

Fall 2025 Graduate Research Symposium

Friday, November 14, 1-4 p.m.
Villanova Room, Connelly Center

• • • • •

Learn about exciting research from graduate students
in the College of Liberal Arts and Sciences!



Sponsored by The Office of Graduate Studies (CLAS)
Free & Open to the Public
Refreshments from 3-4 p.m.

1-3 p.m. Villanova Room, Connelly Center – Oral Presentations

1:00	Opening remarks from Dean Woodard
1:10	Jessie Pagan, Theology
1:17	Sarah Wright, Theatre
1:24	Nicholas Ashenfelter, Psychology
1:31	Anna Bilotta, Psychology
1:38	Danielle Buckley, Psychology
1:45	Colin Bodayle, Philosophy
1:52	Blake Perry, Philosophy
1:59	Weronika Gradjura, History
2:06	Alexandra Shehigian, History
2:13	Livia Graham, Environmental Science
2:20	Charles Sylvester, Environmental Science
2:27	Alexis Atwood, English
2:34	Ismail Khan, Biology
2:41	Cordon Wade, Biology
2:48	Closing remarks from Dean Woodard

3-4 p.m. Poster Presentations and Refreshments

Abigail Robison, Biology	Soumya Swain, History
Rachel Girard, Chemistry	Michael Carrion, Mathematics
Jenna Kosnick, English	Shawn Huberdeau, Philosophy
Ashley Lee, English	Nicole Amoachi, Psychology
Julia Reagan, English	Madison Battinelli, Psychology
Adelma Argueta-Roman, Environmental Science	Abigail Gilbert, Psychology
Emily Myers, Environmental Science	Amy Kennedy, Psychology
Prottoy Roy, Environmental Science	Alexandra Stefanovici, Psychology
Amanda Laule, History	Perdian Tumanan, Theology

Research is an essential element to the experience of graduate students in the College of Liberal Arts and Sciences at Villanova. Each year, the Office of Graduate Studies puts out a call for proposals for the Graduate Summer Research Fellowship. This abstract book represents the research projects of the recipients of the 2024 award, as well as submissions from additional students across the College. These projects reflect the wide variety of fascinating research being conducted by graduate students in CLAS at Villanova, ranging from Biology and Chemistry to History and Philosophy. Students were invited to present their research either with a poster or a Three Minute Thesis-style brief oral presentation. We would like to thank the faculty members who joined Dr. Emory Woodard (Chair) on the 2025 Summer Research Fellowship committees (Doctoral and Master's): Drs. Delia Popa (Philosophy); Brett Grainger (Theology and Religious Studies); Jesse Couenhoven (Humanities); Adam Langley (Biology); Deanna Zubris (Chemistry); Jie Xu (Communication); Janette Herbers (Psychological and Brain Sciences); Edward Sobel (Theatre); Timothy Brunk (Theology and Religious Studies). Sincere appreciation goes to the faculty sponsors for each of these exciting research projects. Faculty mentorship at Villanova is what makes the graduate student experience so unique. Finally, thank you to the Dean of the College of Liberal Arts and Sciences, Dr. Adele Lindenmeyr, for her continuing support of graduate student research.

Office of Graduate Studies, CLAS

Biology

Investigating immune checkpoint blockade of Ly-6A protein as cancer immunotherapy in Mice

Author: Ismail Khan

Sponsor: Dr. Anil Bamezai

The increasing global prevalence of cancer cases among men and women has sparked a growing interest in using immunotherapy as an approach to battling this disease. According to the International Agency for Research on Cancer, by 2040, the global cancer incidence is expected to be 27.5 million new cases and 16.3 million deaths. Although the world has been successful in introducing new ways of treating cancer and its mutative abilities, therapy does not seem to pass the finish line. Cancer poses itself as a self-tissue, allowing it to evade the continuous surveillance by immune cells. Cancer cells evade immune response via Immune checkpoints on the surfaces of CD8 and CD4 cells, and the activation of immune suppression through these checkpoints requires a ligand-receptor interaction. Cancer cells up-regulate specific ligands that can interact with these checkpoints to suppress the T cell response. Therefore, there is a strong need to discover new immune checkpoints and new strategies to block them.

The Bamezai laboratory confirmed that Ly-6A inhibits T cell response. Mice lacking Ly-6A, when injected with B16-F10 tumor cells, showed reduced tumor growth and a better survival rate when compared to the wild type, confirming Ly-6A's immuno-inhibitory role. My research builds on previous literature and transitions this knowledge towards using antibodies to achieve a dual blockade against Ly-6A and PD-1. I hypothesize that blocking these two checkpoint inhibitory proteins simultaneously will result in reduced tumor growth and a better survival rate in tumor transplantation mouse models compared to the blockade of a single immune checkpoint blockade or the wild-type control mouse. This study will explain the advantages of using a dual antibody blockade of Ly-6A with PD-1. The goal of this study is to bring forth new ways of therapy that can improve the odds of patient survival.

The Effects of Estrogen on Sexual Signaling in Eastern Fence Lizards (*Sceloporus undulatus*)

Author: Abigail Robison

Sponsor: Dr. Stephanie Campos

Chemical communication is critical to mate choice in many vertebrates, yet the hormonal regulation of female-produced chemical cues and their effects on courtship remain poorly understood in reptiles. In lizards, males use chemical secretions from femoral pores to mediate social interactions, but female signaling is less obvious and may occur through skin lipids rather than specialized glands. This study examines how estrogen influences both chemical signal production and sexual receptivity in female eastern fence lizards (*Sceloporus undulatus*), and how these traits, in turn, affect male courtship behavior and hormonal responses. I surgically manipulated estrogen levels by creating low estrogen (ovariectomized) and high estrogen (sham surgery) females, then tested male odor preferences in a three-zone arena to assess whether males are attracted more to the scent of high-estrogen females. In a separate assay, I quantified female receptivity behaviors and male courtship displays during live interactions and measured post-interaction testosterone in males to determine whether male hormone levels are influenced by female estrogen state and receptivity, as predicted by the Challenge Hypothesis. I predicted that estrogen will enhance female receptivity, increasing male interest and eliciting elevated testosterone levels. In my presentation I will present the results of my behavior assays. Hormone assays are still in progress. This work will shed light on how female hormones shape both chemical signaling and sexual behavior in lizards, advancing our understanding of sex-specific contributions to mate choice and hormone–behavior feedback across taxa.

