# Research Symposium 2026 Program

## Quick Navigation



## Keynote Address

9:00 a.m. – 10:00 a.m.
Mathew's Auditorium

### Dr. Tina L. Bertrand (2024 E.E. Hall Scholar)

*The Road Not Taken: From "Big Name" to Big Impact" …with apologies to Robert Frost*

The international system is considered anarchic by international relations scholars, since there is no overarching governing structure with sufficient authority to compel countries to act in certain ways or to forbid certain actions, even the most heinous. As such, much of the constructivist literature in international relations examines conditions under which countries may be persuaded to accept limits on their behavior. Landmines, for example, were produced, transferred, and used widely – and with impunity -- before civil society began labeling them "indiscriminate killers" in the 1990s. Such labels and informal pressure from non-governmental organizations (NGOs) led to the adoption of the Landmine Treaty. While countries hold sacred their sovereign decision-making authority, they can be persuaded to accept informal limits on certain behaviors through norm acceptance or formal limits through treaties and conventions. This talk highlights my research on the informal norms that countries have accepted regarding proscriptions on behaviors such as vetoing UN action on genocide, and prescriptions to mitigate violent extremism through educational reform.

**Break:** 10:00 a.m. – 10:15 a.m.

## Morning Sessions (10:15 a.m. – 12:00 p.m.)

### Honors Presentations

**Old Main 103:**
10:15 – HP A1 – Logan Stevens
10:45 – HP A3 – Anyah Campbell
11:15 – HP A4 – Kaylee Worth

**Old Main 107:**
10:15 – HP A6 – Omar Alonso Magana
10:45 – HP A5 – Nathaniel Pyenta

**Cooke 107:**
10:15 – HP A2 – Carmen Velasquez

### Student Oral Presentations

**Cooke 107:**
OP A1 – Ethan Alvey
OP A2 – Dominic Carroll
OP A3 – Kylee Dossey
OP A4 – Daniel Friday
OP A5 – Cassidy Cudd
OP A6 – Carson Fallowfield
OP A7 – Annikah Frank
OP A8 – Ezzerin Lounds
OP A9 – Johnathan McLean
OP A10 – Lily Drews

**Science 105:**
10:15 – OP B1 – Robert Albin
10:30 – OP B2 – John Tran
10:45 – OP B3 – Eduvie Chinosa
11:00 – OP B4 – Sunshyne Parrish
11:15 – OP B6 – John Tran
11:30 – OP B7 – Yumel Josh Calaunan
11:45 – OP B5 – Jacob Wooten

**Old Main 206:**
10:15 – OP C2 – Joanie Burns
10:30 – OP C3 – Natalea Long
10:45 – OP C4 – Alex Clay
11:00 – OP C6 – Molly Daugherity
11:15 – OP C5 – Julia Langkiet
11:30 – OP C7 – Gabriel Martinez

**Old Main 207:**
10:15 – OP D1 – Lauren Scott
10:30 – OP D2 – Liana Benavides
10:45 – OP D3 – Alayna Francis
11:00 – OP D4 – Jackie Santos
11:15 – OP D7 – Wade Springfield
11:30 – OP D6 – Preston Bennett

## Midday Events

**Student Panel:**
12:00 p.m. – 1:00 p.m.
Mabee Room
Heavy hors d'oeuvres provided

**Poster Presentations:**
1:00 p.m. – 3:00 p.m.
Finch Gray Science Building
Posters P-R1–P-R23 will be in the Ryan Fine Arts Building, outside the Ryan Gallery.

**Break:** 3:00 p.m. – 3:30 p.m.

## Afternoon Sessions

**Three Minute Thesis Competition:**
3:30 p.m. – 4:00 p.m.
**Science 105**

3MT 1 – Lumiere Kadetwa
3MT 2 – Alexander Lasserre
3MT 3 – Wade Springfield
3MT 4 – Emilee Thompson
3MT 5 – Tioluwalope Abdul
3MT 6 – Nathaniel Pyenta
3MT 7 – Julia Langkiet

## Additional Programming

**Ryan Fine Arts Film Festival | Ryan Fine Arts Building:**
10:00 – 11:00 – English/Film Panel
1:30 – 2:00 – Theatre Performance: Signing Off
2:00 – 2:30 – Theatre/Film Discussion
2:30 – 3:00 – Animation Videos
3:00 – 4:00 – Theatre Performance: Before You Were Ruth

**Department of Music Honors Recital:**
11:00 a.m. – 12:00 p.m. | Ryan Fine Arts Building

**Student Performers:**

**Abigale Baker**, marimba *(Junior)*
*October Night* – I, II
Michael Burritt (b. 1962)

**Aaron Brokovich**, marimba *(Junior)*
*Cello Suite No. 1 in G Major, BWV 1007* – I. Prelude; III. Courante
J.S. Bach (1685–1750).

**Gabrielle Estes**, flute *(Senior)*
*Sonata for Flute and Piano, Op. 14* – III. Andante; IV. Allegro con moto
Robert Muczynski (1929–2010).

**Hailey Signor**, soprano *(Senior)*
*Je Te Veux*
Erik Satie (1866–1925).

## Abstracts



## Honors Presentation Abstracts

**HP – A1**

**"To Relax or Not to Relax: The Effectiveness of an Educational Intervention on Relaxation Techniques for College Students."**

**Logan Stevens (Mentor: Marcia Straughn)**

The purpose of this thesis project is to evaluate the effectiveness of relaxation-technique education for college students and determine whether the education increases their knowledge and willingness to use these techniques to manage stress and anxiety. Stress and anxiety can lead to many negative effects for college students, such as decreased academic performance, mental health issues, lower graduation rates, and poor coping behaviors. Overall, college students experience heightened stress due to academic pressures, work-related stressors, social changes, financial strains, and general life challenges. These stressors often cause increased levels of anxiety, which interfere with concentration,

physical/emotional health, and decreased motivation. College students need knowledge of effective coping strategies to prevent maladaptive behaviors. The overall goal of this project is to promote the health and well-being of college students by equipping them with techniques to help with stress and anxiety. The educational pamphlet intervention used in this study was accessible and a low-cost strategy to decrease stress and anxiety. These techniques are designed to be easily practiced daily with no equipment or time commitment. The hypothesis is that students will gain increased knowledge and a greater willingness to use the techniques after being educated about the methods. It is anticipated that once students are taught relaxation methods, they will be more inclined to use them in the future. It is expected that the post-test results will show improved understanding of relaxation methods and higher self-reports of intentions to use them in the future. For this research, a pre-test/post-test design was used, with an educational pamphlet intervention in between. The pre-test/post-test included demographic questions and Likert-scale items to assess knowledge and use of relaxation techniques. This design enabled a measurable comparison of data before and after the intervention to assess the impact on participants' understanding and intentions. The educational pamphlet was student-made by Logan Stevens. The educational pamphlet included information about the effects of stress and anxiety in college students, as well as guidance on relaxation techniques, including physical exercise and yoga, meditation and guided imagery, breathing techniques, and a relaxation course. The participants in this research were McMurry students enrolled in undergraduate/graduate programs and aged 18 or older. College students completed the research form using flyers posted at McMurry University and via email to the McMurry University staff, who shared them with students. Participants completed informed consent prior to participation and were reminded that participation was voluntary. The pre-test/post-test was conducted at the participant's convenience, on their own time. There were no vulnerable groups targeted. The data collected will be stored safely using Microsoft Forms through McMurry University's Microsoft 365 system and secured on password-protected devices. No identification information was collected besides basic demographics. Data analysis was conducted by comparing pre-test and post-test responses to evaluate the significance of knowledge and willingness following the intervention with relaxation techniques. Overall, the findings suggest that the educational pamphlet on relaxation techniques was effective in increasing knowledge among college students. For all participants, the average pre-test score was 36.43, while the post-test mean increased to 42.81. This represents an average improvement of 6.38 points, suggesting that students gained knowledge after reading the pamphlet.

**HP – A2**

**"Impact of Donation Systems on the Tipping Industry"**

**Carmen Velasquez (Mentor: Kevin Phillipson)**

The rise of digital payment systems has transformed traditional tipping practices by introducing donation-based prompts across service industries and online platforms. This study examines how these systems influence consumer behavior, focusing on donation

frequency, the likelihood of selecting suggested or maximum amounts, and their broader impact on tipping culture. Drawing on survey data collected from students, faculty, and community members, as well as a review of existing research on economic behavior and social influence, this paper explores the psychological and structural factors that shape giving decisions.

The findings suggest that convenience, social pressure, and preset donation options play a significant role in increasing participation in tipping and donation systems. Additionally, generational differences emerge: younger individuals are more responsive to digital prompts than older participants, who tend to follow more traditional tipping norms. Overall, this research argues that donation-based systems are not only increasing the visibility of tipping but are also reshaping expectations around when and how individuals choose to give. These changes carry important implications for both consumers and workers, particularly in industries where income is partially dependent on voluntary contributions.

**HP – A3**

**"The Prosecutor Behind the Curtain: The Reality of Prosecutorial Power and the Influences It Holds"**

**Anyah Campbell (Mentor: Robert Wallace)**

This thesis investigates the ideology of prosecutorial discretion and its use in prosecutors' offices. It identifies three types of prosecutor style and two orientations to prosecution. Additionally, it discusses the struggles prosecutors face in balancing office culture with their personal morals. This thesis includes interviews with two acting prosecutors in Texas. These interviews are used to exemplify the complications in applying the expectations and ideology placed on prosecutors. After talking with the two prosecutors, it became clear that ideology is not always perfect and that society has contradictory expectations for the role of a prosecutor and for how they should exercise their discretion. With the exposure of wrongful convictions, many individuals have come to argue that prosecutorial discretion is overpowering and needs to be limited. However, there needs to be more structure and review of prosecutors' actions than simply imposing an overall limitation on their prosecutorial discretion.

**HP – A4**

**"Synthesis, Characterization, and Anticancer Activity of Phenol-Derived Ether Compounds"**

**Kaylee Worth (Mentor: Paul Pyenta)**

Cancer remains a leading cause of mortality worldwide, necessitating the development of novel therapeutic compounds capable of targeting tumor growth and survival pathways. In this study, ether-linked derivatives of phenolic compounds were synthesized via

Williamson Ether Synthesis and evaluated for anticancer activity across multiple cancer models. Phenol, ethyl-3-chloro-4-hydroxybenzoate, and 4-chlorophenol were reacted with ethyl 6-bromohexanoate under basic conditions to produce the corresponding ether derivatives: ethyl 6-(phenoxy)hexanoate, ethyl 3-chloro-4-(6-ethoxycarbonylhexoxy)benzoate, and ethyl 6-(4-chlorophenoxy)hexanoate.

Products were purified using automated column chromatography. Product purity and reaction progress were evaluated using thin-layer chromatography (TLC), and compounds were characterized by gas chromatography–mass spectrometry (GC–MS), infrared (IR) spectroscopy, and proton nuclear magnetic resonance ($^1$H NMR). Anticancer activity was assessed using a resazurin-based cell viability assay against four human cancer cell lines: A375 and G361 melanoma cells, and MDA-MB-231 (triple-negative) and MCF-7 (hormone-responsive) breast cancer cells.

Cytotoxic responses varied markedly across cell lines, reflecting strong dependence on cellular phenotype and underlying signaling pathways. In the MDA-MB-231 cell line, several ether-linked products demonstrated measurable activity, with CC50 values in the low- to mid-micromolar range (e.g., the phenol product: 60 μM), indicating moderate susceptibility in this highly aggressive, receptor-independent model. In contrast, MCF-7 cells exhibited highly uniform CC50 values across both reactants and products (e.g., phenol product: $1.7 \times 10^3$ μM; E3C4H product: $2.5 \times 10^3$ μM), suggesting limited efficacy and resistance associated with estrogen receptor-driven signaling. Among melanoma models, A375 cells showed greater sensitivity to several ether derivatives, including the phenol product (42 μM) and the 4-chlorophenol product (52 μM), consistent with the increased vulnerability of BRAF-mutant cells to disruptions in proliferative signaling pathways, such as MAPK. Conversely, G361 cells remained largely unresponsive, with elevated $CC_{50}$ values observed even for synthesized products (e.g., phenol product: $6.0 \times 10^3$ μM), demonstrating substantial variability in melanoma drug response.

