

Duke Colloquium Schedule | April 2025

Morning Sessions

Yates 221

9:00 Yates 221

Measuring the Distances of Galaxies with Clustering Redshifts

Caio Cavarsan

Advisor: Dr. Ross Cawthon

The Dark Energy Survey is an international, collaborative effort to map hundreds of millions of galaxies to find patterns that will reveal information about dark energy. Dark Energy is the mysterious force that causes the universe to expand faster with time. Finding the redshifts of galaxies, proportional to their distance, is an important aspect of using these galaxies. Large imaging surveys can't use the most accurate method (spectroscopy) to calculate galaxy's redshift. Because of that, we need other methods to estimate redshifts, one alternative is clustering redshifts. Because of the gravitational clustering of matter in the universe, the positions of objects that are in a common volume are highly correlated. We can constrain the redshift distributions of an ensemble of galaxies of unknown distances by measuring the amplitude of their angular cross-correlation with a tracer sample of galaxies with known redshifts. I worked with a Python code that calculated the number of galaxies at certain redshifts.

9:20 Yates 221

Material Analysis via X-Ray Diffraction and Mechanical Testing

Adam Hoffman

Advisors: Dr. Blane Baker, Dr. Maggie Sherer

The purpose of this study is to examine the effects of adding tin to AA7075 aluminum alloy. The examinations consist of x-ray diffraction (XRD) for crystallographic analysis and tensile testing for mechanical analysis. Two sample groups were cast, each consisting of three rods and one rectangular prism. The rods were machined for tensile testing and the prisms were polished and etched for x-ray diffraction analysis. One group was un-altered AA7075 aluminum alloy while the other was AA7075 plus a 0.5% by weight tin additive. Crystallography via XRD reveals any molecular differences that may contribute to mechanical performance. In most alloys, tin improves ductility but often reduces elasticity and strength. However, considering AA7075 is a heat treatable alloy, this experiment will test whether ductility via the tin additive can be achieved while retaining strength via heat treatment.

9:40 Yates 221

Development of Hollow Creek Residential Subdivision

Carson Payne, Ian Lawson, Dylan Carr, Emalie Olson, Keketso Lipholo

Advisors: Dr. Will Lindquist, Dr. Taqsim Husnain, Dr. Lea Skelton

In Missouri, The City of Liberty has experienced rapid growth in the past several years, with total project costs estimated at over \$650 million in investments. The expansion of the city brought the need for further residential development. Our Civil Engineering group was tasked with designing a subdivision which we called "Hollow Creek" near Harriman Highway. The group was required to create this layout and subsequent design drawings while being mindful of environmental, economic, social constraints, and owner specific requirements. The project was divided into several areas pertaining to roadway design, stormwater management, environmental sustainability, earth work, and platting. Processes followed in the project mimic those used by professionals in the industry, such as the request for proposal, project scheduling, cost estimates, and scope of work. Conceptual designs and alternative analyses for various design categories will be presented.

9:00 Yates 222

Girls Race to Ace: A Program Designed to Build Life Skills and Confidence in Girls

Molly McBratney

Advisor: Dr. David Lisenby

There is a lack of free sports programs for underprivileged girls in the Kansas City area. Participating in a sports program as a teen has shown several lifelong benefits in general, but more specifically for women. Studies show that teen girls that participate in sports will have a reduced risk of developing cancers later in life, better physical and mental health, a more positive body image, and increased self-confidence (Sabo and Synder, 1993). Participating in a sport also helps teens, regardless of gender, develop vital life skills, such as leadership, teamwork, and good sportsmanship. However, compared to boys, girls have less opportunities to participate in high school athletics. Therefore, many girls do not get to see the benefit of participating in sports, due to the lack of opportunities and sports programs for girls in general, especially in underprivileged areas. For my Honors Institute experiential practicum, I ran a seven-week tennis program called "Girls Race to Ace" to provide middle school girls with the opportunity to play a sport for free and positively develop their physical and mental health as well as life skills. The weekly clinic not only provided the girls with knowledge of how to play tennis, but it also helped to teach them to be confident in themselves. Through the teaching of tennis, I show how sports programs can positively impact adolescent girls, and how much the opportunity to participate in them is needed.

9:20 Yates 222

Examining How to Improve Financial Literacy for Teens

Camille Anderson

Advisor: Dr. David Lisenby

A lack of financial education in the school systems has contributed to poor financial literacy in America. Research indicates that underprivileged teenagers have less financial knowledge than other groups, mostly due to limited access to personal finance education and a lack of financial role models (Bado, Basri, et al and Blanchard). For my Honors Institute experiential practicum, I conducted a project aimed at helping this problem on a small scale by providing short financial literacy lessons to teenagers in the after-school program at the Independence location of the Salvation Army. The lessons focused on budgeting, saving, credit, and investing. Questions were asked of participating teens before, during, and after the lesson to help gauge learning. The project's desired outcome was to engage the teenagers and notice learning through their participation to indicate that the lessons were effectively teaching key financial literacy topics. The challenges faced in project implementation prompted research into variables such as poverty rates and school rankings to consider additional factors that influence financial literacy as well as the potential for progress toward improving financial literacy. The project illuminated the issue through a local, hands-on implementation of a possible solution to poor financial literacy and includes a research review about financial literacy in teens, how it impacts financial decision-making, and what programs have been effective in addressing the identified issue.

Analyzing Slavery Curriculum at the Elementary Level in the KC Metro Region

McKinzie Thompson

Advisor: Dr. David Linsenby

Slavery education is a hard, yet necessary history lesson to be taught in the classrooms. Hard history starts being presented to young children beginning at the elementary level. For these students, however, there are very few regulations on the exact materials needed to be taught. Therefore, teachers use different sources and spend varying amounts of time on the topic of slavery, thus resulting in a knowledge gap about an extremely important and sensitive subject in our nation's history. This gap affects how students view our nation's history, and how much understanding they have over race and racism in the US. This can cause students later in life to struggle to understand important social and systemic issues within our nation like redlining, job discrimination, crime, and homelessness. This presentation will focus on how slavery education and related topics are taught in KC classrooms at the elementary level and the life-long impacts inconsistent and poor slavery education can have on children. It will also share the results from my community-based experiential learning project for the Honors Institute in Critical Thinking where I conducted surveys and interviews with educators in the elementary classroom in the KC-metro region.

