. This research was done using cores collected that were in the Presbyterian College Dendrochronology Lab. The cores' rings were measured using the Velmex VRO Measuring System and data were collected by the measure J2X. Measure J2X compounded the data into a spreadsheet then were analyzed using COFECHA. Upon analysis, the tree cores sampled did reflect a growth pattern of similar peaks and lows, which supports the hypothesis.

## Crusaders and Eastern Romans

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### **Jacob M. McGee**

Richard R. Heiser, Ph.D.

Department of History

The historical record shows that the Byzantine Empire supported the Crusades at first, but the support they offered declined over time as the two sides often found themselves in conflict with each other. There are two schools of thought on why this conflict happened. One claims that conflict was a result of fundamental cultural and religious differences while another claims that conflict was a result of ideological differences. My research backs up the ideological cause for conflict more so than the cultural and religious cause.

## The Dragon versus the Lion: How Beijing's Infringement of Hong Kong's Democracy and Worsening Economic and Social Conditions Caused the Umbrella Movement

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### **Joshua C. McGill**

Roy B. Campbell, Ph.D.

Department of International Studies

This research focuses on the causes of the 2014 Umbrella Movement in Hong Kong, a massive protest in which thousands of Hong Kong citizens occupied central Hong Kong to voice their disapproval of recent actions by the Beijing government to undermine Hong Kong's democratic rights. Many scholars cite the causes of this unprecedented protest to be primarily the political measures Beijing issued, most notably the June 2014 White Paper, to restrict the universal suffrage rights of Hong Kong voters to elect their governor and legislators. While this was certainly a major catalyst for the Movement, I contend that Beijing's history of violating Hong Kong's democratic rights and the underlying economic and social issues of Hong Kong had just as much importance in causing the protest. Specifically, the housing crisis and high cost of living impacted by Beijing investors, the marginalization of the Cantonese language, and the intensifying cultural rift between Hong Kongers and mainland Chinese citizens played an equal role in sowing the seeds of civil discord among the Hong Kong protestors.

## A Community Partnership: The Little Free Library in Lydia Mill

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**Caroline A. Moore** and **Claire E. Doolittle**

Julia Wilkins, Ph.D

Department of Education

Lydia Mill is a predominantly African-American neighborhood in Clinton, South Carolina. Seventy-six percent of children at the local elementary and middle school live in poverty. In addition, literacy rates are low, with only 31% of students in grades 3-8 meeting or exceeding expectations on the SC READY English assessment compared to 43% statewide (SC Department of Education, 2017). Research indicates that children in high-poverty areas often have limited access to books (Allington et al., 2010; Peifer & Perez, 2010). It has also been found that the number of books students own is associated with reading frequency and reading achievement (Au & McQuillan, 2001; Tichnor-Wagner et al., 2015). For our capstone project, we partnered with the City of Clinton to install a Little Free Library at Lydia Mill Children's Park. The purpose of Little Free Libraries is to promote a love of reading among local residents. When people donate books to the libraries, community members are able to take and return books to read. We solicited book donations for the library in the Lydia Mill Children's Park. In order to provide residents with books of interest, we placed book requests slips in the library. During the first week, 19 books for children, adolescents, and adults were taken from the library. Since then, books for pleasure reading and school-topics have been requested on an ongoing basis. Through this project, we hope to provide tips for other communities on how to launch similar literacy projects.



## Exploring Self-Concepts and Global Self-Worth in CHAMPS Students

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**Lauren E. Moore** and **Joel A. Tillirson**

Brooke C. Spatta, Ph.D.

Department of Psychology

Identity exploration and self-reflection are critical factors affecting psychosocial adjustment during late childhood. Susan Harter (1988) created the Self-Perception Profile for Adolescents to assess eight specific self-concept domains as well as overall global self-worth in adolescents. Self-report questionnaires were administered to 78 students (51 females and 27 males) in the CHAMPS program during the summer of 2015. Using Harter's scales, the current project assesses and compares perceptions of competence and levels of importance assigned by students to each self-concept. Analyses to uncover significant relationships between the discrepancy score associated with each self-concept and overall global self-worth will be conducted. Based on previous findings, it is hypothesized that if a student's perceived competence is low in a domain she/he deems important, the overall global self-worth of that adolescent will suffer.