Overall, etherification of the phenolic framework resulted in modest, compound-dependent changes in cytotoxic activity rather than a consistent enhancement in potency relative to parent reactants. While several synthesized products exhibited measurable anticancer effects, particularly in A375 and MDA-MB-231 cell lines, the magnitude of activity was generally limited, and in many cases did not surpass that of the corresponding starting materials. Nevertheless, the observation that ether-linked derivatives retain and, in some instances, moderately improve biological activity suggests that this research provides a viable foundation for further chemical optimization. The persistence of high CC50 values in resistant cell lines such as G361 and MCF-7 underscores the need for structural modifications to enhance cellular uptake, target engagement, and overall efficacy. Future studies will focus on converting these ether derivatives into more polar functional groups, such as carboxylic acid analogs, which may enhance pharmacological activity and broaden anticancer potential across diverse cellular phenotypes.

**HP – A5**

**"Exploring natural anti-microbial and anti-virulence compounds with their mechanism of actions to combat drug-resistant pathogens."**

**Nathaniel Pyenta (Mentor: Santosh Kumar)**

The emergence of drug-resistant pathogens is a global concern, highlighting the need for new therapeutic strategies. Staphylococcus aureus, a Gram-positive bacterium, is listed as a WHO priority pathogen and causes a wide range of invasive infections, including skin infections, pneumonia, endocarditis, and bacteremia. The increasing prevalence of multidrug-resistant strains such as MRSA is particularly alarming. This pathogen produces various toxins and virulence factors, including hemolysins, lipases, and proteases. In this study, we investigated plant-based pure compounds such as glabridin (GLB) from licorice root, usnic acid (UA) from lichens, and eugenol (EUG) from clove for their potential to inhibit the expression of these virulence factors. Furthermore, RNA sequencing analysis of S. aureus exposed to sub-inhibitory concentrations of UA under aerobic and anaerobic conditions indicates that genes associated with survival under redox stress and alternative respiration (the urease cluster) are highly upregulated. In contrast, genes related to carbon metabolism and virulence are significantly downregulated. Some major virulence genes, such as gamma-hemolysins, were strongly down-regulated under aerobic conditions compared to anaerobic conditions. Our analysis suggests that UA alters carbon metabolism and cellular homeostasis toward stress survival rather than active growth and virulence in S. aureus.

**HP – A6**

**"Designing Health: The Role of Graphic Design in Public Health Campaigns"**

**Omar Alonso Magana (Mentor: Jodi Frizzell)**

This thesis examines the role of graphic design in shaping the effectiveness of public health campaigns across historical and contemporary contexts. While often overlooked, graphic design is a critical tool for translating complex health messages into accessible, persuasive visual communication. Through a comparative analysis of campaigns ranging from World War II sanitation posters to modern COVID-19 initiatives, this study evaluates how design elements such as typography, color, imagery, and layout influence public perception and behavior.

The research explores the relationship between visual strategies and measurable outcomes, arguing that strong design significantly enhances message retention and behavioral change. In contrast, weak or misleading design can undermine campaign effectiveness. Additionally, the study addresses the ethical implications of persuasive design, highlighting how strategies such as fear and emotional appeal can both positively and negatively impact public response.

Ultimately, this project positions graphic design not as a decorative component but as a central force in public health communication, contributing to a deeper understanding of the designer's responsibility in shaping public discourse and influencing societal outcomes.

## Oral Presentation Abstracts

**OP – A1**

**"Alvey Cigar Company"**

**Ethan Alvey (Mentor: Kevin Phillipson)**

I will describe my future company in detail and explain my idea and business plan.

**OP – A2**

**"The 42 Foundation: A Scalable Model for Purpose-Driven Impact"**

**Dominic Carroll (Mentor: Kevin Phillipson)**

The 42 Foundation is a purpose-driven initiative that bridges the gap between ambition and opportunity by creating structured pathways for personal, professional, and community development. Built on the belief that meaningful impact requires both vision and execution, the foundation empowers individuals through mentorship, entrepreneurial education, and strategic resource allocation.

This presentation outlines the foundation's core model, including its operational structure, revenue and sustainability strategy, and scalable approach to impact. By integrating principles from business consulting, leadership development, and community engagement, the 42 Foundation positions itself as both a catalyst for individual growth and a platform for long-term societal contribution.

In addition to presenting the conceptual framework, this session serves as an open invitation for potential board members and investors to help shape the foundation's direction. Attendees will gain insight into how the organization plans to measure success, expand its reach, and create lasting value across diverse communities.

**OP – A3**

**"Business Plan Presentation"**

**Kylee Dossey (Mentor: Kevin Phillipson)**

I am presenting my business plan for my lounge that will provide rooms for rent for activities and groups, along with food.

**OP – A4**

**“Veterans Helping America”**

**Daniel Friday (Mentor: Kevin Phillipson)**

A business presentation on my idea.

**OP – A5**

**“Business Plan Proposal”**

**Cassidy Cudd (Mentor: Kevin Phillipson)**

Wall Not Included is a traveling live entertainment event company that brings unique stand-up comedy directly to Abilene communities through pop-up performances. Its mission is to make comedy more accessible, support emerging talent, and create shared experiences by turning everyday spaces into vibrant hubs of laughter and connection.

**OP – A6**

**“Creating a business plan.”**

**Carson Fallowfield (Mentor: Kevin Phillipson)**

I have created a textbook on how to write a business plan.

**OP – A7**

**“Business Plan Presentation”**

**Annikah Frank (Mentor: Kevin Phillipson)**

The Pink Cocoon brings a warm, welcoming environment to those who want to feel relaxed.

**OP – A8**

**“Fade & Save”**

**Ezzerin Lounds, Jayson Henley, Jarvis McCarty, Zachariah Mitchell, and Xavier Williams (Mentor: Kevin Phillipson)**

Fade & Save is an affordable haircut business designed to serve minority communities by offering high-quality haircuts at lower prices. The business focuses on providing skilled barbers who understand different hair textures and styles, an aspect often overlooked in traditional barbershops. By keeping prices reasonable, Fade & Save makes it easier for people to maintain their appearance without spending too much money. The shop also aims to create a welcoming and comfortable environment where customers feel respected and valued. In addition to affordability, the business emphasizes consistency and professionalism, ensuring every customer leaves satisfied. Overall, Fade & Save stands out

by combining quality service, cultural awareness, and accessibility, making it a reliable option for individuals looking for both style and value in their grooming experience.

**OP – A9**

**"Tuffest Rugs"**

**Johnathan McLean, Aiden Shepard, Ciara Hall, Garrett Stimmler, and Alliyah Tolentino (Mentor: Kevin Phillipson)**

Our business is called Tuffest Rugs. We focus on making custom handmade tufted rugs. We turn almost any image, shape, or design into a custom art piece. All the way from business logos to pictures of your favorite athlete, to any image you could ever imagine!

**OP – A10**

**"Revive – Carbonated Electolytes"**

**Lily Drews, Hailee Garmer, Avery Murray, Evan Garcia, and Shelby Blankenship (Mentor: Kevin Phillipson)**

Carbonated Electrolytes (Revive) is a product that promotes health and fitness. Our product is ALL-natural, made with all four electrolytes, 80 mg of caffeine, flavored with fruit, and, if needed, agave sugar. This is a Christ-built foundation where we need revival in sports, life, and faith. God never intended us to run on empty. This drink is a reminder that your strength is renewed daily, and what you pour out can be filled again. This drink will replenish your body while Christ renews your spirit.

**OP – B1**

**"Identifying Bioindicators to Evaluate Mercury Concentrations in Texas Lake Systems"**

**Robert Albin (Mentor: TJ Boyle)**

A population study was conducted on Palaemonetes kadiakensis, commonly known as the grass shrimp, and crayfish to determine how their size classes correlate with mercury concentrations. Mercury deposition in freshwater ecosystems can be measured using bioindicators. Samples were drawn from Fort Phantom Lake, Hubbard Creek Reservoir, Lake Eastland, and the Middle Bosque River headwaters of Lake Waco. Samples were measured in length, width, and weight to classify size classes. Data on size classes were compared with mercury concentrations, with the hypothesis that larger size classes would have higher concentrations. By developing relationships between size class and mercury concentration, the characteristics of each reservoir can be compared. The data will aid future studies aimed at expanding the use of bioindicators of mercury contamination in this region.

**OP – B2**

**"Simultaneous Fit Approach for Nonlinearity Measurements in CMS Luminometers"**

**John Tran (Mentor: Christopher Allan Palmer)**

Conduct a feasibility study using simultaneous fit approaches, given emittance scan data to determine nonlinearity, not traditionally used, in conjunction with established methods to better correct routine luminosity measurements in the CMS luminometers.

**OP – B3**

**"Development of Hypertension Management: The Role of ACE Inhibitors"**

**Eduvie Chinosa (Mentor: Pamela Veltkamp)**

Hypertension affects nearly 119.9 million American adults, resulting in an urgent need for effective medicinal therapies. As cardiovascular risks persist, researchers are consistently exploring and developing drug compounds to combat hypertension and its contributors. New approaches to the detection, management, and treatment of hypertension focus on pharmacological agents, particularly angiotensin-converting enzyme (ACE) inhibitors. The understanding of hypertension biochemically, as well as the clinical applications of ACE inhibitors, has evolved significantly. Advancements in the pharmaceutical industry have led to the standardized production of ACE inhibitors. Targeted drug therapy has been the main method used to improve the regulation of blood pressure. Current ACE inhibitors highlight the role that modern medical chemistry and evidence-based pharmacology play in achieving precise blood pressure control.

**OP-B4**

**"Vocalization Signatures of Frog Species: A Study of Call Patterns for Species Identification and Biodiversity Monitoring in a Temperate Wetland Ecosystem"**

**Sunshyne Parrish (Mentor: Joel G. Brant and TJ Boyle)**

Frog vocalizations are used for species identification, communication, and mate selection, providing a valuable tool for ecological studies and biodiversity assessments. This study investigates the use of frog vocalization, specifically calling patterns, to distinguish between frog species within a shared habitat. We recorded calls of multiple frog species from different genera in a temperate wetland ecosystem at three locations over several months using the Song Meter Mini (Wildlife Acoustics). Calls were analyzed for key acoustic features, including frequency, duration, and call structure in the Kaleidoscope Pro software. Results revealed significant interspecies variation in call characteristics, with each species displaying unique call signatures. Our findings demonstrate that specific acoustic parameters, such as pulse rate and dominant frequency, can reliably differentiate between

species even when ecological niches overlap. These results suggest that acoustic monitoring can be a non-invasive, efficient tool for species identification, population monitoring, and conservation of amphibian biodiversity. A total of four frog species were identified in the areas of study.

**OP – B5**

**"Arachnid Diversity in Callahan County, TX"**

**Jacob Suede Wooten (Mentor: TJ Boyle)**

The goal of this research is to determine the diversity of arachnids in Callahan County. Collections were made at 3 localities using pit-fall traps, flip traps, and by hand. Based on literature searches, there are an estimated 70 different arachnid species in Callahan County. Thus far, we have collected and identified 57 species. A species accumulation curve based on our collection data suggests that future collections could still provide more new species.