Gano Assembly

Dapsone Improves Healing Times in Brown Recluse Spider Envenomation-A Retrospective Study

Nirbhay Vohra, Baran Basu

Advisor: Dr. Mahsa Hosseini

The Brown Recluse Spider (*Loxosceles reclusa*) is responsible for most venomous spider bites in the Southern and Midwestern United States, causing symptoms ranging from mild skin irritation to severe necrotizing skin infections, and, in rare cases, hemolysis and acute renal failure. Despite multiple treatment regimens described in previous literature, no consensus exists on the most effective approach, particularly for severe cases. This study aimed to evaluate the effectiveness of treatment protocols involving Dapsone, Prednisone, and Hyperbaric Oxygen Therapy (HBOT) in managing symptoms of *L. reclusa* envenomation. A retrospective analysis was conducted on 11 confirmed cases treated at North Kansas City Hospital between 2019 and 2023. Patients treated with Dapsone exhibited significantly faster healing times compared to those treated with other antibiotics ($p < 0.05$), and obese patients healed slower than non-obese patients ($p < 0.01$). Our findings suggest that Dapsone may offer a more effective treatment option for *L. reclusa* envenomation and warrants further investigation in larger, randomized trials.

9:20 Gano Assembly

Assessing Eye Health and Access to Care Among American Indian and Alaska Native Individuals in Kansas City

Landon Lee

Advisor: Dr. Mahsa Hosseini

Access to quality eye care is a critical yet often overlooked aspect of healthcare for American Indian and Alaska Native (AI/AN) communities. My research, conducted under the mentorship of Christina Pacheco, JD, MPH, seeks to address this gap by assessing the frequency of eye exams, barriers to care, and the cultural sensitivity of eye health services among AI/AN individuals in Kansas City. This study utilizes a community-based participatory research approach to survey AI/AN individuals at increased risk for vision impairment due to age-related and chronic conditions. The survey, distributed via QR codes at community centers, clinics, and health events, gathers demographic data, eye care habits, existing vision conditions, and patient perceptions of care. The goal is to collect responses from 100-200 participants, allowing for statistically significant analysis using chi-square tests, logistic regression, and sentiment analysis to identify key barriers to eye care access. Findings will be shared with AI/AN organizations, healthcare providers, and public health officials to inform culturally competent interventions aimed at improving eye care access and quality. Through this work, I aim to highlight the importance of integrating AI/AN perspectives into healthcare research and policy while advocating for solutions that respect and address the unique needs of Indigenous communities.

9:40 Gano Assembly

The Objectives of Medical Experimentation by James Marion Sims 1845-1849

Hrithika Bhugvandeem

Advisor: Dr. Daniel Kotzin, Dr. Megan Groninger

James Marion Sims, often referred to as the "father of modern gynecology," developed the cure for vesicovaginal fistula, a severe complication that affected many women after childbirth. His experimental research was conducted between 1845 and 1849 and there remains an ethical debate about his work that used Black enslaved women as subjects. Firstly, this paper provides historical context on 19th-century medical training and practices, and compares the experiences of men and women as practicing medical professionals at the time. I go on to examine Sims' life, surgical practices, and the ethics surrounding his work, particularly from racial and gendered perspectives. My research also addresses the experiences and implications of Sims' experimentation on his known experimental subjects, Anarcha, Lucy, and Betsy. I brought all of these factors together into a debate about whether Sims was merely a product of his time or if his unethical research methods were driven by his own personal beliefs that were rooted in extreme racism and sexism. From my analysis of his book, "The Story of my Life," and other primary and secondary sources, I concluded that he used Black women's bodies flagrantly and without regard or concern for their well-being. He was, in fact, a deeply racist and sexist man that even people at the time were concerned about. His work and attitudes, such as those surrounding polygenism, set a dangerous precedent at the time and have also laid the foundation for racial biases and disparities that persist today and disproportionately affect Black women in medicine.

Why Russia Refrained From a “Cyber Pearl Harbor”

Amberlyn Hoeper

Advisor: Dr. Gary Armstrong

As critical infrastructure has become more connected to the cyberspace worldwide, experts have predicted that cyberattacks would begin to play a pivotal role in supporting conventional warfare. A ‘cyber Pearl Harbor’ was expected to precede Russia’s invasion of Ukraine in 2022, but did not occur. Russia has consistently used Ukraine as a testing ground for malware predating the war. Thus, it is assumed that Russian actors are familiar with Ukrainian systems and networks, making infiltration easier. However, Russian cyberattacks have primarily focused on disinformation and intelligence gathering rather than large-scale, disruptive attacks. My research seeks to understand why Russia refrained from a “cyber Pearl Harbor” and how Russia has approached the cyber domain to support their war effort. By analyzing open-source intelligence and studying literature from experts, my research seeks to explore a new domain of warfare and offer real examples of how modern conflicts can be shaped by the cyberspace.

The Impact of Maternal Stress on Fetal Development and Birth Outcomes

Kalin Lamus

Advisor: Professor Debra Penrod

The impact of maternal stress on fetal development and birth outcomes is an important factor in relation to prenatal care. Current research explores how maternal stress affects fetal health, birth weight, the risk of preterm birth, and other important pregnancy outcomes. The goal is to deepen understanding of the connection between maternal stress and negative birth outcomes, while also identifying key nursing implications based on these findings. The findings indicate that high levels of maternal stress are strongly related to negative birth outcomes such as low birth weight, preterm birth, and developmental delays. The research has also highlighted that stress reduction interventions, relaxation techniques, and psychosocial support during pregnancy can mitigate the risks of poor fetal outcomes. Nurses play a crucial role in identifying high risk populations and stressors during pregnancy to provide support and ensure proper care to promote better pregnancy and birth outcomes. There is a need for more research on effective interventions to help reduce stress and in turn, improve fetal development as well as birth outcomes. Ultimately, effectively managing maternal stress can offer critical pathways to better pregnancy outcomes, healthier fetal development, and improved birth outcomes.