Uncovering Diversity and Investigating the Evolutionary History of a Group of Southern-African Lizards

Author: Cordon Wade

Sponsor: Dr. Aaron M. Bauer

Despite a diversity of over 500 lizard species in Southern Africa, researchers are continually identifying new species in this region or discovering that traditional species are actually comprised of multiple species. In conjunction with characterizing biodiversity, a more complete understanding of species' evolutionary histories is constantly building. The *Trachylepis variegata* group is a group of closely related species distributed widely in Southern Africa. Traditionally, two species were recognized in this group: *Trachylepis variegata* (the variegated skink) and *Trachylepis punctulata* (the speckled skink). New research, however, suggests that populations of the speckled skink located outside of Angola may represent a separate, distinct species. In this study, a comprehensive genetic and morphological trait dataset will be combined to determine if these populations deserve recognition as a full species. The timing of the split between the speckled skink and the tentative species will be determined, and the role of the Kunene River as a barrier driving this split will be evaluated. The tentative species and the variegated skink share a large distributional boundary but appear to be kept separate, and a modeling approach will be used to investigate the hypothesis that a west-east rainfall gradient in Namibia serves as an environmental barrier preventing these groups from interacting. The majority of the world's *Trachylepis variegata* group museum samples will be revised to better approach these questions and to accompany newly collected samples.

Chemistry

Development of a Liquid Chromatography Post-Column Derivatization Atmospheric Pressure Chemical Ionization Tandem Mass Spectrometry Method for the Analysis of Vitamin D

Author: Rachel Girard

Sponsor: Dr. Anthony Lagalante

Vitamin D is a class of lipophilic secosteroids better known as calciferols. Calciferols play an important role in human health, particularly in bone mineralization, growth, and remodeling. Modern-day concerns over moderate vitamin D deficiency and insufficiency continue to push for further improvement to current methods and the development of new methods. Mass spectrometry-based methods offer the sensitivity and selectivity needed to evaluate vitamin D sufficiency, but they often require lengthy derivatization reactions to obtain the sensitivity needed. This study takes advantage of the instantaneous nature of gas-phase reactions to derivatize native vitamin D, by adding the derivatization reagent to the mixing-tee of the atmospheric pressure chemical ionization source (APCI) of the mass spectrometer instead of before the sample run. The liquid chromatograph separates native vitamin D and its metabolites from other components within the sample using a column, and as vitamin D elutes into the ionization source, it enters the gas-phase where it can react with the derivatization reagent. Efficacy, accuracy, and precision have been evaluated by testing oral supplements and powdered beverage mixes containing set amounts of vitamin D.

English

Vulnerability, Poetry of Witness, and Human Rights

Author: Alexis Atwood

Sponsor: Dr. Heather Hicks

The central aim of my research was to understand how vulnerability is depicted in poetry and the pedagogical use of close reading poetry to advance vulnerability studies. My work began by synthesizing existing scholarship on vulnerability studies and worked to resolve any theoretical contradictions about what vulnerability is. I went on to further define the different types of vulnerability as understood by modern scholars and then outlined my methodology for the project. The different kinds of vulnerability explored in my work, explained by Dr. Danelle Petherbridge, are corporal vulnerability which includes both the propensity for bodily suffering and the possibility for sensuality; psychological vulnerability which refers to a sense of individualism that can be accepted or rejected by society; and sociopolitical vulnerability which makes interdependence possible but also exposes us to forms of power that can abuse this vulnerability. I close read El Salvadorian poetry to understand how these different kinds of vulnerability manifest and considered the corporal, psychological, and sociopolitical factors that allow or prevent these kinds of vulnerability to occur. While my work surveyed all three types of vulnerability outlined early in my research, it focused particularly on corporal vulnerability and emphasized the value of evaluating poetry of witness through the lens of theories on corporal vulnerability. I ultimately argued that joining vulnerability studies and the study of poetry in this way can become a tool for human rights education, justice, and advocacy

Global Images in *By the Bog of Cats...*

Author: Jenna Kosnick

Sponsor: Dr. Mary Mullen, Bess Rowen

Marina Carr's 1998 *By the Bog of Cats...* is one of Ireland's most influential contemporary plays. A loose retelling of the Medea myth, Carr's play replaces the princess of Corinth with Hester Swane, a poor "tinker" woman living by the eponymous Bog of Cats in Ireland's Midlands. Abandoned by her mother as a young child, Hester's adult life is falling apart, as her former lover (Carthage) has left her to marry a wealthy farmer's daughter, and is threatening to take custody of his and Hester's child (Josie) if Hester fails to leave the bog, the only home she has ever known. The play culminates in Hester setting fire to Carthage's farm, killing their daughter, and then committing suicide.

Through my research in Galway University's Abbey Theatre Archive, I was able to access photos taken from the original 1998 production, along with prompt scripts. While it is the play's connection to *Medea* that often positions *By the Bog of Cats...* as a global work, looking at these archival images, I theorize that the 1998 production of *By the Bog of Cats...* interfaces with the wider world not only through its script, but through its staging and promotional materials. In its poster, wedding staging, and final filicide, I see echoes of famous global works. Specifically, I connect the poster to Madonna and Child imagery, the wedding to Da Vinci's *The Last Supper*, and Josie's murder to Ilya Repin's *Ivan the Terrible and His Son Ivan*, and trace the ways the 1998 production both builds on and subverts these famous global images. Ultimately, I argue *By the Bog of Cats...* uses these references to not only interface with the global, but to elevate its contained, local tragedy, to dramas on epic scales.