**OP – B6**

**"Density Functional Theory (DFT) Generation of Pop Art as a Visualization of a Phase Transition in a 2D Thermodynamic System."**

**John Tran (Mentor: Tikhon Bykov)**

The Density Functional Theory (DFT) method is used to manipulate photographic images to achieve artistic effects reminiscent of the "aquatint" printmaking technique of the early 19th century, or to create visualizations similar to mid-20th-century pop art paintings. Aquatint is a printmaking technique that adds visual texture to prints, resembling patterns that emerge from the model. This DFT model is based on a two-dimensional lattice fluid with short-range interactions. Closest and second-closest neighbor interactions are included. Calculations are performed in a grand canonical thermodynamic ensemble. In this "fluid," individual particles form domains in certain regions. Physically, this system resembles a wetting phase transition on a substrate, with some regions completely wettable and others not. A photographic image shows the strength of the external field that determines the surface's wettability. An iterative numerical procedure is used to solve the DFT equation for the density profile. The final density profile of the system is used as an artistic representation of the original image. The numerical procedure was then implemented as a MATLAB-based code that will evolve into an app to facilitate the production of future art pieces.

**OP – B7**

**"Synthesis and Analysis of a Chromium Complex with a PHP Ligand as a Potential Photosensitizer"**

**Yumel Josh Calaunan (Mentor: Edward Donnay)**

Photodynamic therapy has emerged as a promising non-invasive treatment modality for various malignancies, relying on the activation of a photosensitizer by visible light to generate reactive oxygen species, primarily singlet oxygen ($^1O_2$), inducing tumor cell death. While ruthenium(II) polypyridyl complexes have been extensively studied as transition-metal-based PSs due to their favorable photophysical properties, their clinical applications are often limited by short triplet-state lifetimes and oxygen-dependent efficacy. Chromium(III) complexes offer a distinct alternative, featuring long-lived ligand-field excited states that may exhibit reduced oxygen sensitivity. However, chromium-based PSs remain underexplored in photodynamic therapy.

This thesis describes the synthesis, characterization, and preliminary photophysical evaluation of a chromium(III) complex as a potential photosensitizer for photodynamic therapy. The work began with the design and synthesis of the ligand, 1,10-phenanthrolinopyrrole. The ligand was characterized using IR spectroscopy and $^1$H NMR spectroscopy. Subsequently, the chromium(III) complex was synthesized by reacting 1,10-phenanthrolinopyrrole with [Cr(phen)2(OTF)2]OTF, yielding the target complex [Cr(phen)2(php)](PF6)3. The photophysical properties of the chromium complex were investigated using UV-Vis absorption spectroscopy and spectrofluorimetry. The chromium complex exhibited photophysical properties distinct from those of the chromium-based photosensitizers studied. This provides insight into the kind of energy transfer done by the chromium. This work demonstrates that chromium(III) complexes could serve as a potential metal center for further development in photodynamic therapy.

**OP – C1**

**"How do life stage and in-person contact affect the relationship between internet use and mental health?"**

**Alex Clay (Mentor: Jori Sechrist)**

Myriad studies examine the relationship between internet use and mental health outcomes. These studies often hypothesize the negative relationship between internet use and mental health outcomes, but this has not been a consistent finding across the studies. A factor contributing to the inconsistent findings may be that life course stage and social relationships moderate the relationship between internet use and mental health outcomes. This study uses the 2022 General Social Survey to examine the relationship between internet use and depression and life satisfaction among young adults (18-29), young middle-aged adults (30-44), older middle-aged adults (45-59), and older adults (60+). We hypothesize that high internet use among young adults and middle-aged adults will

correlate to higher depressive symptoms and lower satisfaction, whereas for older adults, we hypothesize that higher internet use will correlate with lower depressive symptoms and higher life satisfaction, but these relationships will vary depending on the frequency of social interaction with family and friends outside of the internet.

**OP – C2**

**"Early Caregiver Attachment as a Predictor of Adult Attachment: Implications for God-Representation"**

**Joanie Burns (Mentor: Bryan Stewart)**

This thesis explores how early attachment experiences with primary caregivers shape adult attachment styles and influence the perception of God as an attachment figure. Drawing on attachment theory and current psychological research, it examines how secure or insecure childhood relationships form internal models that affect trust, intimacy, emotional regulation, and spiritual life. The study also considers whether later supportive relationships can foster restoration and secure attachment. By synthesizing psychological and theological perspectives, this project highlights both the lasting influence of early caregiving and the possibility of transformation in one's relationships with others and with the divine.

**OP – C3**

**"For the Dog"**

**Natalea Long (Mentors: Annette Wren)**

This paper uses literary analysis and psychological theory to examine Emily Brontë's use of dogs in Wuthering Heights as reflections of their owners' emotional and psychological states. It explores how the dogs, both symbolically and literally, are used as a narrative device, revealing parallels between the treatment of animals as property and the characters' experiences of dehumanization and abuse. Focusing on Heathcliff and Isabella, the paper highlights how these connections strengthen the understanding of generational trauma and fractured relationships, offering a deeper interpretation of the novel's emotional and social complexities.

**OP – C4**

**"Art Imitating Life: An Analysis of Netflix Series Continued Effect on Family Dynamics"**

**Alex Clay (Mentor: Jori Sechrist)**

This research examines four Netflix original series: Unbelievable, 13 Reasons Why, Adolescence, and Ginny & Georgia. Each of which is an example of the changing family dynamics affected by the world we live in. The media has been used to show the world through rose-colored glasses, but these series show the harsher reality of life for some

families. From extreme examples of troubled mental health to the criminal activity that leads to a change in the family. Using many sociological and criminological theories, including functionalist theory, symbolic interactionism, and strain theory. This research will highlight the different family dynamics in the families examined. Using such research to show how some families might navigate the world. It is important to pay attention to the media as it is a historical voice of the future in many ways.

**OP – C5**

**"Unchecked Power: Prosecutorial Accountability and Its Impact on Criminal Trials."**

**Julia Langkiet (Mentor: Robert Wallace)**

The United States legal system is complex, constantly changing, and often hard to navigate, especially for the untrained eye. As a result, many people who find themselves in the criminal justice system at any point in their lives often rely on the counsel they are constitutionally guaranteed. However, when there are inherent and systemic problems with counsel on either side, many issues may result. In the case of prosecutorial power, there are many questions as to their accountability or lack thereof. When prosecutorial attorneys are not subject to the same intervention, oversight, and constraints that, say, defense attorneys are, there are issues of power imbalance and personal discretion that may not be in the best interests or legal interests of all parties at play. This piece will examine the problems that can arise from a lack of prosecutorial accountability in the United States' adversarial criminal justice system. I will examine tunnel vision, jury sway, false confessions and wrongful convictions, plea bargaining, and real-life examples of this pressing issue. To start, I will explain exactly what prosecutors do and introduce other academic studies into the conversation.

Key Words: Prosecutorial accountability, tunnel vision, wrongful conviction, false confessions, juries, power imbalance

**OP – C6**

**"Christian Nationalism and Vaccine Resistance in an Era of Political Polarization"**

**Molly Daugherity (Mentors: Jori Sechrist)**

In the current political landscape after the COVID-19 pandemic, despite scientific evidence confirming the effectiveness of vaccines, there is a growing movement of anti-vaccine attitudes among Americans. This has been specifically potent among conservative right-wing evangelical populations, with the rise of anti-science movements, political polarization, and the growing influence of Donald Trump and white Christian nationalism. We sought to clarify the complex factors influencing vaccine attitudes and to understand their complex relationship using statistical analyses. Using the Baylor 2021 Religion Survey, this study examines the factors that influence anti-vaccine beliefs, including white Christian

nationalism, political conservatism, religious beliefs, social media use, misinformation, and demographics.

**OP – C7**

**“Organized Crime”**

**Gabriel Martinez (Mentor: David Wahl)**

Detailed analysis of organized crime not only in the US but also around the world and the good and bad it creates

**OP – D1**

**“The Art of the Mab”**

**Lauren Scott (Mentor: Joel Whittemore and Neena McLain)**

This presentation will feature a performance of the Queen Mab monologue from William Shakespeare’s "Romeo and Juliet", along with an analysis of the text and a detailed breakdown of its structure and delivery.

**OP – D2**

**“From 'Me' to 'We': Understanding Social Identity Theory”**

**Liana Benavides (Mentor: Mary Anna Kidd)**

People routinely adjust their thoughts, behaviors, and language depending on the social groups they belong to, yet the psychological processes behind these shifts were long overlooked by researchers focused on individual behavior. This paper examines Social Identity Theory (SIT) as a framework for understanding how group membership shapes both individual self-concept and shared identity, guiding communication and behavior across different contexts. Drawing on Hornsey (2008), the paper traces SIT's origins in Tajfel's minimal group experiments and its expansion through Turner's Self-Categorization Theory (SCT), which explains the cognitive shift from individual to group-based identity. Together, SIT and SCT are applied to three interconnected domains: how group prototypes shape everyday norms and communication (Hogg & Reid, 2006), how identity-based leadership influences trust and perceived charisma (Haslam et al., 2001), and how anonymity in digital spaces amplifies rather than erases group identity through the SIDE model (Spears, 2017). Across all three contexts, group membership consistently shapes how people communicate, whom they follow, and how they behave, whether that be face-to-face or online. As communication increasingly moves across physical and digital spaces, SIT offers a durable framework for understanding how shared identity becomes the source of influence in both.

**OP – D3**

**“Storytelling: Playing Through Nerves in Front of a Big Crowd”**

**Alayna Francis (Mentor: Joel Whittemore)**

I will be presenting a storytelling speech about a volleyball player playing through nerves as she plays in front of a big crowd and college scouts.

**OP – D4**

**“Persevere”**

**Jackie Santos (Mentor: Joel Whittemore)**

A speech about a quote that changed the outlook of my life

**OP – D6**

**“Grace”**

**Preston Bennett (Mentor: Joel Whittemore)**

It is a speech over a film/book over a question that the story poses: “Is it better to speak or to die “(in a figurative way). Diving into what it means and how it is portrayed in the movie. As well as how I interpret it in a sense.

**OP – D7**

**“The Tale of the Lantern in the Valley”**

**Wade Springfield (Mentor: Joel Whittemore)**

I will be presenting a storytelling speech for Dr. Whittemore

## Poster Abstracts

**P1**

**“3D Solid Modeling and Reverse Engineering of a Folding Knife with Locking Mechanism”**

**Timothy Risko (Mentor: David Upshaw)**

I reverse-engineered and modeled a folding knife in SolidWorks CAD Software.

**P2**

**“Reverse Engineering and Modeling of Owala Water Bottle.”**

**Landon Wilkerson (Mentor: David Upshaw)**

I reverse-engineered and 3D-modeled an Owala water bottle in SolidWorks CAD.

**P3**

**“Reverse Engineering And Solid Modeling Of A Football Helmet”**

**Noah Hatcher (Mentor: David Upshaw)**

I reverse-engineered a basic football helmet in SolidWorks software.

**P4**

**“Reverse Engineering and CAD Modeling of a Fantasy Sword”**

**Jason McEachern (Mentor: David Upshaw)**

I reverse-engineered a fantasy sword from the video game Final Fantasy VII: Advent Children in the SolidWorks CAD software

**P5**

**“CAD Modeling Custom 5.7L V8 Piston Assembly”**

**Arsany Ibrahim (Mentor: David Upshaw)**

I designed a custom piston assembly in SolidWorks CAD Software.

**P6**

**“Reverse Engineering and CAD Modeling of an Automobile Scissor-Jack”**

**Tremion Bryant (Mentor: David Upshaw)**

I reverse-engineered and modeled an automobile scissor jack in SolidWorks CAD.

**P7**

**“Chaotic Tumbling of Hyperion”**

**Samantha Ford and Victor Huerta (Mentor: Tikhon Bykov)**

This study explores the chaotic rotational motion of Hyperion, one of Saturn’s moons, and the physical mechanisms that drive its unpredictable tumbling. Unlike most moons, which exhibit stable, synchronous rotation, Hyperion displays highly irregular spin due to its non-spherical shape and gravitational interactions with Saturn. Using a simplified physical

model consisting of a rigid body represented by two masses connected by a rod, the rotational dynamics under gravitational torque are analyzed. The equations of motion are derived and numerically solved to investigate the evolution of the angular position over time. To achieve that goal, a MATLAB code for the RK45 numerical method is used. The results demonstrate that small differences in initial conditions lead to significantly different outcomes, highlighting the system's sensitivity to initial conditions and confirming its chaotic nature. This simple model provides an opportunity to gain practical experience with numerical methods for solving nonlinear differential equations, offers insight into real astrophysical systems, and serves as an example of deterministic chaos in classical mechanics.