The Efficacy of Non-Pharmacological Pain Interventions and Their Role in Reducing Opioid Usage

Maxwell Forbes

Advisor: Professor Debra Penrod

The overreliance on opioids for pain management has contributed to the ongoing opioid crisis, indicating that there is a clear need for alternative approaches. Understanding the efficacy of non-pharmacological pain interventions can be extremely beneficial in reducing opioid dependence while ensuring adequate pain relief. Several recent studies discuss the impact of non-pharmacological pain management and its efficacy in providing effective pain relief for patients with chronic pain. Research indicates that these interventions can help to alleviate pain and, in some cases, can help to reduce opioid consumption. While non-pharmacological approaches show promise, further research is needed to determine their long-term efficacy, reliability, and accessibility to the general population. Furthermore, due to their critical role in pain management, nurses would be in an excellent position to help increase awareness and advocate for the implementation of these nonpharmacologic interventions.

The De-labeling of Penicillin Allergic Label

Walter Chan

Advisor: Professor Debra Penrod

Penicillin allergy is common among patients around the world, many have been labeled allergic to penicillin in their early days, often associated with reactions related to penicillin administration. In recent years, the problem of pseudo penicillin allergy has slowly come to the attention of those in the medical field. The label of penicillin allergy greatly hinders the provider's choice of antibiotics in cases of severe infection. Having a penicillin allergy not only rules out β -lactam antibiotics but also those that possess similar structure to β -lactam, such as cephalosporins and carbapenems. Research investigates the prevalence of penicillin allergies in the population, its effect on infection treatment options, and ongoing de-labeling studies along with related statistics. Still today many people are unaware that a person even with a true allergic reaction to penicillin may outgrow the allergy, for the those who had an allergy in their early years some decades ago, it is very likely they've already lost the sensitivity to penicillin and should undergo a penicillin challenge under the supervision of allergy specialist. De-labeling penicillin allergy would give providers a much broader choice of antibiotic therapy in case of an emergency and help control many infectious diseases and may be a solution to ease the recent day concerns over super infections and antibiotic-resistant bacteria.

Telehealth: A Means to Increase Healthcare Accessibility for Obese Populations

Nicholas Zakucia

Advisor: Professor Debra Penrod

Telehealth as a means to overcome stigmatization and healthcare avoidance of obese populations can link existing technologies that have proven to improve accessibility to this underserved population. Throughout the research, issues that led to overweight and obese individuals avoiding healthcare revolved around gender, psychological well-being, and actual or perceived bias. Obesity has been seen to have a strong relationship with healthcare avoidance and has thus created a major burden for healthcare systems due to delayed treatment, lack of preventative interventions, and declining health. Although evidence supports the avoidance of healthcare by obese patients, there is a significant lack of research in this area. Additional studies are needed to identify the benefits of telehealth accessibility for obese patients.

The Dramatic Increase in Mental Health Diagnoses: A Multifaceted Analysis

Jack Alsbach

Advisor: Professor Debra Penrod

The rising prevalence of mental health diagnoses globally presents a critical challenge for the healthcare industry, necessitating an understanding of its contributing factors to inform care delivery and policy decisions. The drivers behind this increase, including overdiagnosis, heightened awareness, pharmaceutical influence, media, technology, cultural trends, and the perception of mental health as a social currency, create a network of causative agents. Studies reveal a complex interplay: broadened diagnostic criteria fuel overdiagnosis, awareness efforts increase symptom recognition but may over pathologize distress, pharmaceutical promotion shapes treatment patterns, social media correlates with heightened anxiety, and cultural attitudes influence help-seeking. High prevalence and unmet needs persist alongside these factors. Validity varies, with some studies limited by sample size or theoretical scope. Conclusions suggest nurses must navigate this landscape by promoting accurate diagnosis, patient education, and holistic care while addressing societal influences thus underscoring the need for nursing to adapt to evolving mental health perceptions and systems.

Pryor Legacy Project 2025

Hrithika Bhugvandeem, Lottie Vickers, Clara Fronabarger, Abigail Harder, Ian Wooldridge

Advisor: Dr. Cory Scheer

The annual Pryor Legacy project aims to serve the community in ways bigger than ourselves. It's all about working together to create meaningful change to the lives of those around us. This year, the Pryor Fellows have partnered up with Rebuilding Together Kansas City to help them on their mission to make the homes of vulnerable neighbors more accessible by completing essential repairs and safety modifications. We have connected with members of the community who are in need of help and have begun the process of transforming their homes. In addition to this, we are hosting a "Rebuilding Day" in early April with RTKC and Liberty Parks and Rec. to clean up Ruth Moore Park ahead of RTKC's beautification project that is looking to develop and improve the park, in order to better serve the community. They will create a safer, more inclusive, aesthetic, and functional space for all to enjoy. Liberty being a place so rich in history, RTKC also wants to highlight this and the stories of those who made it the community it is today. The Pryor Fellows want to document this work and our time with RTKC and share it with the Jewell community in the form of a poster presentation at Duke Colloquium to showcase our progress. It will also be a way of honoring long-serving members of our community and demonstrating how our project has been a chance to give back.

Yates 221

10:45 Yates 221

Examining Contemporary U.S. Bank Failures Through the Perspective of Minsky's Financial Instability Hypothesis

Camille Anderson

Advisor: Dr. Michael Cook

The banking system fosters economic growth through facilitating the flow of capital and is an integral part of an economy. As such, the banking system's stability is important for economic prosperity. Crises, such as the 2008 and 2023 bank failures, threaten the stability of the financial system. Thus, it is important for economists to gain insight into the causes of such failures. This research paper examines the 2023 bank failures through the lens of Minsky's Financial Instability Hypothesis. The thesis of Minsky's theory is that stability breeds instability. When the economy is booming investors and creditors alike are willing to take on more and more risk. When investments become too risky and are no longer validated in the market, there is a "Minsky Moment" when the economy collapses because of the excessive risk. The goal of this paper is to examine the 2023 bank failures and analyze potential causes and methods to manage risk in the future.