## Efficient Coupling of Acoustic Power into Granular Materials

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### **Brandon L. Morrow**

Eli T. Owens, Ph.D.

Department of Physics and Computer Science

Granular materials are made up of a collection of distinct, macroscopic particles such as soil, rice, or the rings around Saturn. When these particles are packed together, they create a heterogeneous distribution of forces inside the granular material. This heterogeneous force distribution is not very well understood, and contributes to non-linear, highly dissipative sound propagation. In order to maximally couple sound into a granular material, we seek a coupling device to impedance match with the granular material. An example of a coupling device that works in air is the cone on a speaker. Current methods of probing granular materials involve sending high energy waves, where most of the energy is lost through dissipation. Finding a coupling device would allow deeper non-destructive probing at lower energy than currently available. To analyze the effects of each coupling device on the acoustic power, we buried piezoelectric sensors in sand to determine the amplitude directly below, and at an angle from the source. For these measurements, we took into account the response of our source, a speaker, which was relatively flat frequency response from 10Hz to 10kHz. During our measurements, we swept the frequencies from 10Hz-10kHz in order to observe the effect of the coupling device on the amplitude at different frequencies within our system. This technique allowed us to find a coupling device with the highest amplitude for the lowest energy driving. Finally, understanding how sound travels through a granular material will open the door to new technologies for non-destructive probing of granular materials.

## Breast Cancer Stem Cells Demonstrate a Hypermethylated Phenotype within Gene Promoter Regions

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### **Christopher H. Parnell**

Austin Y. Shull, Ph.D.

Department of Biology

Current statistics report that breast cancer causes approximately 40,000 deaths per year in the United States. One major factor influencing poor clinical outcome in breast cancer patients is tumor invasion and metastasis into distal organs. Previous studies have shown that the metastatic potential of breast cancers is driven by a small population of aggressive cells known as cancer stem cells (CSCs). Relatively little is known about the phenotypical differences between cancer stem cells and the differentiated cancer cell populations, but it is suggested that these differences are driven by DNA methylation. To determine the differences in DNA methylation specifically within gene promoters of CSCs and non-CSCs, a 450K DNA methylation array was performed comparing isolated CSCs and non-CSCs to several immortalized breast cancer cell lines of varying metastatic and invasive properties. It was found that CSCs and aggressive metastatic cancer cell lines share a general hypermethylation pattern in the promoter of many genes when compared to non-CSCs and less aggressive breast cancer cell lines. Many of the genes differentially hypermethylated in CSCs are involved in specific molecular pathways including the estrogen response, epithelial-mesenchymal transitioning, and glycolytic metabolism. The hypermethylation of these essential gene pathways could provide insight into the proper treatment of cancer stem cells as well as the prevention of tumor metastasis.

## Ecotoxicological Impact of the Ionophore Narasin on the Gonadal Profile of the Southern Leopard Frog

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### **Kristen R. Peagler**

James T. Wetzel, Ph.D.

Department of Biology

The per capita consumption of poultry within the United States in 2015 was 106 pounds and is projected to increase in 2017. In order to meet this demand, poultry farmers must try to eliminate disease from the flock to maintain a death rate lower than five percent. A common disease affecting the poultry stock is coccidiosis. The treatment, Narasin, which is incorporated into feed is largely excreted in poultry feces. Chicken feces is used largely for application to land because of its relatively high nitrogen concentration. This ionophore has been observed in the feces of treated birds and the watershed near poultry farms. Therefore, I altered Narasin concentration to determine its effects on the gonadal profile of the Southern Leopard frog, using light and electron microscopy to determine the cellular effects of this ionophore. Amphibians, an indicator species, have been in decline since 1990; the purpose of this research is to link the use of Narasin to population decline. I expect to see a difference in the cellular components of the testes of frogs treated with Narasin versus those in a pristine aquatic environment. If Narasin has an effect on these cells, infertility of the male frog is an explanatory factor for decline of the amphibian population.