Expanding Asian American Studies: Han Kang's *The Vegetarian* and *Human Acts* and Engaging with Deborah Smith's Translation

Author: Ashley Lee

Sponsor: Dr. Yumi Lee

Han Kang's *The Vegetarian* and *Human Acts* and Deborah Smith's translation of Han King are at the center of this research. *The Vegetarian* follows Yeong-hye, whose refusal to eat meat told through multiple characters—spirals into family estrangement, institutional violence, and body autonomy. *Human Acts* weaves the 1980 Gwangju Democratization Movement through multiple perspectives of collective trauma, state violence, and resistance through memory. Both novels' multi-voiced narratives become crucial sites for investigating translation, not only in the movement from Korean to English, but also through the shifting of narrative perspectives.

Building on the primary novels, I interlace close literary criticism of Han King's work and Deborah Smith's translation choices in conversation with translation theorists and Lisa Lowe's *Immigrant Acts*. This project asks how such conversations critiques the way the United States constructs its international "others," while disrupting exclusionary frameworks within Asian American studies and world literature.

Furthermore, the research integrates Kandice Chuh's concept of "subjectlessness," which challenges essentialist categorization and in turn destabilizing U.S. boundaries of Asian American studies. In dialogue, Dipesh Chakrabarty's "Postcoloniality and the Artifice of History" critiques how colonial historiography, the way colonizers wrote "official" histories, set up Europe as the default model for modernity. Chakrabarty highlights how certain histories and practice of time and memory remain outside the logic of capitalist and colonial modernity, offering ways to think about temporality and history otherwise.

By bringing together literary critics on Han Kang, Lowe's *Immigrant Acts*, Chuh's theorization of subjectlessness, and Chakrabarty's analysis of colonial historiography, I attempt to contextualize and offer readings of Han Kang and Deborah Smith's work demonstrating how by engaging with the texts in translation reinforce the move to expand Asian American studies beyond U.S. centric paradigms to transnational/transpacific literary future.

Economic Policy in Contemporary Literature

Author: Julia Reagan

Sponsor: Dr. Heather Hicks

Literary scholars working on neoliberalism have often focused on the isolated and entrepreneurial self, criticizing the novel form's emotional emphasis on the personal life of the individual. Through interdisciplinary work on economic policy and rhetoric, my research instead seeks to analyze the ways that contemporary novels represent the workings of the economy alongside emotional life and individual subjectivity. Rather than arguing that novels should move beyond the personal and individual, I demonstrate how novels can emphasize that economic policy and subjective experiences mutually shape one another. My research draws on economic theorists of the New Deal consensus and the later turn to neoliberal and supply-side economics—from John Maynard Keynes to James Buchanan—in order to enable literary analysis through an economic lens. Within this framework, I analyze how Nora Lange's 2024 novel *Us Fools* juxtaposes its protagonist's emotional life with details about the specific political actors, laws, and social responses that created the 1980s farm crisis in the American Midwest. *Us Fools* narrates the expansion of credit that advocates of neoliberal economic policies used to mask narrowing opportunities for social mobility. Credit, of course, also means debt, leading the novel's provocatively named Fareown family down a spiral culminating in the loss of their family farm the dissolution of family members' physical and mental health. While *Us Fools* falls short of offering a collective solution to the economic dispossession it narrates, the novel's form successfully ties family struggle and personal alienation to specific economic factors, highlighting the material conditions that produce the stuff of fiction.

Environmental Science

Exploring the effect of *Phragmites australis* on soil and carbon accumulation in wetlands

Author: Adelma Argueta-Roman

Sponsor: Dr. Nathaniel Weston

Tidal wetlands play a vital role in coastal ecosystems, offering services such as flood protection, water filtration, and carbon sequestration. However, climate change-induced sea-level rise threatens their long-term stability, as many wetlands struggle to accumulate enough soil to avoid permanent submergence. Invasive species like *Phragmites australis* are typically regarded as further ecological threats due to their displacement of native vegetation and alterations in marsh hydrology. Yet, *Phragmites* may also enhance soil and carbon accumulation, potentially improving wetland resilience against rising seas.

This study investigates soil accumulation and carbon sequestration rates in *Phragmites australis* dominated marshes compared to adjacent plots of native marsh plants (*Spartina patens* or *S. alterniflora*) in Plum Island, MA, and Stow River, NJ. By analyzing soil cores for radionuclides Pb-210 and Cs-137, we reconstruct changes in sediment deposition over the past ~50 years to assess whether *Phragmites* invasion contributes to changes in vertical accretion and organic carbon accumulation rates compared with native vegetation. Additionally, carbon-13 isotopic signatures ($\delta^{13}\text{C}$) of organic material in the marsh soil help determine invasion timing, as *Phragmites* (a C3 plant) differs isotopically from native C4 *Spartina* species.

Although *Phragmites* invasion is associated with biodiversity loss and changes in wetland hydrology, its capacity to enhance accretion and carbon storage may provide an alternative perspective for wetland management. This study highlights how *Phragmites* invasion alters soil-building processes and may help direct restoration strategies that prioritize resilience over strict species removal. By integrating radiotracer dating and isotopic analysis, this research offers insight into the ecological trade-offs of *Phragmites* invasion, potentially reframing its role in coastal wetlands from a problematic invader to a species that aids in long-term carbon storage and marsh stability.

Impacts of Road Salt Application on Water Quality in Suburban Headwater Streams

Author: Livia Graham

Sponsor: Dr. Steven Goldsmith

Excess application of road salts has resulted in salinization of waterways. More recently, studies have shown salts deposited in roadside soils mobilize metals into groundwater, which can then enter streams throughout the year. Yet, little is known as to the timing of delivery of these salt related contaminants to suburban waterways. This study will determine 1) the timing and delivery of road salt and metals to headwater streams, 2) exceedances of regulatory thresholds for protecting aquatic organisms and human health, and 3) the relationship between these solute fluxes and impervious surface cover in the upstream area

The Nexus of Air Pollution, Social Vulnerability, and Chronic Disease in U.S. Cities

Author: Emily Myers

Sponsor: Dr. Peleg Kremer

This study seeks to investigate the spatial and temporal patterns of fine particulate matter (PM_{2.5}), social vulnerability, and health disparities across the 500 largest U.S. cities. By analyzing data from the CDC's 500 Cities Project and PLACES dataset alongside satellite-derived PM_{2.5} concentrations, I aim to identify communities disproportionately impacted by PM_{2.5} air pollution. Using spatial analysis in ArcGIS Pro and Generalized Additive Models (GAMs), I will explore the relationship between PM_{2.5} concentrations, social vulnerability, and health outcomes, including asthma, COPD, coronary heart disease, cancer, and diabetes. Through an environmental justice perspective, this research will inform government and medical organizations for improved public health interventions and environmental policies to address air pollution and health disparities.