11:05 Yates 221

Peace and Conflict: Testing the Liberal Democratic Peace Theory

Alexander Walls

Advisor: Dr. Gary Armstrong

The primary purpose of international relations is to recognize how and why states interact with each other for the purpose of preventing conflict and promoting peace. Based on these premises, two theories of IR, realism and liberalism, are central to explicating interactions among international actors. These two theories attempt to answer a question related to IR: Is peace achievable? The answer presupposes the possibility of a comprehensive path toward peace. The answer to those questions comes from the liberal zone peace theory which argues that no liberal democracy has gone to war with another liberal democracy, or suffered a famine, or committed genocide. Realists reject this theory and note that liberal democracies experience conflict among each other. Overall, clearly, liberalism requires further explanation and analysis. For that reason, the purpose of this project is to tackle a complicated question: Can liberal democracies experience tension, and does that tension reduce the value of the liberal democratic peace theory? The answer rests with two case studies. The first entails Japan and the United States in the 1990s, where Japan, a rising power, was hampered by the already established international strength of the United States. If conflicts are the consequence of international relations similar to those structural factors in place before World War Two, then the future may replicate the past, and conflict may occur. Yet, war has not broken out during this century between these two liberal democracies, the United States and Japan. Why? The second case revolves around the Ruhr Crisis. Is it fair to allow the liberal democratic peace theory to stand when France was willing to engage in war with a German republic? In fact, was Germany during this inter-war period a liberal democracy? Can democratic precepts be justified? These questions require a response as we consider for the future the efficacy of liberalism. In this way, I argue that if a liberal democracy perceives another to be less liberal then conflict may arise. However, war will be prevented because liberal values will enable the resolution of conflict without war.

Ukraine 1917: The Creation of a Nation

Nathaniel Baggerly

Advisor: Dr. Daniel Kotzin

This presentation is derived from my history capstone project from the Fall semester. In it, I use both well-regarded histories and translated primary sources to investigate nation-building efforts under the Ukrainian Central Rada in 1917. I argue that during 1917, Ukrainian nationalists of diverse backgrounds and politics instigated the momentous project of creating a Ukrainian political nation. This political nation corresponded with, but was not exclusive to, an existing cultural nation. The explicit goal of this project was the recognition of Ukraine as a distinct national entity and self-governing autonomy. I demonstrate that these nation-building efforts wielded notable popularity within Kyiv and Ukrainian-settled territories more widely. I then show how the Rada interacted with first the Russian Provisional Government and then the Russian Bolsheviks. Importantly, the Rada sought an autonomous Ukraine within a Russian federation, only moving towards independence in the face of Russian and subsequently Bolshevik opposition. Indeed, independence was only declared when the Russian Bolsheviks invaded. Through this presentation, I aim to show that the Ukrainian nation is not new, artificial, or united in ideology; It is a self-generated project that has brought together Ukrainians of all stripes, both modern and historic, in pursuit of self-determination. I aim to put the current war in a larger historical context and show the deeper roots of Ukrainian motivation and resistance.

Yates 222

Race and Freedom in the Art of Eastman Johnson and Robert S. Duncanson

Sunny Williams

Advisor: Dr. Daniel Kotzin

Art has long been a powerful tool for reflecting and shaping societal values, particularly during times of social and political turmoil. In the context of the American Civil War, race and freedom were central issues that deeply influenced the visual culture of the era. This research examines how two prominent artists-Eastman Johnson, a white abolitionist, and Robert S. Duncanson, a free Black artist-used their work to respond to and reflect the racial tensions of the time. By analyzing their different artistic approaches, this paper argues that while Johnson's genre scenes served as direct social commentary on the institution of slavery, Duncanson's landscapes employed allegory to envision a racially unified and peaceful America. Furthermore, this research explores the impact of their respective identities on their artistic choices, revealing how Johnson's abolitionist values and Duncanson's position as a Black artist shaped their representations of race and freedom. In contrasting their works, the paper ultimately suggests that Johnson's more direct approach to race and freedom offers a compelling counterpoint to Duncanson's hopeful vision, providing a richer understanding of how art functioned as both a reflection and a catalyst for social change during the Civil War era.

11:05 Yates 222

Queer inclusion in Christian KC Churches

Ryan West

Advisor: Dr. David Lisenby

Queer inclusion in the Christian church is overwhelmingly underrepresented. Within my honors practicum, I have uncovered stories from LGBTQIA+ people and their negative experiences with Christianity as they yearn for an accepting religious community. Research has noted that 45% of LGBTQIA+ adults in Missouri are religious along with 11.3 million queer individuals across the United States. However, it is evident that queer individuals have been driven away from these communities. To address this need, I have immersed myself in the intersection of Christianity and self-identity by interviewing three Christian churches in KC to investigate their progress in becoming open and affirming church bodies. Secondly, I have read publications and testimonies of those seeking to heal the rift formed between the two groups. Altogether, the research concluded that numerous churches in KC are looking for reconciliation towards the queer community. In presenting these findings, the session will be an educational piece for audience members to reflect and analyze their own beliefs rooted in Christianity. The first 10 minutes will deep dive into research findings, true stories, and solutions towards these divisions. Secondly, Reverend Chaplain Melissa Dowling at William Jewell will give a five-minute presentation on how she has created space for the Christian community and LGBTQIA+ community on campus. Finally, Senior Pastor Stephanie Swanson from Crossroads Church will delve into her experiences as a senior pastor within an open and affirming church in downtown KC. The remainder of time will be dedicated towards questions and reflection for audience members.

11:25 Yates 222

Queer inclusion in Christian KC Churches – Community Panel

Ryan West

Advisor: Dr. David Lisenby

Gano Assembly

10:45 Gano Assembly

The United States Death Penalty as Modern-Day Lynching

Tatyana Turner

Advisor: Dr. Alan Holiman

How does the history and application of the death penalty in the United States reflect a legacy of racial oppression, and in what ways could it violate human rights, particularly concerning Black Americans? The racial disparities in the death penalty in the United States are a legacy of the nation's history of slavery, lynching, and Jim Crow segregation. This paper will address the history of capital punishment in the United States and will argue that it has been and continues to be a tool of racial oppression, serving as modern-day lynchings, and ultimately violating Black Americans' constitutional and human rights. The death penalty in the United States should be considered cruel and unusual punishment because of its efficacy, historical ties to slavery, its irreversibility, and its racially discriminatory nature. This paper will address three major areas: the history of lynchings in the United States, how the death penalty violates human rights, and the use of the death penalty in Missouri.