## Improving 3D Printed Prosthetic Hand by Adding Skin and Efficient Wires and Sensors for Basic Movement

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### **Anessa M. Pettis**

James T. Wetzel, Ph.D.

Department of Biology

The technology used in developing materials for prosthetic devices has become more advanced in an attempt to produce both functional and realistic looking limbs. A prosthesis can cost several thousand dollars, but through advances in 3D printing it is now possible to produce a prosthesis for less than a hundred dollars. My study tested various synthetic materials for threads that control movement of the prosthesis; FireLine®, Griffin Nylon Power, Powercord Elastic, Accu-Flex®, and Spiderwire, to test which could withstand the physical wear required of a 3D printed prosthetic hand. I hypothesized that the Griffin Nylon Power thread will be the best thread for use in a prosthesis since it is very strong and has special stretch-tension. Cross sections were taken of each thread after use, and SEM images were generated from each. Visual inspection from these images shows that that the Accuflex wire stayed in its original shape with reduced abrasion and deformation better than the other thread materials. I also tried to create a skin realistic to human skin for the prosthetic device. This was done by adding a glove that had been painted to have details similar to skin. Hopefully, future research will lead to a synthetic skin that feels and looks like human skin while allowing the wearer to experience tactile stimuli.

## Lo práctico y lo ético de la eliminación de los mosquitos en Sudamérica: una investigación científica y unos pensamientos poéticos

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### **Anessa M. Pettis**

Sharon E. Knight, Ph.D.

Department of Foreign Languages

El virus zika causa problemas de salud como microcefalia y el Síndrome de Guillain-Barré en América del Sur. Los mosquitos (*Aedes aegypti* o *Aedes albopictus*) son vectores para el virus. Los pasos disponible hoy para la protección contra las enfermedades trasmidas por los mosquitos no son completamente fiables. Una manera nueva para controlar la población de los mosquitos y la propagación del virus es por la modificación genética, una práctica muy discutible. Hay varias maneras de cambiar los mosquitos por la modificación genética. Una es no eliminar la especie de mosquito sino modificarlos para que resistan las enfermedades. Se ha encontrado recientemente que una bacteria llamado *Wolbachia* puede parar la propagación de los virus por los mosquitos sin matarlos. En mi opinión, esta opción es la mejor, pero algunos científicos piensan que el uso de la modificación genética es inmoral. En este estudio, usaré unos poemas que describen el ambiente en que viven los mosquitos para pintar el fondo geográfico de “la zona tórrida” de América del Sur. También, investigaré cómo la eliminación de esta especie afectará ciertos nichos ecológicos (es decir, la función o la ubicación de un organismo en el ecosistema). En conclusión, se determinará si las opiniones son éticas y si los datos del medio ambiente sugieren que los mosquitos se deban eliminar.

## The Effect of Noble Metal Nanoparticles on the Relaxation Rate of Supercoiled DNA

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**Lucas A. Pressley** and **Darcy N. Nirenstein**

Latha A. Gearheart, Ph.D.

Department of Chemistry

Topoisomerase I is an enzyme commonly known for its ability to relax, or unwind, supercoiled DNA by randomly “nicking” the sugar-phosphate backbone. In this research, the effect gold and silver nanoparticles contribute to the enzymatic reaction of topoisomerase I with supercoiled plasmid DNA was investigated. Gold nanoparticles and silver nanoparticles were synthesized in water by heated reduction of metal salt with sodium citrate. The enzyme-induced plasmid DNA relaxation rate was measured using fluorescence spectroscopy by monitoring the decrease in intensity of a fluorescent dye intercalated within the supercoiled plasmid. As the DNA relaxed, thus exposing the fluorescent dye to water, the emission intensity was quenched. Comparisons of reactions with and without freely suspended metal nanoparticles suggest gold nanoparticles enhance the enzymes’ catalytic ability; however, silver nanoparticles do not. Furthermore, reactions carried out in the presence of gold nanoparticles exhibited significantly more relaxation within the first few seconds of the reaction. Similar experiments were attempted using surface-enhanced Raman spectroscopy (SERS) to monitor relaxation rate, working under the hypothesis that the relaxed, more flexible DNA would adsorb to the metal nanoparticles producing a more strongly enhanced Raman signal. Unfortunately, the SERS signal was too weak to detect under the given conditions.