Identifying methodological opportunities in computational modeling of neighborhood-scale shallow inundations

Author: Prottoy Roy

Sponsor: Dr. Peleg Kremer

As climate change impacts intensify in the face of rapid urbanization, highly impervious urban areas are increasingly experiencing frequent shallow floods caused by extreme rainfall. These events are often exacerbated when runoff exceeds the capacity of existing drainage infrastructure. While advancements in computational techniques and their efficiencies brought about significant changes in the landscape of modeling large-scale flood events, these shallow, small-scale, and temporary inundations have drawn less attention in academic exploration. Despite the availability of many modeling approaches, there is still a lack of tools that explicitly address the intricacies of urban flood modeling, such as dynamic topography, variable rainfall, and complex drainage networks. This study seeks to methodically understand the strengths and limitations of currently available tools in modeling short-lived urban neighborhood-level floods and explore possible opportunities for future development. The methodology involved two aspects: first, it critically analyzed the existing technical and technological flood modeling capabilities; and then, theoretically investigated promising integration opportunities for enhanced results. Among the sixteen widely used tools and techniques reviewed, ten with distinct capabilities as a standalone modeling solution were classified as primary tools, whereas the remaining six were identified as supporting tools with strengths to complement at least one of the primary tools in modeling neighborhood-level shallow-depth floods. The findings highlight key methodological gaps and offer a foundation for advancing future developments in precise urban shallow-flood modeling.

Monitoring Criteria Air Pollutants in West Philadelphia Using Low-Cost Sensors

Author: Charles Sylvester

Sponsor: Dr. Kabindra Shakya

The burden of particulate matter and gaseous air pollution disproportionately affects communities with higher poverty rates and minority-majority populations. One approach to address this burden is to increase monitoring using low-cost sensors to better equip community members with more information to drive change through future decision making. By installing PurpleAir sensors and Ogawa Passive Samplers at residences, schools, and businesses, this study characterizes particulate matter (PM_{2.5}), ozone (O₃), and nitrogen oxides (NO_x) in West Philadelphia. In addition to characterizing pollution across the neighborhood, this study analyzed spatial trends with land use and land cover, and temporal trends with peak exposures times during rush hour, daily variation, and seasonal differences to explain air pollution variation. Two sites in West Philadelphia exceeded the annual PM_{2.5} National Ambient Air Quality Standard (9 µg/m³), but no sites exceeded the NO₂ annual standard (53 ppb). In landscape analysis, areas with more paved surfaces experienced higher pollution while areas with more grass and shrubs experienced lower pollution. The results also showed that sites with more vehicular traffic experienced higher concentrations of NO_x. Finally, NO_x gases were higher in the spring than in the summer, and PM_{2.5} was higher in the summer and winter than the rest of the year. By determining where and when air pollution is elevated, my research will inform community members how to consider future policy and land development decisions that will in turn bring us cleaner air, healthier cities, and better lives.

History

The Philly Cheesesteak Pierogi: Food in the Creation and Recreation of Polish-American Identity in Philadelphia

Author: Weronika Grajdura

Sponsor: Dr. Whitney Martinko

Food is a vital source of both cultural maintenance and fusion for Polish-American communities in Philadelphia and other major hubs of Polish immigration. The importance of Polish food across multiple generations, with immigrants both old and new partaking in Polish eateries. Food serves as a medium for cross-cultural fusion, mixing iconic Polish dishes with American classics to create a new type of cuisine, such as pierogies with Philly cheesesteak or loaded baked potato fillings, found on both Polish-American and non-Polish menus. These variations have been embraced by Polish-American communities. Access to these foods has expanded, with both local restaurants and large-scale distributors selling frozen versions for quick and easy at-home preparation. However, Polish food within the diaspora remains the subject of generalization, with foods like pierogi being made into a symbol of Polish food, while other dishes are seemingly forgotten. Nonetheless, Polish restaurants preserve other dishes and pieces of Polish food culture, including but not limited to gołąbki, kielbasa, kotlet, and various side dishes. Despite the Polish population of Philadelphia drastically decreasing over the century due to movement to the surrounding suburbs or back to Poland, several new Polish eateries have opened up within the last five years, serving as a revitalization of Polish cuisine in the area. Newly opened Polish restaurants in Philadelphia and across the country present an elevated version of Polish cuisine, replacing simple white plates with Bolesławiec pottery and creating elaborate presentations. Many of these newer restaurants, run by later generations of Polish-Americans, serve as a marker of cultural maintenance in a landscape in which the Polish-American community is shrinking and evolving. Ultimately, despite Philadelphia's Polish-American population having significantly decreased, Polish eateries serve as a vital form of keeping Polish culture alive in the city and even serve as a form of cultural revitalization.

Reforming Utopia: Interrogating Infrastructural Inequality and Public Health Reform on the Main Line

Author: Amanda Laule

Sponsor: Dr. Whitney Martinko

Suburban historians agree that the Pennsylvania Railroad shaped Bryn Mawr's spatial development, yet few understand the impact of its competitor, the Philadelphia & Western Railway. Incorporated in 1902, the P&W planned a high-speed line from 69th & Market Street to Strafford. Despite landowner protests, the completed line cut through properties and divided working-class neighborhoods into pieces. Between 1905 and 1906, dozens of working-class homes suddenly abutted the P&W's tall embankments and fenced right-of-way. My research explores the many consequences of this new spatial arrangement. Through an analysis of railway records, historic atlases, and civic publications, I demonstrate that the P&W significantly worsened living conditions in these impoverished neighborhoods. As a physical boundary, the railway trapped wastewater beside homes, which created a breeding ground for disease. Moreover, the P&W's property rights complicated any potential relief efforts. Ultimately, I argue that the Philadelphia & Western Railway exacerbated existing infrastructure inequalities in these neighborhoods, furthering their stigmatization by elite neighbors.