Understanding the Impact of Covid-19 on Kansas City Food Banks

Carson Payne

Advisor: Dr. David Lisenby

In recent years, the reliance on food banks has significantly increased due to the cost of living. These organizations primarily rely on volunteers to prepare and distribute food. When the COVID-19 pandemic spread across the United States in 2020, restrictions were placed on food distribution and large-scale gatherings, inhibiting the ability of food banks to distribute supplies and lowering volunteer participation. A study among 200 food banks in the United States showed that "98% experienced demand increase[s] and 59% face[d] inventory reduction," along with considerable losses in volunteers (Esmailidouki et al.). As a result, food banks were forced to make rapid changes to their preparation and distribution processes. This project compared and contrasted food bank operations during and after the pandemic through first-hand experience with local organizations and online research. These organizations include Kansas City Food Not Bombs, A Turning Point, and the Liberty Disaster Relief Food Pantry, where I prepared meals, interacted with other volunteers, and served food to those in need. From these interactions, I learned about the strategies food banks implemented in response to the pandemic, as well as how they currently stand with the issues they've faced.

Katajjaq: Inuit Throat Singing

Hannah Haley

Advisor: Dr. Dorothy Maglione

Looking through the lens of ethnomusicology in order to learn and teach other about katajjaq. When trying to learn about different musical traditions, it is important to analyze them through a constant way for all teachers, this is through soundscape. There are 3 main aspects of soundscapes, and I will be talking about the sound, setting, and significance of katajjaq as well as how it is spread and practiced today from a famous Inuk influencer Shina Nova, and the incorporation of katajjaq in western pop music. The reclaiming of katajjaq as a marker of identity resonates strongly with many indigenous people in Canada due to the past ban of katajjaq from British colonization.

I will focus mainly on the significance of katajjaq and what it meant when it was created vs the meaning of it today and how it has changed. Katajjaq was created to teach Inuit children about creativity, life, and the environment by Inuit women. Katajjaq is meant to mimic animals and the environment through different sounds, rhythms, and pitches and the interaction between 2 groups of people (normally 2 women). It also teaches about the importance of breath and how Inuit believe that breath is what shows life in living things and that everyone including animals, humans, and even the rivers and trees create breath or sound. Katajjaq was also a way that women would resolve conflict. This is because the root of katajjaq is a game. It's a game between 2 groups that involves repetition and building off of one another that always ends in laughter. The harder it is to make the sound, the more likely that the other person will concede and the more likely you will win. The current significance of katajjaq was caused by the effects of British colonization of Canada and the abuse that Inuit went through during that time and today. Also, because of how katajjaq was banned by the British to try to take away Inuit culture. Practicing katajjaq today is seen as a triumph of the abuse of Inuit. For instance, singing tradition katajjaq pieces like Famous Inuk TikTok Influencer Shina Nova and her mom performing "The Love Song" in a TikTok. Also, another thing seen as a triumph for Inuit culture is how katajjaq has been changed by many Inuit through combining modern music like in "Breather" by Tanya Tagaq where she combines modern pop music with Throat Singing. The thing to take away from katajjaq would be the importance of katajjaq to the people who started it and to the people who practice it today.

10:45 PLC 112

Pollen and Spores of the Dennis Formation

Jonas May

Advisor: Dr. Nathan Jud

The gradual evolution of earth's flora is punctuated by substantial changes associated with climate change and extinction events. Among them is the Middle-Late Pennsylvanian transition, which took place about 305 million years ago. The Middle-Late Pennsylvanian transition is marked by major change in the composition of tropical peat-forming forests. However, changes in the more heterogeneous floras not associated with coals are less clear. To help document patterns of vegetation change through time in the Western Interior Basin, we propose an investigation of the palynology of the Dennis Formation in Missouri. The Dennis Formation is a unit of early Missourian age in the midcontinent depositional basin with plant fossils preserved in carbonate mudstones in its upper part. Previous research on the Dennis Formation has focused on the macrofossil diversity, which primarily includes cordaitalean and medullosan foliage. Rock samples were collected from the Clay County Materials Quarry in Liberty, Missouri. Rock samples were macerated and slides of microfossils including pollen and spores were prepared by Global Geo Labs. Preliminary results reveal a microflora dominated by monosaccate pollen grains, with smaller quantities of pollen bisaccate pollen, monolete spores, and trilete spores, which will serve as a guide for identifying grains from other sites. The abundance of monosaccate and bisaccate grains (~75%) suggests Cordaites and/or conifers were an important part of forest canopies, and the remaining spores capture elements of plant diversity that have not yet been detected among the macrofossils that have been collected so far.

11:05 PLC 112

The Effects of Intraspecies and Interspecies Competition on Genetic Device Construction and Performance

Samantha Thompson

Advisor: Dr. Joseph Shih

The field of biological engineering primarily involves the creation and application of genetic devices in monoculture environments, such as bioreactors. Our goal is to expand the use of genetic devices beyond monoculture settings to more naturalistic environments, such as co-culture systems, which better reflect the complexity of the natural world. In our research, we evaluated the functionality of well-characterized constitutive promoters, Anderson promoters, to determine their ability to remain functional and express tinsel purple, our chromoprotein, in a co-culture system over a 12-day period. This assessment aimed to determine the robustness of Anderson chromogenic devices for use in natural microbial communities. Our findings demonstrated that Anderson chromogenic devices were unable to sustain functionality and express tinsel purple over time in co-culture due to intraspecies and interspecies competition, which led to selection against the device.

To address this limitation, we aimed to construct a genetic device capable of reducing selection in co-culture. We hypothesized that by creating a native promoter attached to a gene with higher RNA transcripts in co-culture than in monoculture, we could reduce some selective pressures. We analyzed transcript per million data, and identified Dps, which exhibited higher transcripts in co-culture. After 12 days, the Dps native chromogenic device maintained functionality and expressed tinsel purple. These findings suggest that the right genetic device can overcome some selective pressures. Our next step is to implement this device in a natural wastewater system.