**P8**

**"Numerical Study and Analysis of Planetary/ Satellite Motion"**

**Alex Smith and Dustin Volk (Mentor: Tikhon Bykov)**

This project aimed to find a numerical solution to the equations of motion for planets and satellites orbiting the Sun/Earth. In MATLAB, using the RK45 numerical method, one can integrate, solve, and plot trajectories of celestial bodies orbiting the Sun/Earth. By changing initial conditions such as velocity and position, one can illustrate stable and unstable orbits, as well as the escape velocities of these bodies. After collecting the above information, additional changes were made to the code to account for the precession of a planetary orbit's Perihelion around the Sun, which could include Mercury, Venus, and/or Terra, or the precession of a satellite's orbit Perihelion around the Earth. To account for additional details in the motion of satellites, solar wind could be simulated, and minor atmospheric interference can be accounted for as well. With these interferences, one can then observe changes in the orbits over time.

**P9**

**"Aqualogic"**

**Phillip Benard (Mentor: Aravind Mohan)**

AquaLogic is a simulated IoT edge framework for underwater environments that emphasizes diver safety and marine life observation. Using virtual multimodal sensors and the command-line logic simulator DrMoss, the system models real-time edge decision-making, including predictive alerts for diver fatigue, oxygen levels, and environmental hazards, as well as the automated collection of environmental and species data for marine research. All sensor and environmental data are represented in structured JSON format, enabling efficient parsing, simulation, and extensibility. The implementation leverages the Java JDK and object-oriented programming principles to define reusable simulated sensor, diver, and environmental modules, while GraphViz is used to visualize logic circuits and Boolean decision pathways. AquaLogic was developed, executed, and benchmarked against other logic simulators such as Logisim and Logicly, demonstrating improved flexibility in

modeling complex underwater scenarios. Furthermore, DrMoss provides a modular environment for testing custom Boolean logic and sensor interactions before deployment in physical systems. This platform also highlights the benefits of logic-based simulation for training and educational purposes, enabling researchers to evaluate system performance and safety protocols without incurring field costs or risks.

**P10**

**"GRACE-Gesture Recognition for Augmented Cultural/Religious Environments"**

**Daniil Kochkonbaev (Mentor: Aravind Mohan)**

Religious practices often involve deeply symbolic gestures that express faith, devotion, and reverence. However, these gestures are rarely integrated with modern technology in a way that preserves their cultural and spiritual meaning. When worshipers interact in temples, churches, or mosques, their physical expressions, such as kneeling, bowing, or folding hands, carry profound significance. Yet technology in sacred spaces is often limited to static audio or visual aids, which do not respond dynamically to human presence. In this project, we introduce GRACE, which stands for Gesture Recognition for Augmented Cultural/Religious Expression. GRACE is a robotic prayer companion that recognizes devotees' gestures and responds with appropriate actions. For example, when a person kneels, the robot may light a lamp or recite a short prayer. The system is built using an RGB camera and a Yahboom ROS depth camera for gesture recognition, a Raspberry Pi 5 as the main processing unit, and servo motors connected through a "PCA9685" driver to perform physical actions. Speakers are used to deliver prayers or chants, and LED lamps provide visual feedback when gestures are detected. Our software framework is developed in Python using TensorFlow for real-time gesture detection and control integration. GRACE serves as both an engineering and cultural exploration, demonstrating how technology can respectfully enhance religious experiences without replacing human or spiritual elements. Preliminary experiments show that GRACE can accurately identify and respond to common devotional gestures, offering a meaningful connection between tradition and innovation within sacred environments.

**P11**

**"Morocco - A Secure Exam Operating System for Academic Integrity"**

**Roco Guevara (Mentor: Aravind Mohan)**

Academic institutions increasingly face challenges in maintaining exam integrity as students gain access to advanced AI tools, remote assistance technologies, and operating-system–level workarounds. Traditional lockdown browsers restrict applications at the software layer but remain vulnerable because they depend on the security of the host environment. As a result, universities require a more robust solution that isolates the testing environment from the underlying system while still supporting programming tasks, technical assessments, and classroom-scale deployment. In this project, we introduce MoRocco, the

Modular Restricted Operating Computing Core OS, a lightweight secure exam operating system designed specifically for controlled academic testing. To support modern computing courses, MoRocco incorporates a Java and Object-Oriented Programming-based framework for managing system modules, where secure components such as the exam launcher, file isolation manager, and policy enforcer are implemented using modular Java classes that improve maintainability and extensibility. Additional supporting utilities are developed using Python and shell scripting, enabling efficient integration with Linux kernel features. MoRocco boots into a sandboxed Linux-based environment that disables internet access, blocks communication channels, prevents access to Windows or macOS files, and restricts clipboard, multitasking, and unauthorized application execution. The operating system provides only essential tools such as a code editor, compiler, and terminal, all governed by a strict security policy that validates binaries and enforces a zero-trust runtime. MoRocco can run locally on low-spec university laptops as a virtualized or containerized image, eliminating the need for network speed or cloud resources. Instructors prepare exam materials through a secure packaging utility, ensuring that exam files, datasets, and auto-grading scripts become available only after the OS boots and remain isolated from the host. Preliminary evaluations demonstrate that MoRocco offers a tamper-resistant, resource-efficient, and pedagogically flexible testing environment that surpasses traditional lockdown solutions by providing OS-level control while preserving ease of use for students and instructors.

**P12**

**“How does religion shape political and policy decisions in Latin American countries such as Brazil and Argentina?”**

**Alekzandrea Uresti (Mentor: Tina Bertrand)**

Religion plays a major role in many Latin households, shaping values, traditions, and everyday decisions. In many families, religion influences how people think about topics like gender roles, family structure, and morality. Seeing how strong this influence can be at the personal level made me curious about whether those same beliefs extend into politics. If religion is so important in daily life, it raises the question of whether it also shapes government decisions. Because of this, my research asks how religion shapes political and policy decisions in Latin American countries such as Brazil and Argentina.

In this paper, the dependent variable is the level and direction of political and policy decisions influenced by religion, especially in areas such as gender rights, reproductive policy, and family law. To better analyze this, I measure the dependent variable across three key dimensions of comparative politics: institutions, political behavior, and policy outcomes. First, institutions refer to how laws and formal political structures reflect religious influence, such as restrictions on abortion or marriage laws. Second, political behavior includes how politicians, parties, and voters act in light of religious beliefs, as reflected in voting patterns and public debate. Third, policy outcomes focus on the enacted laws, especially those related to gender and family issues. Looking at all three dimensions

makes it easier to see how religion shapes politics at multiple levels, not just in laws but also in how people and institutions behave.

Religion has long been deeply intertwined with politics in Latin America. Countries like Brazil and Argentina were originally colonized by Catholic European powers, which meant that the Catholic Church became closely tied to the development of the state. During the colonial period, religious authority and political authority often worked together, and even after independence, the influence of Catholicism did not disappear. Although many countries later created constitutions that separated church and state, religion remained an important part of national identity.1 This history helps explain why religion is still visible in politics today. It is not just a private belief system but something that has shaped laws, institutions, and political culture over time.

Scholars have tried to explain how ideas like religion influence political behavior. Martha Finnemore and Kathryn Sikkink2 argue that norms develop and spread over time as different actors promote them until they become widely accepted. Even though their work focuses on international politics, their ideas can help explain developments in Latin America. Religious institutions have promoted certain values, especially ideas about family, gender roles, and morality. Over time, these beliefs have become deeply rooted in society and have influenced how political leaders think about policy decisions. This influence can be seen across all three dimensions of the dependent variable. Religious norms shape institutions by influencing legal frameworks, they affect political behavior by guiding how people vote and participate, and they shape policy outcomes by limiting or encouraging certain types of legislation.

One of the most important ways religion shapes politics is through the strength of religious institutions. In many Latin American countries, religious groups are not only spiritual organizations but also political actors. Frances Hagopian explains that religion has become more active in democratic politics, with religious leaders organizing voters and, in some cases, even holding office themselves.3 This is especially clear in Brazil, where Evangelical Protestant churches have grown quickly in recent decades. These groups have formed strong political alliances and have a noticeable presence in government. They often speak out on issues such as abortion, same sex marriage, and education p

**P13**

**“The Causes of Military Coup D'Etat: A Comparative Study of India and Pakistan”**

**Jax Melbourne (Mentor: Tina Bertrand)**

Abstract: Countless theories seek to explain the political phenomenon of military coup d’état in developing countries. One prominent theory used to explain coups is historic institutionalism, a form of “new institutionalism” that emphasizes the role institutions play in shaping historical outcomes. This theory focuses on the role institutions play in shaping human behavior. Through a historical institutionalist lens, this paper employs a comparative analysis to investigate the causes and conditions for a military coup, focusing

on Pakistan and India. Both countries were British colonies and gained independence in 1947. Almost one decade after achieving independence, Pakistan was afflicted by a military coup, which was followed by three more before the turn of the century. Contrarily, India, while experiencing extreme social turmoil, experienced no military coups. This research seeks to explain these differences by examining the relationship between democratic institutions, civil-military relations, social turmoil, and foreign influence.

**P14**

**"Same but different."**

**Jaylinna Cadena (Mentor: Tina Bertrand)**

This study compares GDP per capita growth between Singapore and Malaysia since independence, focusing on the factors that have contributed to their divergent economic outcomes. Although the two countries share geographic proximity, historical ties, and cultural similarities, Singapore has achieved significantly higher GDP per capita than Malaysia. Using a most similar systems design, this analysis examines key independent variables, including differences in governance, economic policy, levels of foreign direct investment, and education systems. The study finds that Singapore's strong institutional framework, export-oriented economy, and emphasis on human capital development have played a crucial role in its rapid economic growth. In contrast, Malaysia's resource-dependent economy and differing policy choices have contributed to comparatively slower growth in GDP per capita. This comparison highlights how policy decisions and institutional effectiveness can significantly influence long-term economic success.

**P15**

**"Why Does Political Stability Differ Between Egypt and Sudan?"**

**Chad Lara (Mentor: Tina Bertrand)**

This paper explains why Egypt is more politically stable than Sudan, despite their many similarities. It focuses on three main factors: the military, political institutions, and the economy. Egypt's stronger institutions and tighter control have helped keep it stable, while Sudan's weaker system and economic struggles have led to instability.

**P16**

**"Power Vacuums and Pro-Nationalism: Catalysts for Communist Regimes in China and Vietnam"**

**Blake Jones (Mentor: Tina Bertrand)**

This paper investigates the historical and socio-political factors that catalyzed the rise of communist regimes in the People's Republic of China (PRC) and the Socialist Republic of Vietnam (SRV). The primary research question examines how distinct political and

socioeconomic environments—specifically, severe rural poverty and political instability—contributed to the establishment of Marxist-Leninist states in both nations.

**P17**

**“Why does Saudi Arabia rank higher than Iran on the Global Peace Index?”**

**Hosannah Tsehay (Mentor: Tina Bertrand)**

Much has been written about the different aspects of the Global Peace Index's influence on countries. Using a comparative analysis, this research examines the influence of ethnic divisions, the Pew Research Center’s Government Restrictions Index, and the Social Hostilities Index on the Global Peace Index in Iran and Saudi Arabia. Iran's diverse ethnic population, its conservative interpretations of Sharia law as Shia Muslims have led to hostile environments, contributing to its low ranking in the Global Peace Index. In contrast, Saudi Arabia’s homogeneous population, which follows Sharia law but is less radical, has ranked higher on the Global Peace Index. Through a comprehensive examination of these factors, the paper sheds light on the complex interplay between religion, law, and societal norms in shaping women's rights, providing valuable insights into the dynamics of gender inequality in Islamic societies. Literature Review: The UN and Norms.