A Survey of Personal School Sports Memorabilia Collections in Town- and County-Level Archives of Central and Eastern Pennsylvania

Author: Alexandra Shehigian

Sponsor: Dr. Whitney Martinko

Pennsylvania high school athletics programs served as important pathways for building community identity throughout the twentieth and twenty-first centuries. Sports memorabilia objects created by students' participation in athletics programs, such as uniforms, equipment, awards, and photographs, have received attention as tangible representations of both individual and collective athletic achievements. Athletes, their families, and the surrounding communities

view these objects as valuable, suggesting a desire to align themselves with the achievements these objects represent through ownership. This study examines the role of school athletics in maintaining local identity by examining a new set of actors: the local historical societies that have chosen to retain, process, and interpret school sports memorabilia as objects of regional importance. Through examining the sports memorabilia holdings of five local historical societies across Central and Eastern Pennsylvania, the researcher produced a comprehensive Index of School Sports Memorabilia tracking the contents and presentations of each collection. The index reveals that collections donated by individuals with whom archival staff and volunteers maintained personal relationships with were processed with the greatest level of detail, suggesting that personal relationships influence how local historical societies prioritize organizing their school sports memorabilia holdings. The index also serves to make information on sports memorabilia collections more accessible to researchers and visitors as a supplement to extant collections documentation.

‘American Dream, Indian Nightmare’? Rethinking the afterlife of the Green Revolution through pesticides

Author: Soumya Swain

Sponsor: Dr. Andrew B. Liu

On the night of December 3, 1984, a runaway reaction caused a gas leak at a pesticide manufacturing plant in Bhopal, India, killing nearly 3000 people in what is still the worst industrial disaster in history. The plant was owned by the US-based chemical giant, the Union Carbide Company, set up in 1969 to serve the new market for pesticides that the Green Revolution created in India. The Revolution was a project for agrarian self-reliance that used high-yielding varieties of seeds, fertilizers, pesticides, irrigation and credit to increase productivity. The Green Revolution ‘package’ was intentionally fashioned as a ‘parable of seeds’ by its proponents. Making HYV seeds the agents of technoscientific modernity told a success story of American intervention in the

developing world – a story of democratic knowledge exchange and collaboration that saved millions from famine.

The case study of Union Carbide's production of pesticides in India challenges this triumphalism. The Green Revolution created a demand for pesticides in India without a commensurate impact on food yield. This happened because the 'Green Revolution' package established a specific relationship between science and policymaking. This project proposes that with pesticides as the protagonist, the story of the Green Revolution ceases to be about food yield, or even technology transfer, and comes to represent a more complicated, profit-driven exchange of knowledge, that required new negotiations between the state and transnational capital. The period of the 1960s and 1970s did not result in a net increase in food production but, as Union Carbide shows, it did set the stage for the establishment and rapid growth of pesticide production. That raises questions as to whether the Green Revolution also had an impact on industrial production, a question I hope to explore in future work.

Mathematics

Maximizing the Number of q -Colorings in Graphs

Author: Michael Carrion

Sponsor: Dr. Melissa Fuentes

A *graph* consists of *vertices* (points) connected by *edges* (lines) and models relationships in scheduling, optimization, and network design. The *Graph Coloring Problem* seeks to assign labels, or colors, to vertices so that vertices connected by an edge receive different colors, ensuring conflicts are avoided in practical applications such as frequency allocation and task scheduling. A *q -coloring* is a valid assignment of at most $q \geq 1$ colors to the vertices of a graph. The *chromatic polynomial* of a graph G , denoted by $PG(q)$, counts the number of such valid q -colorings, offering insight into graph structure and combinatorial properties.

This research investigates which graphs maximize $PG(q)$ when G has a fixed number of vertices and edges. We examine a conjecture stating that among all graphs with the same number of vertices and edges as the *Tur'an graph*, the Tur'an graph is the only graph that attains the maximum number of colorings. The Tur'an graph is fundamental in extremal graph theory, as it maximizes edge density while avoiding complete subgraphs, making it crucial in combinatorial optimization. Establishing this result deepens our understanding of the running time of the Backtrack Algorithm for the GCP.

Philosophy

The Logic of Paradox

Author: Colin Bodayle

Sponsor: Dr. Gabriel Rockhill

Is it possible for something to be both true and false? We might think that it could be true at one time and false at another, or true in one way and false in another, but is it possible for something to be both true and false at the same time and in the same respect? Most philosophers have endorsed the principle of noncontradiction, the idea that something can't be both true and false at the same time and in the same respect, yet I would like to talk about how there might be exceptions to this rule by looking at topic of classical self-reference paradoxes.

Archaeology against Anthropology: Foucault against German philosophical modernity

Author: Shawn Gary Francis Huberdeau

Sponsor: Dr. James Wetzel

I reconstruct the development spanning Foucault's early-to-archaeological period in order to show: (1) how Foucault emancipated himself from phenomenology; (2) why he disavowed its influence methodologically. The Italian scholar Elisabetta Basso has demonstrated one aspect of this movement from the side of Foucault's training in psychology prior to his academic philosophical career. Basso, who has led the charge on this renaissance in Foucault scholarship through her writing on and translations of key early manuscripts, shows that Foucault's concept of *historical a priori* owes less to Husserl's use of the term in *The Origins of Geometry* and more to the German psychiatrist Ludwig Binswanger's project of existential psychology. French scholar Philippe Sabot has also shown how this problem captured by the term *historical a priori*, that of how accidental contingency assumes the force of necessity in determining a course of events, similarly vexed Sigmund Freud in his early elaborations of psychoanalysis. Foucault attempted to

level an ontological criticism of psychology, with Heidegger, through a phenomenological formulation of transcendental critique, with Husserl. But these accounts dovetailed in a philosophical anthropology which circumscribed on each side the very limits that drove Foucault to turn to philosophy. Psychology and phenomenology shackled history to the human.