Evaluation of the Signaling Pathway Between *Pseudomonas aeruginosa* and *Escherichia coli* via a Spent Media Assay

Clara Fronabarger

Advisor: Dr. Joseph Shih

First-generation biotechnology has largely focused on growing organisms in monoculture. However, next-generation biotechnology recognizes that biological systems do not exist in isolation. Instead of working with single-species cultures, researchers are now embedding engineered devices into complex microbial communities. This shift raises two fundamental questions: Can my device work in a multispecies environment? And will my device have unintended consequences on the surrounding ecosystem? In this study, we focus on the first question by evaluating the signaling interactions between *Pseudomonas aeruginosa* and *Escherichia coli*. Previous work in the lab has led us to hypothesize that there is cell signaling from *P. aeruginosa* to the *E. coli* that is turning off the expression of a genetic device in *E. coli*. Determining the signaling pathway between the *E. coli* and *P. aeruginosa* will help to better understand the co-culture and how to maintain the integrity of genetic devices within the co-culture. Using a spent media assay, we determined that this signaling is through paracrine/receptor signaling, while observing the mutation rate within the co-culture. Our liquid chromatography analysis of spent media revealed peaks in the spent media co-culture that were not present in fresh media. We are currently in the process of evaluating chemicals with similar peaks in order to determine candidates for a signaling assay.

Duke Colloquium Schedule | April 2025

Afternoon Sessions

Yates 221

1:00 Yates 221

Integrated Mathematics Lessons' Effects on Mathematical Identity

Preston Bigler and Landis Johnson

Advisor: Dr. Jeanine Haistings

The world of education has seen a push towards integrated learning and the use of real world contexts for instructional materials. The purpose of this study was to observe how using mathematics-based literature and real-world problems would affect a student's mathematical identity. A pre and post-survey was given to students in a classroom regarding their mathematical identity, as well as three lessons developed around mathematics-based literature and problems applicable to the world beyond the classroom. After the lessons were completed, a writing activity was introduced that allowed students to create their own mathematical stories that tie in their interests. Some students reported improvement in their mathematical identity, while others stayed consistent. These results indicate that integrating literature and real-world contexts with mathematics may result in an improved perception of oneself as a mathematician.

1:20 Yates 221

The Implications of Vocabulary in Reading Comprehension and the Production of Oral Narratives in Elementary Students

Elisabeth Hampf

Advisor: Dr. Amy Barth

Purpose: This project examined how vocabulary impacts reading comprehension and the development of oral narratives among students enrolled in grades 3-5.

Method: Student participants (n = 31) were randomly assigned to 1 of 3 vocabulary acquisition conditions (practice, same, or different). In all conditions, participants first learned a controlled knowledge base on ancient Egypt. Next, participants practiced recalling this knowledge base across 4 time points. In condition 1 (study), participants practiced saying, identifying, and defining the target vocabulary. In condition 2 (same), participants recalled the knowledge base by answering the same comprehension questions across time points. In condition 3 (variable), participants recalled the knowledge base by answering different comprehension questions across time points. After learning the knowledge base and then recalling it, participants completed an oral narrative recall task. The knowledge recall task measured the number of target vocabulary words used in conversation.

Results: Results indicated that participants who learned the knowledge base on ancient Egypt and then answered the same comprehension questions across time points, retrained and used more target vocabulary words in their oral narratives. Students in the study condition performed similarly. Students in the variable condition performed the lowest.

Conclusions: Evidence from this study suggests that working memory activities involving higher order thinking, prior knowledge, and frequent knowledge retrieval lead to durable learning. Additionally, it was deducted that early reading ability contributes to participant scores on the oral narrative task.

Do Colleges Provide Pre-Service Teachers What They Need to Work Effectively in an Inclusive Classroom?

Leo Edwards

Advisor: Dr. Amy Barth

The purpose of this study was to find if preservice teachers believe they are receiving enough information about special education practice and law to comfortably teach in an integrated classroom. This study bases its findings on Albert Bandura's self-efficacy theory, and if current education students have the needed sources of self-efficacy to believe they can teach students of all abilities and skill sets. A survey was sent to the education majors of William Jewell College to assess students' beliefs on their skill set and confidence, and interviews were conducted with William Jewell College education staff to garner their beliefs on if they are properly preparing their students. Results show that while students believe they have adequate knowledge on special education law and practices, many feel they are unequipped to work in integrated classrooms and would benefit from further knowledge and experience. Research leads to the recommendation that preservice teachers would benefit from being placed in a special education fieldwork environment.

Yates 222

Illuminating the History of the Radium Girls

Cal Perkins

Advisor: Dr. Megan Groninger

In the early 20th century, in the dawn of World War I, young women eagerly took jobs painting luminous watch dials, blissfully unaware that they were slowly poisoning themselves with each brushstroke. The Radium Girls, as they would come to be known, trusted their employers when told the glowing substance was harmless, until their bodies began to decay. This paper explores their fight for justice against corporations that knowingly endangered them, the intense legal battle that followed, and the lasting impact of their sacrifice. Referencing historical records, firsthand accounts, and scientific analysis, this project sheds light on a near-forgotten tragedy that reshaped labor laws and workplace protections. Nearly a century later, the Radium Girls' legacy endures, yet not even recognized by Kansas City's own WWI museum. It remains a haunting reminder of the cost of corporate greed and the power of a collective resistance.