## The Morphometric Analysis of Four Species of Hypertragulids Using PCA Statistics

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### **Austin J. Priaulx**

Michael O. Rischbieter, Ph.D.

Department of Biology

The White River Badlands has been a site of interest for paleontologists since the mid 1800's. This fossil bed is a collection of irregularly shaped and highly eroded areas that extends from the southwestern portion of South Dakota through parts of northwestern Nebraska and eastern Wyoming into eastern Colorado (Meehan et al. 2004). Overall the White River fossils were deposited in an alluvial flood plain environment and the conditions were perfect to facilitate the preservation of many unique and interesting mammal species, including the Hypertragulids we will be studying. For this research, we will be doing a morphometric analysis of the four Hypertragulid species of the Eocene/Oligocene White River Formation of Wyoming. We are trying to see if we can distinguish the four, *Hypisodus*, *Hypertragulus*, *Stibarus* and *Leptomeryx* using principle component analysis. For this analysis we will take images of the bones we have with a digital camera, and upload them onto the web program, ImageJ, for further analysis of the morphometrics. We will then take the data collected from ImageJ, and will run a PCA (principle component analysis) to determine whether or not the taxa we have indeed are closely related or not, based off of clusters. Principal component analysis is a technique used to emphasize variation, and will hopefully bring out strong patterns in our dataset.



## King Richard I: A Good Crusade Leader?

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### **Tanner L. Price**

Richard R. Heiser, Ph.D.

Department of History

My research focused on Richard I's impact on the Crusades, specifically on how his leadership affected the wars in the Holy Land. To answer my research question, I have divided my paper into distinct parts. I begin with my background and historiography to inform readers on who he was and the opinions of academics about him. I then move on to the argument both for and against him being a good leader in order to gain my conclusion. Finally, I wrap up my paper by giving my insight into what I believe is true of Richard I.

## Surgical Reconstruction of the Knee

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### **Mikayla G. Register**

James T. Wetzel, Ph.D.

Department of Biology

Physical therapy is used to reduce pain, improve range of body motion, strengthen muscles, and prevent future joint injuries. This therapy requires a thorough understanding of knee anatomy and of the mechanics of joint movement. My project was designed to fully understand the functional anatomy and biomechanics of the knee, and also to analyze surgical repair of the knee from a sports-related injury. Dissection of a sheep knee was used to model the gross anatomy of the human knee through the identification of muscles, tendons, ligaments, and meniscus. Histology of the knee allowed for the observation of osteocytes, dense connective tissues and meniscus cells, and supporting cartilages. Cartilage was distinguished as either hyaline cartilage or fibrocartilage based on cellular anatomy. Non-invasive imaging techniques were used to identify and diagnose knee injuries. Techniques such as X-ray, CT-scan, and MRI were studied to understand how each could be used to identify specific injuries to soft or hard skeletal elements. Clay modeling was then used to physically reconstruct the knee—showing the associated ligaments, tendons, meniscus, muscles, and the controlling nerves. I also researched rehabilitation following ACL reconstruction after knee surgery. Research on non-invasive imaging techniques, knee reconstruction, and physical therapy provided me with a better understanding of such injuries, as well as surgical and rehabilitative techniques used to correct those problems.

## Remote Myoelectrically Controlled Robotic Hand

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### **Andrew P. Rhodes**

Eli T. Owens, Ph.D.