Foucault first formulated the anthropological theme as a demand placed upon philosophical thought to elucidate humanity's meaning; the archaeological analysis on offer in Foucault's middle text, *The Order of Things*, was designed to solve for this matrix of the human constitutive of modern thought. Archaeology achieves this through a radicalization *cum* transformation of the phenomenological reduction into a method of archaeological suspension by means of reading the German idealist and post-Kantian traditions against one another. Foucault conceded that the problems of phenomenology are his own, those of genesis and subject-object constitution. His question was how better to approach them.

Aporetic Anthropology: Dialectical Humanism in Kant and Adorno

Author: Blake Perry

Sponsor: Dr. Julie Klein

My research investigates the question of the human being at the intersection of German philosophy, ethics, and critical social thought. I focus on the limits and possibilities of reason, the critique of identity-thinking, and the ways philosophy can illuminate questions of human freedom and education. My dissertation, *Aporetic Anthropology: Dialectical Humanism in Kant and Adorno*, develops what I call an "aporetic anthropology": an account of the human being as both constituted by reason and resistant to a totalizing grasp. By placing Kant's critical philosophy into dialogue with Adorno's negative dialectics, I argue that we can preserve the emancipatory promise of Enlightenment while resisting its pathologies.

Psychology

Investigating the Association between Postpartum Depression and the Mother-Infant Relationship

Author: Nicole Amoachi

Sponsor: Dr. Rebecca Brand

In 2023, an estimated 24.7% of mothers worldwide struggled from perinatal depression [1]. Previous literature demonstrated that postnatal depression is pervasive and can negatively influence mother-baby relationships [2]. One possible connection between maternal depression and worse mother-baby bonding could be that postnatal depression negatively affects mothers' perceptions of their baby and shared bond. This project was the first to investigate the relationship between mothers' (n=78) postpartum depression as measured by the Edinburgh Postnatal Depression Scale (EPDS, completed 1 month postpartum) and mother-baby bonding as measured by the Five-Minute Speech Sample (FMSS, completed on average 3.5 months postpartum). The FMSS asks mothers to reflect upon their baby's personality and shared relationship. Each FMSS recording was coded by a lab member who did not administer the measure and then by a second lab member to prevent bias and assess interrater reliability. The results showed a strong positive bivariate correlation between EPDS score and FMSS negativity as well as overall FMSS composite score ($R(77) = 0.425, p < 0.001$; $R(77) = -0.292, p = 0.009$). The worse a mother's depression, the more negatively she reported her baby's personality and their relationship. These patterns maintained, including mothers who completed the FMSS 10 months after the EPDS. Finally, a partial correlation indicated that the relationship between depression 1 month postpartum and FMSS score approximately 3 months postpartum remained significant controlling for depression measured approximately 3-10 months postpartum ($R(76) = 0.361, p = 0.001$). This suggests that postpartum depression may cause mothers to negatively perceive their baby and their relationship rather than merely report more negatively due to their mood or outlook in the moment while completing the measure. I look forward to continuing this

work in my master's thesis, which will explore parenting stress in addition to depression and bonding.

References

- [1] Roddy Mitchell, A., Gordon, H., Atkinson, J., Lindquist, A., Walker, S. P., Middleton, A., Tong, S., & Hastie, R. (2023). Prevalence of Perinatal Anxiety and Related Disorders in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis. *JAMA network open*, 6(11). <https://doi.org/10.1001/jamanetworkopen.2023.43711>.
- [2] Frankel, L. A., Sampige, R., Pfeffer, K., & Zopatti, K. L. (2024). Depression During the Postpartum Period and Impacts on Parent-Child Relationships: A Narrative Review. *The Journal of genetic psychology*, 185(2), 146–154. <https://doi.org/10.1080/00221325.2023.2276264>.

That's Just My Opinion: Political Identity Threat in Virtual and In-Person Environments

Author: Nicholas Ashenfelter

Sponsor: Dr. Caitlyn Yantis

Animosity between political parties in the U.S. has increased over time. The current study tested whether an imagined interpersonal interaction with someone expressing an opposing political ideology elicits political identity threat: anticipation of negative treatment based on one's own political beliefs. This study also examined the possibility that political identity threat may be heightened in virtual as opposed to in-person environments.

We randomly assigned 356 American adults to imagine interacting with a coworker after hearing a negative political or apolitical comment from them that was communicated either in-person or online. The coworker's negative political comment (pilot tested) voiced either opposition (for liberal participants) or praise (for conservative participants) for gender neutral bathrooms at their workplace, whereas the apolitical comment expressed displeasure at a man taking off work to be with his newborn. Next, participants reported anticipated political identity threat, including categorization (i.e., being reduced to a single dimension), distinctiveness (i.e., lack of uniqueness), and general identity threat, as well as potential coping strategies for the interaction, including avoidance.

In partial support of pre-registered hypotheses, participants anticipated greater general and categorization threat when exposed to a political (vs. apolitical) comment. However, the effect of comment type on categorization threat was only significant among those who did not identify as moderate in their beliefs. Unexpectedly, participants reported greater distinctiveness threat when exposed to an apolitical (vs. political) comment. There was no main effect of setting, but there was a significant interaction between comment and setting predicting coping through avoidance. Although past research on social identity threat has examined this experience in terms of gender or racial identity, the present work finds that political identity may be rendered salient through negatively valenced, politically salient interpersonal interactions. The present work does not support setting as a moderator of these relationships with political identity threat.

