Macalester College
Senior Honors Projects

2025

May 1, 2025

Macalester College is fortunate to have an abundance of creative, thoughtful and engaged students. The graduating seniors who have completed honors projects have further distinguished themselves through these accomplishments and they deserve our congratulations and gratitude.

This booklet describes the honors projects completed by the Class of 2025. These compelling and original works, completed under the guidance of dedicated faculty sponsors, were judged worthy of honors by an examining committee in accordance with the standards of their fields. A copy of each project will become part of the DeWitt Wallace Library's digital collection, joining those completed by previous honors graduates.

It is with great pride I make these achievements public and wish the Class of 2025 the very best in the years to come.

Katie Kelly
Assistant Dean for Academic Programs and Advising

Honor Projects

Eliza Anderson-Lefort

Rapid Construction of Novel Aromatic Imides by a Diels-Alder Cycloaddition

Organic Field Effect Transistors (OFETs) have proven to be a competitive alternative to the Silicon Thin Film Transistors (TFTs) available on the market today. They can be produced at lower cost, lower energy, and higher throughput than TFTs and additionally show unprecedented physical flexibility, allowing for a variety of applications. However, OFETs lack the same level of intermolecular interactions as TFTs; as such, work is being done to discover high mobility values for the two types of materials needed for OFETs, n-type and p-type. My research in the Cao lab focuses on synthesizing different aromatic imides as potential n-type semiconductors.

Honors Project in Chemistry
Advisor: Dennis Cao
Chemistry Department

Melissa Ballin-Cardona

Monocytes and Macrophages in A Chronic Vulvar Pain Model

Vulvodynia, chronic vulvar pain affecting 8–28% of women, lacks effective treatment. We use a murine model based on links between vulvodynia and chemical exposure. Repeated exposure to methylisothiazolinone (MI), a common preservative, causes short-term inflammation and long-term anogenital sensitivity. Mast cells and fibroblasts likely mediate this altered inflammatory response. In vitro, MI induced apoptosis in these cells, potentially attracting macrophages. We hypothesized MI exposure disrupts M1/M2 macrophage balance, driving chronic inflammation and pain. We assessed monocyte/macrophage presence in blood, tissue, and in-vitro, finding polarization differences in MI-treated bone marrow-derived macrophages.

Honors Project in Biology
Advisor: Elena Tonc
Biology Department

Mathilda Barr

Did the Minnesota Buffer Law Improve Water Quality?

The 2015 Minnesota Buffer Law aims to reduce agricultural nonpoint source pollution by mandating vegetative filtration strips and conservation practices alongside surface waters. I construct a subwatershed-level panel dataset of conservation practices and pollutant loads across Minnesota from 2007 to 2021. Using a difference-in-differences approach with climate, temperature, and upstream controls, I investigate the average impact of an increase in conservation practice intensity on water quality. My results indicate localized effects of BMPs on nitrogen, phosphorous, and total suspended solids.

Honors Project in Economics
Advisor: Gabriel Lade
Economics Department

Nibia Becerra Santillan

The Impact of Large, Manipulated Rainfall Events on Soil Greenhouse Gas Fluxes is Mediated by Warming, Spatial Heterogeneity, and Hurricane Disturbance Recovery in a Puerto Rican Wet Tropical Forest

Tropical forest soils are critical to global carbon cycling, so their responses to compounded climate stressors are key to understanding how these systems could shift from carbon sinks to sources. This project explored how antecedent conditions, specifically soil moisture and temperature, influence the response of soil CO_2 and CH_4 fluxes and nutrient dynamics to extreme rainfall events. I conducted a field rainfall manipulation and a lab incubation in Puerto Rico's Luquillo Experimental Forest. Findings reveal that microbial responses to extreme rainfall depend strongly on prior moisture conditions, with warming exacerbating these effects. These results have implications on how climate-driven disturbances may accelerate tropical soil carbon loss.

Honors Project in Biology
Advisor: Stotra Chakrabarti
Biology Department

Silas Benevento Zahner

The Left Hemisphere's Linguistic Influence on Emotion Perception

Across two experiments, this study investigated how linguistic concepts influence emotion perception in a hemisphere specific manner. This study employed a semantic satiation procedure to manipulate access to emotion words and a divided visual field paradigm to assess hemispheric differences during perception. Results showed that the left hemisphere was selectively impaired by reduced word accessibility during early trials, supporting linguistically relativist theories of emotions and localizing the effect to the language-dominant hemisphere. Intriguingly, this effect reversed in later trials, suggesting that the brain flexibly adapts its facial expression processing strategies over time in response to sustained conceptual disruption.

Honors Project in Psychology
Advisor: Darcy Burgund
Psychology Department

Antara Bhattacharyay

Modeling Literary Connections: Exploring Transregional Resistance in Dalit Poetry

Structuring socio-political identities, the caste system (a graded form of hierarchy) remains entrenched in contemporary Indian society. Dalits, marginalized by the caste system, have expressed their resistance through literature, envisioning substantive equality and social change. In this thesis, I draw on digital humanities methods to examine regional variation in translated Dalit poetry from Bengali, Hindi, Marathi, and Tamil languages. I utilize topic modeling—a machine learning algorithm that detects latent semantic structures in a text—as a point of departure for poetry analysis. I observe how topic modeling enables newer readings of the poems, revealing regionally resonant and broader Dalit themes.