**P18**

**“Ethiopia and Somalia Individualism”**

**Mariela Espino (Mentor: Tina Bertrand)**

Much has been written about the role of culture, governance, and historical trajectories in shaping societal values such as individualism and collectivism. This research employs a comparative analysis to investigate the development and expression of individualism in Ethiopia and Somalia, two neighboring nations in the Horn of Africa with shared regional influences but distinct political, cultural, and institutional histories. Ethiopia’s long-standing centralized state tradition, diverse ethnic composition, and evolving federal system have fostered a complex balance between communal identity and emerging forms of individual agency, particularly in urban and economically developing contexts. In contrast, Somalia’s prolonged experience with state fragmentation, clan-based social organization, and limited formal governance structures has reinforced collective affiliations, where individual identity is often closely tied to kinship networks and customary norms. Through an examination of legal frameworks, social institutions, and cultural practices, this study highlights how differing state capacities and historical developments shape the extent and expression of individualism in each country. While Ethiopia demonstrates gradual shifts toward individual autonomy driven by modernization and globalization, Somalia shows resilience in its collectivist structures amid ongoing political instability. By analyzing these dynamics, the paper provides insight into how governance, social organization, and historical context interact to influence individualism, contributing to a broader understanding of societal development in the Horn of Africa.

**P19**

**“How Democracy Affects Judicial Independence in European Countries.”**

**Kenneth Biggs (Mentor: Tina Bertrand)**

This study examines how judicial independence affects the level of democracy in Poland and Ukraine. The dependent variable is the level of democracy, while the independent variables are government interference in judicial decisions and the security of judicial tenure. The study is based on two main hypotheses: first, that increased government interference in courts will decrease democratic quality, and second, that stronger protections for judges’ tenure will increase democratic quality.

The existing comparative politics literature strongly supports the idea that independent courts are essential to maintaining democracy. When judges are free from political pressure, they are more likely to uphold the rule of law, protect civil liberties, and limit abuses of power. However, when governments interfere with judicial decisions or control appointments and removals, courts can become politicized, weakening democratic institutions.

The cases of Poland and Ukraine illustrate these dynamics in different ways. In Poland, recent judicial reforms have increased government influence over the courts, which scholars link to democratic backsliding. In contrast, Ukraine has focused on building judicial independence after a history of corruption and political control, with reforms aimed at strengthening democracy.

Overall, this study argues that judicial independence plays a critical role in shaping democratic outcomes. While increased interference tends to weaken democracy, stronger judicial protections can support democratic development, though broader political conditions may influence these effects.

**P20**

**“Political Stability of Portugal and Spain”**

**Vanessa Garcia (Mentor: Tina Bertrand)**

This article examines the different levels of governmental stability in Spain and Portugal after their transitions from authoritarian regimes to democratic governance. Despite sharing similar historical trajectories and having much in common, both emerging from prolonged dictatorships towards democratic systems, these two countries have experienced different patterns of political stability. This study argues that a key factor contributing to this divergence is linguistic and regional diversity. In Spain, the presence of multiple widely spoken regional languages reflects deeper cultural and political divisions that have at times contributed to a lack of communication between the central and regional governments, as well as to the rise of separatist movements and political violence. In contrast, Portugal's

relative linguistic homogeneity has favored greater national cohesion and fewer internal conflicts.

**P23**

**"Why France and the United Kingdom Struggle to Manage Erratic Migration Flows"**

**Orlando Uribe-Saucedo (Mentor: Tina Bertrand)**

France and the United Kingdom have faced persistent challenges in effectively responding to erratic migration flows, especially in recent years, as asylum applications, irregular crossings, and political conflicts over immigration have increased. These two countries, despite being wealthy democracies with established migration institutions, continue to experience pressure and instability in their asylum and migration management systems. System strain is shaped by three major factors: administrative capacity, national integration models, and economic integration outcomes. When states lack sufficient staffing, infrastructure, and institutional resources, backlogs and delays increase. Then, different national integration models shape how migrants are incorporated into society and how governments respond to diversity. France's assimilationist model and Britain's more multicultural approach create different political and institutional pressures, but both have limits during periods of unpredictable inflows. Then, weak labor-market integration and continued economic inequality between immigrants and natives heighten social tensions and political backlash, further straining migration systems. Using a comparative analysis of France and the United Kingdom, this paper shows that migration management problems are not solely due to the number of arrivals, but also to state capacity, integration policies, and long-term economic incorporation. Together, these factors explain why both countries have struggled to manage migration effectively.

**P24**

**"The Need for Financial Literacy and How to Prepare Our Children for the Real World"**

**Gale Marden (Mentor: Frank Badua, Raney Edmiston, and Elizabeth Watson)**

This thesis demonstrates the importance of financial literacy and proposes a specialized curriculum to prepare high school students for the real world. As financial literacy is crucial not only for individual stability but also for societal economic health, the widespread deficiency in financial literacy among United States consumers has led to significant adverse effects on individuals, the US economy, and society. This is illustrated by the fact that U.S. household debt totaled $18.39 trillion in the second quarter of 2025, with the average household paying over $4,200 a month on debt alone, resulting in high delinquency rates and a reliance on high-interest credit and extended-term loans. The path to economic stability requires a fundamental shift in how personal finance is taught.

To address these literacy gaps, a comprehensive financial literacy curriculum for grades 9-12 is proposed. Moving beyond theoretical frameworks, the curriculum uses real-world simulations to equip students for early adulthood. Key pedagogical areas include the distinction between “wants” and “needs”, the calculation of opportunity costs, and the practical management of diverse banking products. Through this four-year simulation, students gain hands-on experience with creating a zero-based budget and managing the costs of independent living, from selecting and furnishing an apartment to meal planning and grocery shopping. Topics such as opening bank accounts, entering the workforce, analyzing pay stubs to understand tax deductions, and the full expenses of vehicle ownership are covered. By analyzing the long-term consequences of credit card APRs and the factors affecting FICO credit scores, students are equipped to view credit as a tool rather than a source of perpetual debt. Ultimately, this educational framework aims to promote individual financial freedom and security, reduce societal debt burdens, and support long-term economic health by empowering students with the knowledge and skills necessary for lifelong financial independence.

**P25**

**“Winged Romance: The Biology Behind Bird Mating”**

**Tyler Williams and Jeremiah Smith (Mentor: Jay Packer)**

“Winged Romance: The Biology Behind Bird Mating” explores the complex biological processes and behaviors that drive reproduction in birds. This project examines how courtship displays, vocalizations, and physical traits function as signals of fitness and play a critical role in mate selection. It also analyzes avian mating systems, including monogamy, polygyny, and cooperative breeding, and highlights how environmental factors and evolutionary pressures shape these strategies. In addition, the poster investigates reproductive anatomy, fertilization, egg development, and parental care, emphasizing their importance for offspring survival. By connecting behavior, physiology, and evolution, this project demonstrates how bird mating is not random but a highly adapted process that increases reproductive success. Overall, the study provides insight into the diversity of avian reproduction and illustrates the role of sexual selection in shaping bird species over time.

**P26**

**“Bird Romance 101: The Full Journey of Life and Reproduction”**

**Jake Broom, Carlos Davenport, Drake Grimes, and Buddy Selvera (Mentor: Jay Packer)**

Prior to spring break, our objectives for the lab were to learn about the reproductive activities of passerine birds. To understand how the dominance of males in securing the best nesting areas and females' selection of males shape the population's genetic makeup, we recreated this process. We started by dividing the class in half with males and females,

and having the males pick their nest. We started the first of three rounds. After the females selected their males until all 20 beads were gone, we went to the class to record data and repeated the process two more times. After recording all the data, we learned how the nest and quality of offspring affect the mating population.

**P27**

**“Bird Sex Lab”**

**Azaria Birdsall, Clairen Roberts, Laney Baxter, and Isabel McCurdy (Mentor: Jay Packer)**

In our experiment, we studied how different factors affected the outcomes of random versus non-random mating. We found that changes in nest location, egg color (beads), and the men's behavior all played a role in offspring outcomes. Our research also examined what changed when a penalty was involved. Overall, our project examines which factors affect the offspring and reproductive rates of birds.

**P28**

**“The Mating Games”**

**Clark Deffo, Jeri Thompson, Zachary Lindley, and Faylynn Wooten (Mentor: Jay Packer)**

Do the location of the nest and the quality of the male affect the female's selection when mating? To test this, we conducted an experiment. In the experiment, males were given different beads and different nest locations. We then had the females choose a male, but to get a bead, they had to walk to the male's nest. Because males with a closer nest or better beads were more likely to be chosen.

**P29**

**“Simulating Mating Behaviors in Birds”**

**Olivia Conner (Mentor: Jay Packer)**

This lab simulated the reproduction process using human models to better understand how avian reproduction functions. Students modeled courtship behaviors and fertilization to represent how birds reproduce. By acting out these processes, we were able to visualize complex biological concepts such as timing and sexual selection.

**P30**

**“Let's Talk About Bird Sex”**

**Layla Pacheco, Nuruin Batres, and Mia Mendez (Mentor: Jay Packer)**

This lab, known as the bird sex lab, explored sexual selection through student participation, reflecting the behaviors of birds in nature. Through three trials and a set method, we observed how location affects the "mating" process and how adding infidelity rules affects it. We tracked all data between the simulation mating of the ten females and ten males, allowing us to present our findings.

**P31**

**“Feathered Romance”**

**Layke Haynes, Terrance Dukes, and Dustin Hynson (Mentor: Jay Packer)**

In our biology lab, we simulated sexual selection among birds, with females choosing their mates. But with a penalty for cheating, the number of mates had a decrease.

**P32**

**“Fifty Shades of Birds”**

**Blake Campbell and Savannah Montemayor (Mentor: Jay Packer)**

Our poster covers the bird reproduction lab, and our presentation covers fighting over prime nesting spots, monogamy, and how these factors affect the birds' reproductive success.

**P33**

**“Love is in the Air ... Literally.”**

**Megan Lyons, Racie Decker, Jazmyn Johnson, and Kalyce Richardson (Mentor: Jay Packer)**

This project simulates sexual selection in birds. Three factors were used across three trials: completely random mating (test run), the most valuable mate, and the introduction of infidelity into the mating process. The data collected across the three trials were used to determine which males had the greatest success in producing offspring.

**P34**

**“Nestflix and Chill”**

**Christian Lewis, Hayle Heinen, Zavian Alexander, and Zackery Rygg (Mentor: Jay Packer)**

This lab was made to demonstrate sexual selection in birds. Our results indicated that male birds were less likely to cheat when consequences were present. By the end of the experiment, most stayed monogamous.

**P35**

**“Fifty Shades of Beads”**

**Isabella Cornejo, McKenna Owens, and Alana Fox (Mentor: Jay Packer)**

We conducted an experiment on bird sex to determine how factors such as the distance of the nest from the feeding grounds, competition among males, and female choice affect mating outcomes.

**P36**

**“Endemicity Analysis Using ENM Overlap of Western North American Angiosperms”**

**Robert Albin, Olivia Doutt, and Kendrick Hancock (Mentor: Anna Saghatelyan)**

Endemicity analysis is a robust method for informing bioregionalization and conservation practices. We aimed to investigate patterns of endemism among western North American angiosperm species to ultimately update classical floristic regionalization. From our compiled species list, we analyzed the correlation among 12 environmental layers using a multi-step workflow that integrated biodiversity databases, data cleaning tools, ecological niche modeling (ENM), and spatial analysis.