"We Can No Longer Accept Genocide as an Answer to AIDS": ACT UP and the History of AIDS Activism in Kansas City, Missouri

Tarryn Fredde

Advisor: Dr. Daniel Kotzin

Though it often gets left out of many mainstream narratives of US history, the AIDS epidemic led to significant shifts in the sociopolitical climate in the country. Emerging first in the US in the 1980s, AIDS quickly became associated with the gay community, despite them not being the only ones impacted by the condition. Using research done by Dr. Jennifer Brier and Dr. Joe Wright into the early stages of the AIDS crisis, I analyze the ways historians characterize the government's response to the epidemic, as well as that of LGBTQ activists. One of the most significant responses was the forming of the AIDS Coalition to Unleash Power (ACT UP) in New York City in 1987 by activists to protest the abysmal treatment people with AIDS received and to advocate for their rights. Chapters quickly sprung up across the country, including in Kansas City, Missouri in 1989. Drawing from an extensive amount of archival research done into ACT UP KC, I examine the kinds of protest the group engaged in and the impact they had on Kansas City. In turn, I also discuss the leaders of ACT UP KC and their personal beliefs and motives that shaped the kind of protest they engaged in. Overall, ACT UP KC planned protests that were influential at a local and national level and successfully brought attention to the discrimination people with AIDS faced, despite not being as large or having access to as many resources as other ACT UP chapters.

From Blood to Oblivion: Little Italy and the Making of Columbus Park

Jacob Tetlow

Advisor: Dr. Daniel Kotzin

"We can almost tell what part of the city a man was from just by seeing the way they did him up," a hospital attendant told Ernest Hemingway in 1918 as they hovered over a man with grade-three bullet wounds. The attendant added, "[t]hey preferred the sawed off in Little Italy." This remark raises intriguing questions: When did Kansas City have a Little Italy? Why did the name change? How does a neighborhood become associated with a particular act of violence? Kansas City's North End, historically home to a large Italian immigrant community, underwent a significant transformation in the mid-20th century. This shift is reflected in the transition from its colloquial name, Little Italy, to the official designation Columbus Park, by the late 1960s. Analyzing Kansas City Star articles reveals a clear trend: as the use of Little Italy declined, Columbus Park nearly doubled in frequency. A rhetorical analysis of these articles further qualifies how the North End's evolving identity was framed. This study engages with the works of Simina Frunza and Thomas Joseph Cesarini, whose research on Italian enclaves in New York and San Diego highlights the persistence of ethnic identity. In contrast, the Kansas City case suggests a significant erosion of Italian identity, exemplified by the transformation of Holy Rosary Church into a Vietnamese parish. The renaming of the North End was not just a linguistic shift, but a marker of deeper cultural assimilation shaped by mid-20th-century social anxieties around Italian Americans.

Gano Assembly

1:00 Gano Assembly

The Foster Care to Homelessness Pipeline: Identifying Risk Factors and Ways to Address Them

Erin Wenzel

Advisor: Dr. David Lisenby

Approximately 20,000 people age out of the American foster care system each year, and according to recent statistics about one in five will become homeless the day they age out. In Missouri, which places seventh in the nation for having the most youth in foster care, that statistic is raised to one out of every four youth becoming homeless. This project seeks to understand the contributing factors behind the foster care to homelessness pipeline, and how we might curb the rates of adolescent homelessness in Missouri. To better understand the lived experiences of Missouri foster youth, I partnered with the Synergy Youth Resiliency Center, which provides temporary emergency housing for current foster youth, runaways, youth currently in between foster placements, and actively homeless youth. During my regular visits, I learned, and what later research would confirm, that the Missouri foster care system was not equipped to meet the mental health care needs of the youth in its care. Approximately 90% of foster youth have experienced at least one traumatic event, with 30% meeting the diagnostic criteria for Post Traumatic Stress Disorder. Despite the prevalence of mental health issues among foster youth, there is no required training on the subject for foster families in Missouri nor is there easy access to mental health treatment. This leads me to conclude that the first step towards preventing homelessness after foster care must be to place a greater emphasis on the mental health and well-being of foster youth.

1:20 Gano Assembly

Honors Institute Project: A Nutritional Education Initiative for Underserved Mothers and Children

Lauren Flickinger

Advisor: Dr. David Lisenby

Malnutrition persists as a leading global health crisis, affecting millions of children under the age of five. In 2022, an estimated 149 million children experienced stunted growth, 45 million suffered from wasting, and 37 million were overweight or obese (CDC, 2022). This statistic emphasizes the urgent need for nutrition education, particularly among vulnerable populations such as pregnant women and young children. That said, this project aimed to bridge that gap by providing evidence-based nutritional education to pregnant women and mothers of young children at St. Mary's Home for Women. Through four, one-hour interactive presentations in a group-discussion setting with numerous visual aids, participants learned about essential maternal and fetal health nutrients, dietary recommendations, and practical recipes for ensuring adequate nutrition on a limited budget. The sessions also covered key nutritional considerations for toddlers, emphasizing the importance of establishing healthy eating habits. The mothers' engagement and feedback confirmed the need for accessible, community-driven nutritional education, with 100% of the mothers expressing increased confidence in making healthier dietary choices. This project highlights the importance of nutritional health education in improving maternal and infant well-being, and the lesson plans will serve as a model for future nutrition education initiatives with this facility.

Experiential Learning in Evidence-Based Chaplaincy

Nancy Gillespie

Advisor: Dr. David Lisenby

My Honors Institute experiential practicum project explored evidence-based chaplaincy in both the hospital and community settings and focused on how pastoral leaders integrate evidence-based practice into spiritual care. After a personal internship at a community church in 2023, my experiential learning involved conducting interviews with spiritual leaders and chaplains in the community, database research, and the development of a guide to empower congregants to provide spiritual care in their communities. Kolb's Experiential Learning Cycle framed the learning process, completing key steps such as concrete experience, reflective observation, and abstract conceptualization. My experience highlighted the importance of holistic health, further research into evidence-based chaplaincy, and advocacy for congregant training in chaplaincy practices. Although the last step of Kolb's process has not been performed, Active Experimentation is evidence-based spiritual care in communities and hospitals. This experiential learning process has aided in my nursing education by reinforcing the importance of holistic health principles and therapeutic communication techniques.