Department of Physics and Computer Science

The loss of a limb can be a traumatic experience for a person. Prosthetics restore functionality of the limb and confidence to the user. However, insurance often does not cover the cost of prosthetics, and commercial prosthetics can cost over \$10,000. This cost motivates the need for low-cost prosthetics. We have designed and built a low-cost Myoelectrically controlled, 3D printed prosthetic that can be easily produced for under \$100. 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 control the prosthetic hand. The circuit uses three electrodes to differentially measure two independent muscle contractions. One signal is measured between the flat part of the wrist and the elbow, and the other signal is measured between the top of the wrist and the elbow. The signal processing circuit consists of a differential amplifier, a high pass filter, a low pass filter, an amplifier, and a rectifier. For the 3D printed hand, we used the “Raptor Reloaded” designed by e-NABLE. The tensioner box was modified to hold servos, which pull on cord to retract the fingers. This work will provide affordable prosthetic hands to thousands of adults and children, restoring the functionality of their hands and their confidence.

## Women and the Crusading Movement

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### **Kimberly N. Rhodes**

Richard R. Heiser, Ph.D.

Department of History

This paper is about the social roles of medieval, Christian women in the crusading movement. By examining primary sources and their descriptions of women and women's participation in the crusading movement, this paper looks at how women's participation is rationalized by chroniclers and historians.

The three most common roles in which women are described are mother, Christian, and whore; this paper looks at how the typically male medieval authors adapted these roles to describe the participation of women in traditionally non-female activities.

This paper ends by examining how modern historians interpret and understand women in the crusading movement and how their interpretations are shaped by their own societal values.

## Examining Plant Biodiversity along Riparian Zones at Bush River

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### **Kathleen G. Snead**

Rachel M. Pigg, Ph.D.

Department of Biology

Riparian zones are floodplains along rivers that have rich soil, but are often sensitive habitats. Generally, plant diversity in riparian zones is higher compared to upland zones, which are further away from the river. The source of the Bush River is located in Clinton, South Carolina, and is a mix of riparian and upland zones at the Sterilite Nature Area. In this study, we surveyed plant diversity at the Bush River's source with three specific aims: (1) to obtain general information about the plant life in this area, (2) to identify factors that might explain any observed variance in plant diversity in this area, and (3) to determine if any plants classified as endangered by Department of Natural Resources list are present. We sampled using a random sampling method, and quantified our results using different biodiversity metrics, such as species richness, Shannon's Index of diversity, and Simpson's Index of diversity.

## Gene Body DNA Methylation is Highly Dysregulated in Breast Cancer Stem Cells

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### **Brandon L. Stone**

Austin Y. Shull, Ph.D.

Department of Biology

Breast cancer can take many different forms that vary greatly in terms of severity. The severity of a breast cancer cell line is strongly correlated to how invasive it is. Typically the more invasive (metastatic) cell lines are more severe. Metastatic potential of breast cancer corresponds with its cancer stem cell (CSC) population. The molecular characteristics of CSCs in breast cancer are of great interest because they can be used to predict severity and invasiveness of the cell line. To elucidate some of the molecular characteristics of CSCs, we analyzed at a 450K DNA methylation array dataset of several different breast cancer cell lines. Specifically, we looked at the methylation patterns found in the less defined regions known as gene bodies. We found 2,880 total hypermethylated gene bodies in the CSC rich MCF10A p53/PTEN double knockout cell line and 3,029 hypomethylated gene body regions. Some of these gene bodies that show dysregulation of methylation patterns in breast CSCs are involved in pathways such as estrogen response, epithelial to mesenchymal transition (EMT), glycolysis, and UV radiation response. This research has the ability to reveal common patterns seen in the deregulation of gene body methylation of breast CSCs. Greater understanding of what leads to CSC-rich populations could be used to inform clinicians of the molecular drivers in metastatic breast cancers.