**P37**

**“Isolation and Identification of Endospores Forming Microorganisms”**

**Racie Decker, Jalie Miller, McKenna Moreland, Natalee Shaw, Kayla Varela, Karen Santos, Meriah Gonzales, Madison Lopez, Kasey Solis, and Kenlee Turner (Mentor: Bhavana Gangwar)**

Endospores are tough, dormant structures produced by some Gram-positive bacteria that help them survive harsh conditions such as heat, drying, and exposure to chemicals. The goal of this experiment was to see and identify endospores in bacterial samples using an isolation method. To do this, we heat-fixed the bacterial cultures, stained them with malachite green while applying steam, and then counterstained with safranin to distinguish endospores from regular cells. When we looked at the samples under the microscope, we

saw green endospores either inside or outside of redish/pink vegetative cells in bacteria that form spores. In bacteria that don't form spores, we didn't see any endospore structures. Overall, these results show that endospore staining is an effective method for identifying spore-forming bacteria and demonstrate the importance of endospores to bacterial survival.

**P38**

**"Identifying Bacteria Through Gram Staining"**

**Olivia Doutt and Alexis Smotchzer (Mentor: Bhavana Gangwar)**

This poster reviews the differences between Gram-positive and Gram-negative bacteria using the Gram staining procedure. The cell walls of bacteria consist of peptidoglycan layers composed of alternating acetylglucosamine (NAG) and N-acetylmuramic acid (NAM) that provide strength and support. The key difference between these two groups is the structure and thickness of the peptidoglycan layer. Gram-positive bacteria have thick peptidoglycan layers (20-80 nm) that retain the crystal violet stain and appear purple under a microscope. In contrast, gram-negative bacteria consist of thin layers (7-8) and an additional outer membrane. As a result, they do not retain the crystal violet stain and instead take up the counterstain (safranin), appearing pink under a microscope. Understanding these differences allows for the identification and differentiation of bacterial species based on color.

**P39**

**"Isolation and Characterization of Endophytic Bacteria and Their Antimicrobial Compounds from Medicinal Plants Found in the Native Flora of Texas"**

**Kendrick Hancock (Mentor: Bhavana Gangwar)**

Antimicrobial resistance (AMR) is an ever-growing concern in the medical field, as it can lead to higher mortality and morbidity, longer hospital stays, and more difficult treatment. With concerns over AMR increasing and the prospect of common infections having higher fatality rates, many have sought solutions. One solution has been to identify new antimicrobial compounds (AMC). Medicinal plants harbor diverse endophytes that produce AMCs, which can be isolated for medical use. Endophytes are microbes that live inside plant tissue and act as mutualistic symbionts, aiding in plant growth, health, and defense. Due to Abilene, TX's distance from major research centers, little has been explored about local endophytes. To conduct my experiment, I collected leaf tissue samples from local medicinal flora I researched, sterilized the outer surfaces of the samples, cut them to expose the inner surfaces, and placed the samples on Nutrient Agar (NA) plates. After isolating the bacteria, the colonies were characterized morphologically. Then, Gram staining was performed to further identify the bacterial strains. After the Gram staining, the colonies were grown on two selective media, mannitol salt agar (MSA) and eosin methylene blue (EMB). Strain-level identification was conducted using the BIOLOG metabolic fingerprinting system. Following

the identification of the bacterial Isolates, the antimicrobial properties were tested using well diffusion and cross-streaking against a pathogenic strain of Staphylococcus aureus. This study contributes to the broader effort of bioprospecting underrepresented geographic regions and highlights the potential of locally sourced endophytes as candidates for novel antimicrobial discovery.

**P40**

**"Effects of Antimicrobial Chemicals on Bacterial Growth"**

**Alondra Vargas (Mentor: Bhavana Gangwar)**

Antimicrobial resistance continues to challenge modern medicine, making the evaluation of effective antimicrobial agents an important area of scientific inquiry. This experiment investigated the comparative effectiveness of various antimicrobial chemicals against bacterial growth using a standardized disk diffusion assay. A uniform bacterial lawn of Gram-positive and Gram-negative bacteria was established on agar plates and exposed to filter paper disks saturated with selected chemical agents. Plates were incubated for 24 hours, after which zones of inhibition surrounding each disk were measured to quantify antimicrobial activity.

Results demonstrated considerable variation in antimicrobial efficacy among the chemical agents tested, with some compounds producing zones of inhibition while others showed minimal to no inhibitory effect. These differences in performance reflect the distinct chemical properties, mechanisms of action, and target specificities of each agent, highlighting that not all antimicrobial compounds are equally effective against a given bacterial species.

These findings demonstrate that understanding how various compounds interact with microbial growth under controlled laboratory conditions yields valuable insights into the broader field of antimicrobial research and supports ongoing efforts to identify and optimize effective treatments amid rising antimicrobial resistance.

**P41**

**"Isolation and Identification of Microorganisms from Various High-Contact Surface Areas"**

**Emilee Dominguez (Mentor: Bhavana Gangwar)**

High-contact surfaces in public spaces serve as primary reservoirs for microbial transmission. Understanding the diversity and antibiotic resistance profiles of these microorganisms is critical for public health. In this study, seven high-contact locations were sampled using sterile swabbing techniques. Samples were inoculated onto nutrient media and incubated at $37$°C for 24 hours. To obtain pure cultures, individual colonies were isolated using the streak plate method and then incubated further. Initial morphological analysis was followed by Gram staining to differentiate bacterial cell wall structures.

Furthermore, the isolates were subjected to Kirby-Bauer antibiotic disc diffusion assays to evaluate their resistance to common antimicrobial agents. Conclusion: This research characterized the microbial load of everyday surfaces and assessed the prevalence of potentially resistant strains in the environment.

**P42**

**"Analyzing and Comparing Gut Microbiome Diversity among AGP Patients"**

**Jack Miller (Mentor: Brooke Yarbrough)**

Purpose

The primary purpose of my honors research project is to analyze and compare gut microbiome diversity among patients across the following variables: Type II Diabetes vs. no Type II Diabetes, BMI, race, age, and gender. Gut microbiome diversity will be analyzed and compared between patients with and without Type II Diabetes. Gut microbiome diversity will be analyzed and compared between patients with the following BMI levels: normal, underweight, overweight, and obese. Gut microbiome diversity will be analyzed and compared between patients of the following races: Caucasian, African American, Hispanic, Asian or Pacific Islander, and Other (which does not specify a race but often includes Native American patients). Gut microbiome diversity will be analyzed and compared between patients of the following age groups: 20s, 30s, 40s, 50s, 60s, and 70+. Gut microbiome diversity will be analyzed and compared between male and female patients.

Hypothesis

Participants with Type 2 Diabetes will be shown to have lower overall gut microbiome diversity and evenness than participants without T2D.

Methodology

400 anonymous patient data files from the American Gut Project (AGP) were randomly selected from a diverse array of patients and compiled into a Microsoft Excel File. 200 of these data files were from patients with Type II Diabetes, and 200 of them were from patients without this condition. The patient data from the latter group will serve as controls in our proposed research. Of the 200 patients with Type II Diabetes in our test group, 88 files (FASTQ) were accessible in the European Nucleotide Archive (ENA) browser; thus, data from 88 patients with Type II Diabetes will be used in the experiment. Of the 200 control patients, 148 had FASTQ files accessible via the ENA browser; thus, data from 148 patients without Type II Diabetes will be used in the experiment. Thus, 236 patients will be tested in this experiment. Five mapping files were created in Excel, and these will be used to run tests comparing gut microbiome diversity across all 236 patients, each based on a single key variable. The first mapping file will be used to compare patients' data based on the presence or absence of Type II Diabetes. The second mapping file will be used to compare data by patients' varying BMI levels. The third mapping file will be used to compare data by

patients' varying races. The fourth mapping file will be used to compare data across patients' age groups. The fifth mapping file will be used to compare data by patients' gender. In each mapping file, statistical analyses will be utilized. The results of the analyses will help the investigators determine differences in gut microbiome diversity across each key variable.

**P43**

**"The Impact of Hormonal Contraceptives and Vitamin Use on BMI and Obesity Risk"**

**Racie Decker (Mentor: Brooke Yarbrough)**

Obesity has become a major health issue and affects millions of people worldwide. It increases the risk of serious conditions such as heart disease, type 2 diabetes, and certain cancers (International Journal of Obesity, 2026). While factors like diet, exercise, and genetics also play a

role, they do not fully explain why obesity rates continue to rise. This has led researchers to look at other possible contributors. [nature.com] Recent studies suggest that antibiotic and contraceptive use may affect body weight by changing the gut microbiome, which plays an important role in digestion and metabolism (Vliex et al., 2024; Brito et al., 2025). Other research has found possible links between vitamin intake or deficiencies and body mass index (BMI), since vitamins are involved in energy use, appetite regulation, and fat storage (Lee, 2023; Ge et al.,

2025). However, results across studies are mixed, and more research is needed to better understand these relationships. This project reviews current research to determine whether antibiotic/contraceptive exposure and vitamin use are associated with BMI and obesity, and to examine how these factors may contribute to weight changes beyond traditional lifestyle explanations.

**P44**

**"Extraction and Identification of Organic Compounds in Cumin Seeds Using Soxhlet Extraction and GC-MS"**

**Samantha Abila (Mentor: Edward Donnay)**

The purpose of this experiment was to extract compounds from cumin seeds using Soxhlet extraction and analyze them with GC-MS. Ground cumin seeds were extracted with ethanol via repeated heating and cooling cycles, which facilitated the extraction of compounds from the solid material. The extract was diluted and analyzed by GC-MS to identify the chemicals present. The results showed that cumin contains several organic compounds, including aromatic molecules. Overall, the experiment showed that Soxhlet extraction is an effective method for extracting compounds from plant material, and GC-MS is useful for identifying them.

**P45**

**“The Chemistry of Saffron: An Analysis of its Components”**

**Tioluwalope Abdul and Sophia Peltier (Mentor: Edward Donnay)**

Saffron, renowned for its unique aroma, vibrant color, and bitter taste, is globally recognized as the world's most expensive spice. This study emphasizes the major bioactive organic compounds present in this spice. In this experiment, saffron compounds were extracted using the Soxhlet extraction method and analyzed by Gas Chromatography–Mass Spectrometry (GC-MS) to investigate their chemical composition. This comprehensive analysis revealed Saffron’s characteristic components: safranal, crocin, and picrocrocin. Overall, the experimental methods provided a qualitative analysis of the organic compounds present in saffron.

**P46**

**“A Research Proposal for Investigation of Toxicity of PEDOT: PSS in the Invasive Estuarine Crab”**

**Neetika Sainju (Mentor: Edward Donnay)**

Poly(3,4-ethylenedioxythiophene) polystyrene sulfonate (PEDOT: PSS) is an organic polymer that conducts electricity. The compound has been in the spotlight for its use in various technological areas, including capacitors, biomaterials, organic photovoltaics, polymer light-emitting diodes (PLEDs), solar panels, and sensors. However, the manufacturing process for the compound involves expensive metal catalysts, strong oxidants, and a toxic solvent, raising environmental safety concerns.

The proposal aims to replicate a green chemical synthesis of PEDOT and to determine its toxicity using the invasive crab species Rhithropanopeus harrisii, collected from surrounding lakes. The study will investigate the crab’s response to a controlled dose of the compound across various crab age groups. By investigating the biological effects of PEDOT: PSS, the study will explore the potential environmental impact of its use.

**P47**

**“Comparison Study of the Browning Rate of Apples”**

**Robert May, Neetika Sainju, and Yumel Calaunan (Mentor: Edward Donnay)**

Many kinds of apples start to brown when exposed to air. When apples are exposed to air, a chemical reaction begins between an enzyme called catecholase and the oxygen in the air we breathe. This type of chemical reaction is known as an oxidation reaction. Three apple varieties (Fuji, Honeycrisp, and Red Delicious) were analyzed for oxidation rate. These apples were blended into a puree; the puree was extracted to expel the unnecessary parts of the puree, and the apple juice was collected. After the different types of apple juice were

analyzed using the Beckman Ultra-Violet Spectrophotometer, the absorbance data were graphed and analyzed.

**P48**

**"Extraction of Nutmeg"**

**Alexis Stromsoe and Savanna Daily (Mentor: Edward Donnay)**

This study extracted a compound from nutmeg using the Soxhlet extraction method. To identify the compounds extracted, proton NMR, IR, and GC-MS analyses were performed. The analysis concluded that the main compound extracted was Elemicin.