Pryor Learning Commons 112

Lactobacillus acidophilus Promotes Oxidative Stress in a Escherichia coli and Pseudomonas aeruginosa Wastewater Co-Culture Model

Sadie Blacketer

Advisor: Dr. Joseph Shih, Dr. Lilah Rahn-Lee

P. aeruginosa forms biofilms in wastewater systems, which provides other microbes a stable environment for growth. We built a model wastewater community of *P. aeruginosa* and *E. coli* co-culture grown in standing conditions. In this system, there are three phases of growth: the floating pellicle, the surface-associated biofilm, and planktonic growth in the liquid between the two biofilm layers. The presence of *E. coli* in this co-culture with *P. aeruginosa* requires biofilm formation. To model disruptions to an established system, we observed how *P. aeruginosa* and *E. coli* responded to the invasion of *L. acidophilus* into the co-culture. We saw differences in biofilm behavior after invasion, including a disrupted and fragile pellicle in comparison to that of the uninvaded coculture. Using RNA-sequencing, we found that *P. aeruginosa* upregulates oxidative stress response genes after *L. acidophilus* invasion, suggesting that *L. acidophilus* produces reactive oxygen species directly or indirectly. Under some conditions, *L. acidophilus* replaces *P. aeruginosa* in the co-culture, which we hypothesize may be mediated by reactive oxygen species. Surprisingly, *E. coli* is able to participate in the invaded co-culture without a change in population or oxidative stress response, with gene expression suggesting a shift from a biofilm to a planktonic growth phase after invasion.

How do bacteria survive stress? The gene *yqiK* strengthens the *Escherichia coli* cell envelope.**Scott Jolly***Advisor: Dr. Lilah Rahn-Lee*

How do we resist stress and how do we overcome the environmental forces that stand to act against us? All organisms must persist in the face of physical stressors, such as extreme temperatures, dehydration, and exposure to harmful chemicals. *E. coli* are gram-negative bacteria found in the guts of many animals including humans and freshwater. Similarly, *E. coli* must also contend with physical stressors; some specific stressors *E. coli* might face are extreme pH levels, salt concentration, and antibiotics. Furthermore, it is the cell envelope of *E. coli* that must bear the weight of these stressors. Gram-negative bacteria like *E. coli* have a cell envelope that consists of an inner cytoplasmic membrane, a thin layer of peptidoglycan, and an outer membrane. In this study, we aim to determine the genes that help bacteria resist stress, specifically those dealing with the bacterial envelope. To find such genes, we began by screening a large collection of *E. coli* mutants on both normal and stress-inducing plates to identify mutants that don't survive under the stressor. From this, we were able to identify each disrupted gene. One such gene we found from this method was *yqiK*. Ultimately, through standard microbiological techniques and AI protein structural predictions, we demonstrate *yqiK*'s role in inner membrane stability.

Biofilm Formation is Not a Primary Factor in Promoting Multi-Species Growth for *Pseudomonas aeruginosa* and *Escherichia coli* Communities**Skyler Boylan***Advisor: Dr. Lilah Rahn-Lee*

Bacteria are microscopic, single-celled organisms whose interactions within multi-species communities are critical for understanding how they can grow, communicate, and respond to the environment. While bacterial interactions are often competitive, resulting in one species dominating over another, bacterial cooperation can significantly impact bacterial persistence and community stability. Biofilms, which are composed of bacteria that are adhered to each other or a surface and are encased in a protective extracellular matrix, have been shown to promote bacterial resistance to environmental stressors, antibiotics, and immune defenses. In this study, we explore the role of biofilm formation in facilitating the coexistence of *Pseudomonas aeruginosa* and *Escherichia coli*, two common species whose individual community dynamics are well-studied. Despite the fact that these two bacteria can be in competition with each other, it is also the case that biofilm formation can enable stable cohabitation of the two species. By examining how biofilm formation affects multi-species community dynamics with these two species, we aimed to identify the impact that biofilm has on interspecies dynamics and persistence, finding that its importance may be overstated.

Pillsbury Music Center

1:00 Pillsbury Music Center (Forbis Recital Hall)

The Creative Process of Young Composers

Bryson Gates

Advisor: Dr. Dorothy Maglione

Every composer has a different process to creating music and it is truly a unique and individual creative process. In this presentation, I will share the inspiration behind and creation of my String Quartet in B Major, no. 1. First, I will discuss the initial idea behind the string quartet and how something that was a mere idea for a string quartet, transformed into a lyrical composition. Second, I will provide an analysis and overview of the theory for the piece, different musical elements I used to write the composition, and how these elements work together. Finally, I will share the revisions I made to the piece as I was fortunate to get feedback from other composers and professors here at the College and collaborate with performers while we rehearsed the string quartet this semester for chamber music. Explaining the overall creative process and breakdown in this presentation will reveal an inside perspective of how a composer makes the decisions and choices throughout the creative process. Think of it as Behind The Scenes! I will conclude the presentation by playing String Quartet in B Major, no. 1 with Irene Taboada, Mars Beck and Milo Johnson.

Afternoon Music Performances (Locations Below)

2:00 Pillsbury Music Center (Forbis Recital Hall)

Musical Theatre Revue: Family Matters

Ivan Calderon, Marquis Williams, Lianna Morelli, Clara Bay, Giuliano Lule-Paredes

Advisors: Dr. Jennifer Townsley, Prof. Nathan Wyman

Jewell Theatre Company's Musical Theatre Revue was a creative performance project that showcased nine William Jewell students. These students were all given the task to choose solos and ensemble numbers from various musicals to perform, but there were two conditions:

1. The students had to select musical numbers that fell under the theme "Family Matters." This common phrase could be referring to the idea that family is important, precious, and vital to the human experience, but "family matters" can also be interpreted as family issues, drama, or affairs.
2. The students would only have 8 hours of rehearsal to prepare for a live audience. This included music rehearsal, stage rehearsal, and tech rehearsal.

"Family Matters" was produced as a black box performance - a style of minimalist theater that uses little to no props, set pieces, or costumes. Black box productions are not just cost-effective methods of theatre production; they provide an innovative, creative opportunity for actors while also being a more intimate and raw audience experience. This production had a major impact on both the audience and performers, as we also chose to honor the years of Jewell Theatre's existence and the end of a department that served generations of Jewell students and faculty. Seven students sang and acted for the performance while two students served as lighting designer/technician and sound technician. The production and rehearsal process was facilitated by Dr. Jen Townsley, a faculty member of the Performing Arts Department.