Understanding Student Internship Experiences: Work-Nonwork Boundaries

Author: Madison Battinelli

Sponsor: Dr. Heather Cluley

Hybrid work impacts employees' work-nonwork boundaries and their experience of work-life balance. Work modality is a significant component of an employee's experience within their organizations. However, little attention has been paid to early career individuals, such as those engaging in hybrid internships. Setting proper work-nonwork boundaries is crucial to avoid burnout and overwork. A 3 time-point survey study was conducted, exploring the relationship between hybrid work environments and student interns' boundary permeations and subjective well-being. A small infographic intervention targeting work-life balance was also included. Student interns did not significantly differ in their subjective well-being and boundary permeations based on work modality (hybrid vs. office-based). However, student interns who saw an infographic related to strengthening work-nonwork boundaries had significantly lower endorsements of overwork at time 3 than those who did not view the infographic. Organizations may provide this population tailored, early career support that will guide their development as professionals. Findings from this study address the gap in the literature by accounting for early

career individuals' experience of work-life balance while navigating the ever-growing hybridization of work environments.

Exploring Material Use in Ants

Author: Anna Bilotta

Sponsor: Dr. Suzanne Gray

This summer was spent evaluating how the ant species *Aphaenogaster rudis* interacts with materials while foraging. This research was inspired by previous studies published on a species in the same genus of ants (e.g., Maák et al., 2017). Extensive research went into establishing husbandry guidelines for food, humidity, temperature, foraging environment, and nest setup. A variety of food sources were given to the ants, including sucrose and protein.

After the ants were well established, they were introduced to naturally occurring and ecologically relevant materials to evaluate how they interacted with these items. Leaves, moss, pebbles, pine needles, soil, and twigs were placed in the foraging environment. All materials were presented simultaneously, with 10 pieces of each in one of six apparatus locations. Across six trials, all materials were presented in each of the six possible locations. Interactions with the materials were measured by the ants moving the materials from the starting location, as well as where the tools ended up. Start and end photos were taken to record material interaction. Proportion analysis was conducted to determine how the ants interacted with the materials.

The ants interacted the most with leaves, moss, pebbles, and pine needles ($M=.71$, $SD=.02$) and less with soil and twigs ($M=.38$, $SD=.01$). When the ants interacted with a material, they most often left it in the sucrose solution ($M=.73$, $SD=.08$). The ants interacted with the material that was positioned closest to the sucrose solution ($M=.77$, $SD=.26$) more than with the materials in other locations ($M=0.56$, $SD=0.078$).

The results of this project inform the direction of my thesis. Ecologically relevant and novel problems are being developed based on the data collected about *A. rudis*' interactions with materials while foraging. This line of research will expand the field's understanding of problem-solving and tool-use capabilities of *A. rudis*.

Continuity versus Categoricity in Tactile Perception

Author: Danielle Buckley

Sponsor: Dr. Joseph Toscano

Although tactile perception is crucial to human experience, it is underexplored. One concept that has been studied in perception broadly is categorical perception, which states perception is based on categorical distinctions rather than continuous ones. Early work across all fields of perception supported the categorical model, but more recent work favors continuous perception. Tactile perception has not yet been thoroughly examined for this distinction. Particularly, previous work has not used tasks that distinguish continuous and categorical perception, as it is typically understood in other areas. To assess the tactile categorical perception hypothesis, the current study applied standard discrimination and identification tasks organized on a 9-point continuum along the left ventral hand, wrist, and arm. The study consists of three tasks: (1) a two-alternative forced choice (2AFC) identification task, (2) an ABX discrimination task, and (3) a 4IAX discrimination task. The 2AFC task identified a “category boundary” at the wrist. Accuracy on the ABX and 4IAX tasks was highest at the hand and wrist (~90%) and lowest at the arm (~69%). These results are inconsistent with a categorical model, where accuracy would peak at the category boundary and be reduced on either side, and instead support a continuous model of tactile perception.

Dark Triad Measurements to Safeguard High-Stakes Roles

Author: Abigail Gilbert

Sponsor: Dr John Kurtz

The Dark Triad of personality – machiavellianism, psychopathy, and narcissism – focuses on socially aversive traits such as manipulation, exploitation, and grandiosity. Individuals with these traits may attempt to distort their responses during psychological testing, particularly in high-stakes contexts like employment selection, security clearance evaluations, or fertility screenings.

The present project constructed scales to assess dark triad traits using existing items from the Personality Assessment Inventory (PAI). The PAI is a 344-item inventory of personality and psychopathology that is commonly used in a variety of clinical assessment contexts. The Short Dark Triad (SDT) is the standard measure in research on machiavellianism, psychopathy, and narcissism, producing 9-item scales to assess each trait. A sample of adults were recruited using Prolific crowdsourcing platform, and administered items from the PAI and SDT. The final sample (N = 207) was 49.76% Male, 50.24% Female, with a mean age of 49.82.

The three SDT scales were correlated with selected items from the PAI to find PAI items that showed quality convergent and discriminant validity. Items with significant correlations ($p < 0.001$), effect sizes above $r = .30$, and correlations at least .01 higher than the other two SDT scales were retained as candidate items. This selection process revealed 20 PAI items indicating narcissism, 12 items indicating machiavellianism, and 16 items indicating psychopathy. The newly constructed scales showed strong internal consistency with coefficients $\alpha = .90$, $.83$, and $.87$ with PAI_Narcissism, PAI_Machiavellianism, and PAI_Psychopathy, respectively. These new PAI scales were correlated with the three SDT scales. PAI Narcissism showed modest convergent validity with SDT Narcissism. PAI Machiavellianism and PAI Psychopathy showed strong convergent validity with the SDT Machiavellianism and SDT Psychopathy, but they also showed problems with discriminant validity. The results of this study provide useful pilot data for further investigation of dark triad traits and PAI assessment.