## Stimulating Tin Whisker Growth with Etchants and Investigating Whisker Growth Mechanisms

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**Jonathan W. Turnley**

Chad L. Rodekohr

Department of Physics and Computer Science

Tin (Sn) whiskers are signal crystalline growths, typically between 1-5  $\mu\text{m}$  in width and 1-500  $\mu\text{m}$  in length, that have caused many issues in electronics. When they form in these devices, they can cause short circuits that damage the device and prevent functionality. Sn whiskers have caused failures in satellites, military radars, and computers. Much research has been done to try to learn how Sn whiskers form and how they can be prevented, but there is still no scientific consensus as to a growth mechanism. While whiskers are typically observed to grow over a period of months or years, recent studies have indicated that partial etching can result in the formation of whiskers in just a few days. This finding opens up the door for potentially beneficial uses of Sn whiskers. Due to the high degree of order in the crystallographic structure, Sn whiskers are both strong and conductive. If the growth of Sn whiskers was controlled, they could be ideal self-assembling components in microelectronics. This research will test several etchants to observe their impact on whisker growth rate, length, location, and population density. Samples will consist of 0.5 inch by 0.5 inch squares of brass that are sputtered with a layer of Sn to a thickness of 2000 $\text{\AA}$ . Samples will be partially etched using dilute acids. The etchant type, etchant strength, and etching time will be varied. The samples will be observed in a scanning electron microscope before being etched and over the 10 days following etching.

## The Kilted Crusaders

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### **Jon Walker II**

Richard R. Heiser, Ph.D.

Department of History

My History Capstone explores whether Scotland played a role in the crusade; if so, how, and to what extent? My argument is that Scotland did play a role in the crusade, but wars and politics prevented them from going on some crusades, and on the ones that they could go, Scottish troops proved to be ineffective. The kingdom also funded the movement and operated military orders. Scotland sent an ill-prepared group on the First Crusade, defying and verifying stereotypes of crusade-era Scotland. Also, Scotland's most famous medieval king, Robert the Bruce, went on crusade. The presentation will end with a discussion concerning the newness of the topic, and how it helps the modern study of crusading.



## Retention of Conflict-Induced Avoidance Behavior in Male Syrian Hamsters

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### **Destiny A. Willis**

J. Alicia Askew, Ph.D.

Department of Psychology

This experiment used the Conflict Alleyway to investigate the long-term retention of post-conflict avoidance in defeated male Syrian hamsters. The aim of the experiment was to determine whether equating the number of defeat experiences would yield long-term retention of avoidance when tested 7 and 14 days after post-defeat trials. This study found that the Pre-defeat mean position was significantly higher than both Avoidance and Recall mean positions. When tested 7 or 14 days after the final defeat, about 88% of tested subjects met avoidance behavior criterion. This study found that equating the number of defeat experiences yielded retention of avoidance when tested 7 or 14 days post-defeat. It is possible that the apparatus used in this study, the Conflict Alleyway, might be utilized to establish a model of recurrent stress.

## The Effects of Social Conflict on Anxiety and Avoidance

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**Destiny A. Willis and Ashlyn Bordelon**

Evelyn A. Hunter, Ph.D.

Department of Psychology

Social conflict, a type of social stress, occurs when two or more individuals oppose each other in an agonistic, social interaction--one that leads to the establishment of a dominant-subordinate relationship (Willis & Askew, 2016). Defeat in a social context tends to be related to various psychiatric disorders, such as anxiety and depression. Previous research that employed the use of animal models found that avoidance of the aversive stimuli (dominant opponent) persisted post-defeat and 7 or 14 days post-defeat (Willis & Askew, 2016). The purpose of this experiment was to use the General and Specific Avoidance Questionnaire (GSAQ) and Beck Anxiety Inventory (BAI) to investigate the relationship between social conflict and Anxiety/Avoidance in human participants. We subjected participants to three test conditions (i.e., video, recall and neutral) which exposed participants to various social conflict defeat (seeing another defeated on video, recalling a personal experience in which the participant was defeated, or control group). We found that anxiety and avoidance were significantly and positively correlated, but there was no main effect of our social conflict test condition. Limitations of this work include lack of direct exposure to social conflict (i.e., the participants were not engaged in a social conflict defeat at the time of the experiment) which may be imperative to observing an effect on anxiety/avoidance.

## Interracial Relationships

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### **Daryl J. Wilson**

Robert H. Freymeyer, Ph.D.

Department of Sociology

This research uses data from the 2014 General Social Survey to consider the impact of region of residence on interracial relationships. Racial diversity varies greatly between the regions of the United States with the South having the largest percent of African Americans. Because of this greater diversity, I expect that southerners are more supportive of interracial relationships involving Blacks, Whites, Hispanics, and/or Asians. This research will add to understanding of the role of race in the contemporary United States.