**P49**

**"Body Composition vs Performance: What Actually Matters?"**

**Addisyn Kinnan and Matthew Pillans (Mentor: Ryan Dalton)**

Research Question: Does body fat percentage impact performance in strength and VO2 Max tests?

Hypothesis:

1. Lower body fat percentage equals better VO2 max and jump performance

2. Strength may not be as affected

Tests Used:

1. Body Composition

2. Vertical Jump

3. VO2 Max

4. Strength

**P50**

**"The Female TRIAD/ REDs of bone health"**

**Alyssa Whitaker and Anna Nielsen (Mentor: Shanna Martin)**

The full abstract of the project is about bone health and how female athletes require assessment of risk factors, prevention strategies, and management to ensure long-term well-being, including the Female TRIAD, LEA, and REDs.

**P51**

**"Do athletes with higher vertical jump scores also perform better in change-of-direction tests?"**

**Jordan Bravo and Dirk Johnson (Mentor: Ryan Dalton)**

The purpose of this study was to examine the relationship between vertical jump performance and change of direction (COD) ability in athletes. Vertical jump height is commonly used as a measure of lower-body power, while COD tests assess an athlete's ability to rapidly decelerate and accelerate in different directions, both of which are critical components in sports like basketball. It was hypothesized that athletes with higher vertical jump scores would also perform better on COD tests, reflecting greater lower-body power.

**P52**

**"Does Lower-Body Isotonic Strength Influence Fatigue During Repeated Sprint Test (RAST)?"**

**Madison Black (Mentor: Ryan Dalton)**

Background: Lower-body strength plays a critical role in athletic performance, including repeated high-intensity efforts like sprinting. The Running Anaerobic Sprint Test (RAST) is commonly used to assess anaerobic capacity and fatigue by measuring the performance decline throughout multiple sprints. Stronger athletes may be better fit to produce force efficiently and resist fatigue due to higher strength power output. Load-velocity profiling in exercises like the back squat and power clean provides information for an athlete's strength and power. Understanding the relationship between isotonic strength and fatigue during repeated sprint activity may help improve training strategies for athletes. The purpose of this study was to determine whether individuals with greater strength and power output, as measured by load-velocity profiling in the back squat and power clean, show reduced fatigue during the Running Anaerobic Sprint Test (RAST).

Methods: Students in Lab Testing completed isotonic strength tests using the back squat and power clean. During each exercise, load-velocity data were collected for multiple loads to evaluate strength and power output. A maximal anaerobic test will be assessed using the Running Anaerobic Sprint Test (RAST), which consists of six 40-meter sprints with 10-second rest intervals between each sprint. The sprint times will be recorded for all trials. Power, fatigue index, and anaerobic capacity will be calculated to identify performance decline across the six sprints. Before performing the tests, a standardized warm-up will be done to ensure standardization. The data will compare strength and power measurements from the load-velocity profiles with RAST performance. This will include sprint times and fatigue index to determine the relationship between lower-body strength and fatigue.

Results: The RAST test has not yet been completed. Hypothetically, the stronger athletes with higher load-velocity outputs in both the back squat and the power clean will show

lower fatigue indices and more consistent times during the test. The participants with lower strength levels should show a greater decline in performance across the six sprints. Overall, the graphs should show a negative slope between strength and fatigue index. This shows that as strength increases, fatigue decreases.

Conclusion: This study found that greater lower-body isotonic strength is associated with improved resistance to fatigue during repeated sprint activity. Participants with higher strength and power outputs should exhibit more consistent sprint performance and a lower fatigue index throughout the RAST test. The results should underscore the importance of strength development for enhancing anaerobic performance and reducing fatigue during high-intensity activities. Strength training strategies that improve force and velocity could be beneficial for athletes who perform many repeated-sprint events.

**P53**

**“Balancing Intensity: How Exercise During Pregnancy Influences Maternal and Fetal Physiology”**

**Kendra Humphries and Gracyn Shultz (Mentor: Shanna Martin)**

During pregnancy, the body undergoes major cardiovascular changes, including increased blood volume, cardiac output, and heart rate, all of which are necessary for fetal growth. But when a pregnant woman exercises, her body has to cope with extra physical work, raising concerns about the safety and effects of different levels of exercise intensity on the mother's and baby's health. This research aimed to find out the effect of exercise intensity on cardiovascular changes in the mother's and baby's health. In the articles we read, the results showed that moderate-intensity exercise makes a mother's cardiovascular system work more efficiently, delivering more oxygen and thereby maintaining her overall health without hindering the fetus's growth. On the other hand, vigorous-intensity exercise temporarily decreases uterine blood flow and fetal oxygenation, as blood is diverted to the active muscles. These changes are only temporary, and there have been no reports of adverse effects on long-term fetal outcomes in normal pregnancies. The evidence supports current guidelines recommending at least 150 minutes of moderate-intensity exercise per week during pregnancy. While higher-intensity exercise may be safe for physically trained individuals, it should be performed with caution and appropriate monitoring. These findings highlight the importance of exercise intensity in optimizing maternal health while maintaining fetal safety, reinforcing the role of structured physical activity in prenatal care.

**P54**

**“The effect of body composition on power”**

**Christine Hyde (Mentor: Ryan Dalton)**

Body composition can be directly linked to fitness components; particularly lean body mass facilitates strength and power development according to the National Strength and

Conditioning Association. Thus, this presentation focuses specifically on the effect that body composition has on power. To evaluate body composition, the researcher examined results from subjects' skinfold measurements using the Williams model, as well as analysis of their Bod Pod GS-X and Dual-energy X-ray absorptiometry (DEXA). As for power, multiple tests were conducted, including back squats, in which velocity was used to calculate each subject's power output. With height used to calculate power for counter-movement, step, and static jumps. These two areas were then analyzed statistically, with the hypothesis that increased lean body mass will increase power, whereas increased fat body mass will decrease power. As power is a common element in athletics, this information is important to athletes and anyone involved in their training.

**P55**

**"Built to Last: The science of Bone Health and Injury prevention for the Female Athlete."**

**Ashlynn Galvin, Madison Lopez, and Kenneth Black (Mentor: Shanna Martin)**

Female athletes face unique injury risks, specifically a higher incidence of ACL tears and bone stress injuries. These risks are driven by a combination of biomechanical alignment and physiological factors, particularly the link between nutrition and hormonal health. We want to identify how Relative Energy Deficiency in Sports (REDS) and neuromuscular mechanics influence injury rates, and to provide evidence-based strategies for long-term skeletal resilience.

**P56**

**"Pregnancy or postpartum physiology"**

**Grayson Winter, Jenemiah Perez, and Kole Verdadero (Mentor: Shanna Martin)**

Partner research project

**P57**

**"The Relationship Between Strength, Power, and Speed in Individuals"**

**Tristen Hall and Jose Alanis (Mentor: Ryan Dalton)**

Strength, power, and speed are key components of athletic performance and are closely related. Strength is the ability to produce force, power combines force and velocity, and speed reflects how quickly movement occurs. Research in Exercise Physiology suggests that greater strength can enhance power, while greater power can improve speed, especially in sprinting.

This study examines these relationships in individuals to determine whether strength, power, and speed are correlated and if one can help predict the others, with applications for training and performance improvement.

**P58**

**“Endurance performance across the follicular and luteal phases of the menstrual cycle.”**

**Brooke Frelke, Jyllian Phillips, and Gracie Hunter (Mentor: Shanna Martin)**

Giving detailed research on how women's athletic endurance performance can be affected by which phase they're on in their menstrual cycle.

**P59**

**“How does hormonal contraception influence physiological performance, recovery, and perceived performance outcomes in female athletes compared to naturally menstruating athletes?”**

**Aryana Cleveland, Zoe Aldrich, and Cason Oshields (Mentor: Shanna Martin)**

This project examines how hormonal contraceptives influence physiological performance, recovery, and perceived performance outcomes in female athletes compared to naturally menstruating athletes. The purpose of this research is to better understand whether the hormonal regulation caused by contraceptive use impacts athletic ability and overall training adaptations. This study reviews current scientific literature comparing athletes using hormonal contraceptives with those experiencing natural menstrual cycles. Findings suggest that hormonal contraceptives may alter hormone levels in ways that can influence strength, endurance, and recovery. However, results are often mixed and vary depending on the type of contraceptive used. Additionally, perceived performance outcomes, such as energy levels and fatigue, may differ between individuals. Overall, this research highlights the need for individualized approaches in training and athlete care, as well as further research to fully understand the relationship between hormonal contraceptive use and athletic performance.

**P60**

**“Factors contributing to Higher Sports-Related Injury Risk in Female Athletes”**

**Lucy Fulton, Nyema Muhammad, and Briley Waters (Mentor: Shanna Martin)**

Female athletes experience a higher risk of certain sports-related injuries compared to male athletes, particularly injuries involving the knee and anterior cruciate ligament (ACL). The purpose of this research poster is to examine physiological and biomechanical factors that contribute to increased injury risk in female athletes. Peer-reviewed scientific articles published within the last ten years were analyzed to identify key mechanisms associated with injury prevalence. Research indicates that anatomical differences such as pelvic structure and knee alignment, hormonal influences affecting ligament laxity, and neuromuscular control patterns during jumping and landing contribute to a greater likelihood of injury. Additionally, differences in strength ratios between the quadriceps and

hamstrings may increase stress on the knee joint during athletic movements. These findings highlight the importance of injury-prevention strategies, including neuromuscular training, strength development, and proper movement mechanics. Understanding these factors can help coaches, athletic trainers, and exercise professionals design safer training programs for female athletes.

**P-R1**

**“Cheryl Medow”**

**Karalynn Wilson (Mentor: Jodi Frizzell)**

Cheryl Medow, a photography artist whose works are inspired by bird species.

**P-R2**

**“Margie Crisp”**

**Caitlyn Soto (Mentor: Jodi Frizzell)**

Poster of Margie Crisp explaining who she is and what her work is about.

**P-R3**

**“Ida Lansky”**

**Garon Shanks (Mentor: Jodi Frizzell)**

It is a poster featuring details about Ida Lansky and examples of her photography.

**P-R4**

**“Hollis Hammonds”**

**Bruce Brown (Mentor: Jodi Frizzell)**

It is a poster featuring some of Hollis Hammonds' artwork.

**P-R5**

**“Julie Speed”**

**Lola Jasper (Mentor: Jodi Frizzell)**

A poster about Julie Speed, a printmaker and painter whose work is featured at The Grace Museum, provides details on several of her pieces, along with a short background and a description of her style.

**P-R6**

**“Graciela Iturbide and Carol Golemboski”**

Posters of two women photographers

**P-R7**

**“Cindi Holt”**

**Edwin (Zadie) Plowman (Mentor: Jodi Frizzell)**

Poster on Cindi Holt.

**P-R8**

**“Sarah Williams”**

**Merry Booe (Mentor: Jodi Frizzell)**

A biographical poster about the artist Sarah Williams.

**P-R9**

**“Barbara Maples”**

**Asia Brown (Mentor: Jodi Frizzell)**

Barbara Maples, biographical poster.

**P-R10**

**“Peggy Bacon”**

**Aubrey Elliott (Mentor: Jodi Frizzell)**

Peggy Bacon is a biographical poster for a caricature artist.

**P-R11**

**“Flor Garduño poster”**

**Esai Monroy (Mentor: Jodi Frizzell)**

Poster on Flor Garduño, the photographer.

**P-R12**

**“Florence McClung”**

**Hope Ryan (Mentor: Jodi Frizzell)**

Florence McClung is a local female artist. She lived to around 99 and was shown in the Grace just recently for Women's History Month.

**P-R13**

**“Tobacco Forrester”**

**Gabriel Sanchez (Mentor: Jodi Frizzell)**

It is a poster about Tobacco Forrester.