Acoustic cue integration over prolonged timescales

Author: Amy Kennedy

Sponsor: Dr. Joseph Toscano

Speech perception depends on integration of multiple acoustic cues that unfold over time, and fine-grained details about these cues are crucial for speech sound categorization. Classic work in speech perception argued that these acoustic details are lost after sounds are sorted into phoneme categories. However, recent research shows that this information may be maintained over longer timescales spanning multiple words. Determining the extent and nature of maintenance is necessary for developing models that accurately represent information at each stage of speech processing. The current study investigates cue integration over prolonged timescales based on approaches used in visual perception that demonstrate maintenance for multiple cues. On each trial, listeners heard 1-5 instances of a word from a minimal pair, separated by gaps that were approximately 1-8 seconds long. Samples varied in voice onset time and were drawn from a distribution spanning the English /b/ and /p/ categories. After listening to each set of samples, listeners made a two-alternative forced choice response between the voiced and voiceless word pairs. Accuracy improved as more samples were presented ($p < 0.001$) but was not affected by gap length ($p > 0.05$), suggesting that listeners used and maintained information about the cues over both short and long timescales.

Parenting Stress and Child Self-Regulation

Author: Alexandra Stefanovici

Sponsor: Dr. Janette Herbers

Children's capacity for self-regulation develops rapidly in the first five years of life. Self-regulation is characterized by the flexible management of emotions, cognitions, and behaviors when responding to environmental demands. The development of self-regulation occurs in the context of the parent-child relationship, where supportive parenting behaviors foster healthy regulatory development and unsupportive parenting behaviors undermine it. Early self-regulation has been linked to positive outcomes such as school readiness and social competence and is

negatively associated with child behavior problems. The challenges of homelessness can undermine a parent's ability to respond appropriately and sensitively to their children, potentially affecting their healthy development of self-regulation abilities. Despite significant social stressors, prior studies have found that many parents experiencing homelessness demonstrate positive parenting, mitigating the harmful impacts of adversity. Child self-regulation, along with the quality of parent-child relationships, are key contributors to resilience among children experiencing family homelessness. However, stress associated with the caregiving role can diminish supporting parenting behaviors, limiting opportunities for children to develop appropriate self-regulatory abilities. The current study investigated the relationship between parenting stress and self-regulation skills of children aged 3-5 experiencing family homelessness, using a sample of 26 children. Both parenting stress and child self-regulation were assessed through parent-report questionnaires. Results indicated that parenting stress predicted child self-regulation abilities, even when controlling for child age and gender. Elevated parenting stress may limit parents' capacity to provide warmth and support, undermining children's self-regulation, while children's difficulties with self-regulation may in turn heighten parental stress. My thesis will expand this work by examining a broader range of parenting behaviors, including warmth and discipline practices, alongside direct behavioral assessments of children, providing a more comprehensive understanding of how parenting influences early self-regulation and informing strategies to support positive parenting and promote children's regulatory development.

Theatre

Reconciling Familial Love, Loss, and Secrets

Author: Sarah Wright

Sponsor: Dr. Valerie Joyce

My research attempted to reconstruct the life of my uncle, Roger Wright, a young gay man who died of AIDS at the age of 31 in 1987. He was an accomplished pianist, an actor, an ethnomusicologist, and a playwright. Literary analysis of Roger's extant plays, essays, and short stories, reveal an obsession with loneliness and isolation, and center characters who either live alone or face exile. This recurring motif reflects the life that Roger lived. According to living relatives, Roger never officially told anyone he was gay. However, Roger kept letters he received from friends while living in Paris from March 1978 - June 1980. They reveal that Roger's inner circle knew he was gay and that he was pursuing relationships with men. While in Paris, Roger had an affair with a French man, and a married man in Germany. His male friends recount their own attempts at finding love in the gay scenes of San Francisco, Sacramento, and Los Angeles. The letters and writings create a portrait of a young man who knew what it meant to live in the shadows, to conceal the deepest part of himself, who found a way to express this through the characters he created. This research, along with stories pulled from my own life, will become the foundational content for my capstone project, a solo performance to be presented during spring semester. I will use the research to interrogate myself and my family in an attempt to find answers and perhaps generational healing. What happened when Roger's secret homosexuality collided with being diagnosed with a very visible disease? How can I reconcile being raised in a dogmatic practice that preached against homosexuality after learning I had gay family members?

Theology

A Study in Embodied Historiography of a Late Thirteenth Century Female Monastic Community

Author: Jessie Pagan

Sponsor: Dr. Rachel Smith

The importance of the physical site of Helfta is attested to through the historical narrative and literary evidence of one of the major communities to exist on the land, St. Mary's, a Cistercian female community. Historical accounts of Helfta demonstrate a commitment to residing and returning to the place itself. Historical theologians who study one of the most famous residents of the community—St. Gertrude the Great—comment upon how her book *Herald of Loving Kindness* relies on a series of images bound to the physical spaces of the monastery to create a spiritual curriculum which unites the physical space, the book, and the worship of the community as one way of being. Moreover, the community of St. Mary's upon its reconstitution in 1999, sought to re-establish physical spaces of the first St. Mary's, spanning from the Church to the very garden, where meditation on universal images, shared between the medieval culture of thirteenth century Helfta and the twenty-first, could reanimate both the physical and literary worlds of the women of Helfta.

Sphere of Sovereignty and Common Grace: Moral Construction in Abraham Kuyper's Theological Thoughts

Author: Perdian Tumanan

Sponsor: Dr. Stefanie Knauss

This project examines the theo-political vision of Abraham Kuyper (1837–1920), a Dutch theologian, journalist, and Prime Minister whose influence continues to shape evangelical thought in the United States and beyond. Kuyper advanced two central ideas: **sphere sovereignty**, the conviction that social institutions such as family, education, politics, and religion each have their own God-given authority; and **common grace**, the belief that God's care extends to all people and cultures, making cooperation across differences possible. These concepts have been widely embraced as resources for Christian engagement in public life. Yet they also reveal limitations. Kuyper's application of these doctrines in the Dutch colonies, particularly Indonesia, shows how they could legitimize paternalistic and hierarchical structures that positioned Europeans as cultural and political overseers. This study highlights both the constructive and problematic dimensions of Kuyper's theology, offering a critical lens for rethinking ethical politics in contexts marked by pluralism, power, and historical injustice.