## Examination of Cannabinoid-Positive Urine Samples for the Presence of Pesticides

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### **Adrienne M. Wright**

David H. Eagerton, Ph.D.

Department of Pharmaceutical Sciences

Marijuana is one of the most used illicit substances in the United States. Currently, states that have legalized the drug are reporting issues with pesticide use on marijuana products. However, due to marijuana being illegal at the federal level, there are no regulations for pesticide use on the cannabis plant. In this study, we are analyzing cannabinoid-positive urine samples for the presence of pesticides. Our aims are to develop a method for doing this analysis using high-performance liquid chromatography (HPLC) and mass spectrometry (MS) and obtain results from urine specimens provided by the South Carolina Law Enforcement Division (SLED). We believe that pesticides will be present in the urine specimens due to the other states' recent discoveries. The HPLC-MS method was developed using neat standards of the pesticides. A liquid-liquid extraction was performed using 0.1 M NaOH and methylene chloride. Our standards were linear between 0.1 mg/L and 1 mg/L with strong inter- and intraday stability. We have completed one extraction and have qualitatively found pesticides in the urine based on their molecular weight and retention times. However, we do not yet have enough data to quantitatively confirm the presence of the pesticides. We plan on continuing this study by obtaining more urine samples, performing more sample extractions, and determining the limit of detection and limit of quantification for the pesticides.

## The Effect of Grain Shape on Side-Wall Pressure in Model Grain Silos

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### **Salem C. 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. Grain silos store granular particles and are subjected to irregular force build-up, which can have catastrophic results. It has long been observed that the pressure at the bottom of a silo is screened as the silo is filled. I 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 48 inches in length and 6 inches in diameter. A hopper with a diameter of 6.5 inches at its widest point and 1.5 inches at the bottom feeds the grain into the silo. Four identical 1.25 inch holes were sawed into the bottom of the wall of the silo to accommodate four force sensors. The fill height was approximately 40 inches from the bottom of the silo. Rice was found to exhibit more irregular force build-up, while corn and peas were more regular. Corn and peas followed Gaussian force distributions, but rice was more varied and randomly distributed around the mean force. Corn and peas tended to build up to a final force, while rice reached a maximum and then decreased. Finally, the time at which corn and peas reached a maximum force was more frequently at the end of a run than rice. Rice's irregularity is attributed to its large aspect ratio in comparison to peas and corn.



*Boone Hall Plantation, 2017 - Oil on canvas - 30 x 60 inches*



*Gleaton's Senior Exhibit - 2017*

## Senior Art Exhibition

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### **Katherine H. Gleaton**

Mark R. Anderson, M.A.

Department of Art and Art History

My artwork for this particular show is supposed to give the viewer a different way to look at simple landscapes. I distorted the color and composition to be able to represent what happens in a panoramic photograph, with the purpose of giving the viewer the opportunity to think about what they're looking at with a different perspective. I wanted to create art that would have a sphere-like composition to make viewers feel as if they're an omniscient presence. I feel like having this viewpoint gives the onlooker an all-knowing feel, as if she/he is secretly looking into a scene without anything/anyone else knowing. When I was in the process of developing a theme for my show, I wanted what I was going to be creating to be different from anything I had seen in the past. The idea that I could think beyond the unique composition came shortly after I had sketched out several more pieces. I then dove into forming a deeper meaning and purpose behind what I created. I specifically avoided straight lines as much as I could. When in the process of creating my artwork, I found the physical nature of painting the circular, fluid-like shapes and skylines to be very therapeutic. I believe that both the creation by the artist and interpretation by the viewer is meant to be a quelling experience.

## Department of Music Honors Recital Students

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**Olivia Joy Aldridge**, *soprano*

**Edgar Lee Alford**, *guitar*

**Harris Houser Banks**, *cello*

**Thomas Turner Banks**, *baritone*

**Seth Matthew Brown**, *double-bass*

**Kellie Christine Cleveland**, *soprano*

**Collin James McKinnon**, *cello*

**Emlynn Lee Shoemaker**, *mezzo-soprano*







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