**P-R14**

**“Orna Feinstein”**

**Lovelyn Goad (Mentor: Jodi Frizzell)**

Orna Feinstein Biographical poster.

**P-R15**

**“The Artworks Behind Lois Hogue Shaw”**

**Alexis Shield (Mentor: Jodi Frizzell)**

This poster is based on the artworks behind Lois Hague Shaw.

**P-R16**

**“The significance of Hung Liu”**

**Jeri Thompson (Mentor: Jennifer Nichols)**

It is a poster about Hung Liu, a great woman artist who focuses on photography; they find and paints it to either improve the old photo or use it as a reference.

**P-R17**

**“Margaret Patterson”**

**Jessica Parker (Mentor: Jodi Frizzell)**

Margaret Patterson and her work.

**P-R18**

**“Gail Norfleet”**

**Nicole Dominique Hernandez Ramirez (Mentor: Jodi Frizzell)**

In collaboration with the Grace Museum, I researched a woman artist.

**P-R19**

**“The Art of Light Design”**

**Grant Pike (Mentor: Zack Frizzell)**

My project examines the lighting design for Romeo and Juliet, produced at McMurry University and later presented at the Christian University Theatre Festival. The design process began with the development of a cohesive color palette. Because the production was set in a space between time and reality, I intentionally avoided naturalistic lighting.

Instead, I established a contrasting “morning versus evening” palette to reflect shifts in tone and emotional intensity throughout the play. To further support this abstract setting, I incorporated a star-like, galaxy-inspired visual element, reinforcing the idea that the production's world is not confined to a specific time or place.

A central objective guided these design choices: to highlight the universality and enduring nature of love, which remains the play's core emotional force.

**P-R20**

**“Lights and Design: Moonlight and Magnolias”**

**Alexandria Welch (Mentor: Zack Frizzell)**

This project showcases the combined roles of lighting and set design in McMurry Theatre’s Fall 2025 production of Moonlight and Magnolias and how these elements work together to support storytelling and mood. Set in a fast-paced Hollywood office, the play focuses on the intense rewriting of the film adaptation of Gone with the Wind. The set design creates a believable office space that reflects both the time period and the high-pressure working conditions. The lighting design enhances the performance by giving the actors a classic, warm Hollywood glow, while also using shifts in color and intensity to highlight key storytelling moments. These changes help emphasize the stress, isolation, and humor that are ever-present throughout the production. Together, the lighting and set design create a cohesive environment that brings the play's energy and tension to the forefront.

**P-R21**

**“Lighting Design for”**

**The 25th Putnam County Spelling Bee" – Evelyn Van Houten (Mentor: Zack Frizzell)**

My project presents the lighting design for the musical "The 25th Putnam County Spelling Bee", centered on a playful and imaginative concept that reflects the emotional complexity of adolescence. Set in a high school gym during a Saturday spelling bee, the production explores themes of competition, vulnerability, and the desire for acceptance.

The lighting design emphasizes these themes by using focused illumination to isolate characters during moments of introspection, such as inner dialogue and solo musical numbers. Frequent use of spotlights directs audience attention and highlights individual emotional journeys. Supporting materials, including a cue sheet, renderings, and a light plot, demonstrate how the conceptual approach is translated into technical execution.

**P-R22**

**“Lion King Jr.”**

**Suellyn Hunter (Mentor: Zack Frizzell)**

I will be discussing my lighting design for the show Lion King Jr. and the research and inspirations I used to make it both biophilically accurate and engaging for the audience.

**P-R23**

**“Margaret Ann Scruggs Caruth”**

**Hanna Niebelski (Mentor: Jodi Frizzell)**

It is a poster presentation on Margaret Ann Scruggs Caruth.

**P-R24**

**“Ari’s Coffee Shop”**

**Tiffany Laird (Mentor: Zack Frizzell)**

Posters for Ari's coffee shop

**P-R25**

**“Romeo and Juliet Costume Design”**

**Alexandria Welch, Ian Chatman, Kylie Crawford, Gabriel Pyenta, Evelyn Van Houten, Alex Neal, Ella Hunter, Will Anderson, Mya Rogers, Ben Jeter, Lauren Caspwell, Mia McKean, Kinley Jeffers and Jaylynn Wilkins – (Mentor: Keri Perkins, Neena McLain and Gracie Melbourne)**

Our project presents the costume design for Romeo & Juliet. The design was created by all of the students in the Costume Design & History course taught by Professor Kari Perkins. We collaboratively researched, designed, and constructed costumes for all 20 characters, many of whom had multiple costume changes. The production reimagined Shakespeare’s star-crossed lovers in a 1990s-inspired, urban landscape. The Montagues are dressed in business-corporate wear with grunge elements, conveying their new-money status. The Capulets are adorned in a manner that expresses old-money wealth, inspired by the country-club aesthetic. Romeo & Juliet's costumes stand out from their family: Romeo leans into modern streetwear, and Juliet expresses youth and femininity with light colors and flowing dresses.

## Three Minute Thesis

**3MT – 1**

**“Priceless Trap”**

**Lumiere Kadetwa (Mentor: David Wahl)**

My project, named "Priceless Trap," is about the corrupt business of drug trafficking and why it will never fully end.

**3MT – 2**

**“MEN IN SOCIAL WORK: SEXISM IN THE WORKPLACE”**

**Alexander Lasserre (Mentor: David Wahl)**

Men in Social Work are an underrepresented group, only 19% nationwide, especially in child welfare, which our culture treats poorly. This proposed study aims to examine how they interact with others in their lives and in their industry to understand how our culture shapes their job performance. This study focuses on sexism in social work. How are men treated in their jobs in child welfare by the people with whom they interact? To do this, a research model of qualitative interviews will be used to understand the experiences and culture surrounding men in social work and how they are treated. Using the four measures of the coworkers, clients, family, and self to determine if there is sexism and to see where it comes from. This study is important because very little research has been done in this area,

especially in the United States, and to change a stigma and end sexism, we must understand where it comes from and how it is experienced.

**3MT – 4**

**"I do not have one."**

**Emilee Thompson (Mentor: David Wahl)**

I do not have one.

**3MT – 5**

**"Deciphering the anti-virulence and anti-microbial mechanism of natural compounds against Pseudomonas aeruginosa."**

**Tioluwalope Abdul (Mentor: Santosh Kumar)**

The growing threat of drug-resistant pathogens highlights the urgent need for new treatment strategies. Pseudomonas aeruginosa is a Gram-negative opportunistic bacterium. It is a member of the ESKAPE group and is recognized as a WHO priority pathogen, known for its ability to resist multiple antibiotics. It causes a wide range of infections, including respiratory, wound, and bloodstream infections, particularly in immunocompromised individuals. This pathogen produces several virulence factors, such as proteases, elastases, pyocyanin, and biofilm components, which play key roles in disease progression and drug resistance. In our ongoing study, we are exploring plant-derived compounds, such as eugenol, coumarins, and terpenoids, for their potential to combat virulence and drug resistance in P. aeruginosa. Additionally, using gene expression profiling and cell-based approaches, we aim to elucidate how these underexplored lead compounds modulate bacterial metabolism, virulence, and drug-resistance in P. aeruginosa.

**3MT – 6**

**"Exploring natural anti-microbial and anti-virulence compounds with their mechanism of actions to combat drug-resistant pathogens."**

**Nathaniel Pyenta (Mentor: Santosh Kumar)**

The emergence of drug-resistant pathogens is a global concern, highlighting the need for new therapeutic strategies. Staphylococcus aureus, a Gram-positive bacterium, is listed as a WHO priority pathogen and causes a wide range of invasive infections, including skin infections, pneumonia, endocarditis, and bacteremia. The increasing prevalence of multidrug-resistant strains such as MRSA is particularly alarming. This pathogen produces various toxins and virulence factors, including hemolysins, lipases, and proteases. In this study, we investigated plant-based pure compounds such as glabridin (GLB) from licorice root, usnic acid (UA) from lichens, and eugenol (EUG) from clove for their potential to inhibit the expression of these virulence factors. Furthermore, RNA sequencing analysis of

S. aureus exposed to sub-inhibitory concentrations of UA under aerobic and anaerobic conditions indicates that genes associated with survival under redox stress and alternative respiration (the urease cluster) are highly upregulated. In contrast, genes related to carbon metabolism and virulence are significantly downregulated. Some major virulence genes, such as gamma-hemolysins, were strongly down-regulated under aerobic conditions compared to anaerobic conditions. Our analysis suggests that UA alters carbon metabolism and cellular homeostasis toward stress survival rather than active growth and virulence in S. aureus.

**3MT – 7**

**"We are not in Kansas Anymore: An exploration on the mainstream effects of the incorporation of Artificial Intelligence Technology within Tornado Climatology and the effects on Human Suffering."**

**Julia Langkiet (Mentor: David Wahl)**

Since the mid-1980s, the region known as 'Tornado Alley' in the US has shifted eastward rapidly, changing who is most affected. (Breen '24) This means that more people are being affected by extreme weather events, such as tornadoes. As the number of people who experience these effects increases, many have asked: Is there anything that can lessen overall suffering? The answer lies in new artificial intelligence-backed technology. Previous data from systems such as Dual-Pol radar and plans drawn from MIT's new conceptual AI-driven systems prove that new technology, specifically artificial intelligence, has begun to enter the meteorological field. I compared new and old technological systems used in the field. I identified trends that align with the success and failure patterns of these platforms, while also collecting data on the various scientific aspects of tornadic activity, including their formation. These scientific developments have driven a rapid increase in demand for such systems. These technological advancements have created undeniable benefits for the entire field of meteorology. This study found that gathering tornadic data was made easier, more effective, and more widespread with the use of these new and innovative technological systems. Through the examination and analysis of these materials, it was concluded that incorporating new technologies in this field is vital to maintaining human livelihood.

Keywords: tornado, activity, technology, artificial intelligence, mental suffering

## Theatre/Film Synopses

**T1**

**"Ari's Cafe Commercial by Deni Booe"**

**Merry Booe (Mentor: Zack Frizzell)**

An animated commercial for Ari's Cafe.

**T2**

**“Signing Off”**

**Gabriel Pyenta (Mentor: Neena McLain)**

Set during a late-night Christmas broadcast, Signing Off follows Jimmy Harper, a young host struggling to live up to his late father’s beloved television show. When Jimmy impulsively puts a drunken Santa on air, the live broadcast spirals into chaos, exposing tensions among the crew and Jimmy’s own insecurities. The fallout forces Jimmy to confront the pressure of legacy, leadership, and failure.

**T3**

**“Ari's Coffee Shop Reel”**

**Tiffany Laird (Mentor: Zack Frizzell and Jennifer Nichols)**

Video reel I made for Ari's Coffee Shop

**T4**

**“Ari’s Café”**

**Kristopher Cantu (Mentor: Zack Frizzell)**

In this video, I showcase Ari’s Cafe, offering a behind-the-scenes look at how it is made and introducing the people who make it all happen. The video also features an interview with the owner, who shares what it is like to balance running the cafe with teaching.

**T5**

**“Ari’s Holiday video”**

**Jordan Braud (Mentor: Zack Frizzell)**

A Holiday commercial dedicated to spreading the festive energy for Christmas, while promoting Ari’s Cafe as the place to spend the holidays with your friends and family.

**T6**

**“Before You Were Ruth”**

**Lauren Scott (Mentor: Neena McLain, Charlie Hukill, and Mary Anna Kidd)**

Ruth Mara Gudrun has a secret. Her life, painted with moments of love and joy, conceals a deeper reality of fear and isolation. The play "Before You Were Ruth" follows Ruth, a young woman in the 70's, as she navigates the complex terrain of relationships, trust, and sacrifice. Ruth's story demonstrates the painful truths that emerge when fear and judgment run our lives. Anger, resentment, and even violence surface in the absence of communication,

leaving Ruth to make difficult decisions that will shape the future of her relationships. The play seeks to inspire conversations about the unattainable demands placed on women in society and to present a story that meets them with patience, understanding, and sincerity.