Honors Project in Mathematics, Statistics, and Computer Science
Advisor: Andrew Beveridge and Niharika Yadav
Mathematics, Statistics, and Computer Science Department

Antara Bhattacharyay

Hearing Caste: Dalit Resistance Through Folk Music in West Bengal, India

Caste—a graded structure of hierarchy—has historically shaped identities in South Asia and persists to this day. In opposition, Dalits (caste-marginalized communities) have utilized diverse mediums to communicate their resistance. In this thesis, I analyze the role of music in Bengali Dalit resistance through the work of Dalit singer-songwriter Smritikana Howlader (b. 1960). Based on ethnographic research, I investigate how folk music becomes a mode of Dalit historiography. In particular, I explore how Howlader aims to transcend caste boundaries through song, evoking shared humanity. I argue that Howlader's performances combat dominant caste discourse and Dalit erasure, furthering Bengali Dalit resistance.

Honors Project in Music
Advisor: Chuen-Fung Wong
Music Department

Julia Brandfonbrener

Quantifying DNA Methylation in Response to Drought Stress in Silver Firs

Frequency and severity of droughts are expected to increase under climate change. My study examines epigenetic responses of silver fir trees (Abies alba) under progressive drought stress to understand tolerance mechanisms. I collected data on physiological responses in control and drought-treated seedlings. To establish epigenetic underpinnings, DNA was extracted from needles at mid- and end- drought timepoints and analyzed through a whole-genome methylation assay to determine the percentage of methylation. The assay revealed significant increases in whole-genome methylation in drought seedlings at mid-drought, indicating that epigenetic modification plays a role in drought resistance mechanisms, even under mild drought stress.

Honors Project in Biology
Advisor: Mary Heskel
Biology Department

Ben Bridenbaugh

External Trees for Random Walks

A random walk is a sequence of adjacent vertices that are chosen uniformly at random from the neighbors of the previous vertex. An access time is the average length of time that a random walk takes to reach a target probability distribution from a starting probability distribution, given an optimal stopping rule. This paper deals with characterizing the trees of diameter d and on n vertices that extremize three different types of access times.

Honors Project in Mathematics, Statistics, and Computer Science
Advisor: Andrew Beveridge
Mathematics, Statistics, and Computer Science Department

Sophie Carpenter

Spatio-Temporal Analysis of Human-Carnivore Conflict in the Tarangire-Manyara Ecosystem, Tanzania

Livestock depredation by large carnivores poses significant ecological and socioeconomic challenges globally. Analyzing 406 livestock depredation records from 2004 to 2023 in the Tarangire-Manyara Ecosystem of Tanzania, we identified spatiotemporal patterns of attacks by lions, leopards, and spotted hyenas. Subsequently, using maxent models, we developed depredation hotspots at the interface of eco-geographical variables that we chose based on the ecological understanding of the landscape and the species involved. Our results revealed higher predation likelihood near protected area boundaries, coupled with terrain elevation being a key driver. This study provides a road-map for spatial and strategic prioritization of human-carnivore conflict resolution in this critical biodiverse region.

Honors Project in Environmental Studies
Advisor: Stotra Chakrabarti
Biology Department

Tina Chen

Evaluating the Power of Admixture Mapping

Admixture mapping (AM) is a statistical method to help identify genetic variants that cause diseases in admixed populations (populations with mixed ancestry). This project assesses the power of AM via simulation studies. We used genetic data simulation tools to generate admixed genotypes and binary disease outcomes, varying disease characteristics such as heritability and prevalence. Three AM methods (marginal logistic regression, case-only, and case-control) were evaluated by calculating empirical power under two thresholds (Bonferroni and permutation-based). Results indicate that statistical power improves with increased heritability and disease prevalence across all methods, highlighting the effectiveness of AM for detecting true associations.

Honors Project in Mathematics, Statistics, and Computer Science
Advisor: Kelsey Grinde
Mathematics, Statistics, and Computer Science Department

Rachel Christensen

Examining Species Boundaries and Evolutionary Relationships of New Zealand's Mite Harvesters in the Genus *Rakaia*

Mite harvesters are small arachnids that reside in leaf litter habitats worldwide. Rakaia, the genus of focus in this study, is endemic to New Zealand and a fascinating system for biogeographic study. In this study, I perform species delimitation analysis using an integrative approach in the hopes of further understanding the species structure within Rakaia. Based on this work, I present descriptions of two new species and validate species boundaries within Rakaia. Additionally, I present results of isolation-by-distance analysis which reveals the impacts of recent geographic range expansion.

Honors Project in Biology
Advisor: Sarah Boyer
Biology Department

Kendall Coney

Death and Inheritance: How Meanings of Money are Drawn from Everyday Life

Probate is a legal process to distribute a deceased person's assets involving a personal representative who administers the estate. I draw on interviews with personal representatives to expose the dissimilar way they understand the meaning of the inheritance. I use an interactional framework that situates earmarking in the fluid context of legality to illustrate that inheritance's social and legal meanings draw from each other to culminate in a dominating social meaning of inheritance as a legitimate and necessary procedure, despite its inconveniences, to accommodate the non-linear nature of complex social relationships and how inheritance money helps to define these relationships.

Honors Project in Sociology
Advisor: Erik Larson
Sociology Department

Bess Connolly

Backlash and the ADA: Conflicting Constructions of Disability in US Policy

The Americans with Disabilities Act (ADA) has faced significant judicial and regulatory backlash, even after the passage of the ADA Amendments Act (ADAAA). Examining the legislative histories and trends in ADA litigation, I argue that this backlash arises from conflicts between the medical and social models of disability embedded in both laws. Compromises made during both legislative processes resulted in a law that accommodates multiple conceptions of disability, allowing courts to reshape the law according to their own views. Ultimately, the ADA remains a site of contestation as its internal contradictions have gone unresolved.

Honors Project in Political Science
Advisor: Patrick Schmidt
Political Science Department

Leonardo Corral

Care to Work? How Latinx Students Care to Pursue the Collectivist Immigrant Bargain

This study asks, “how do Latinx college students pursue the collectivist immigrant bargain amid the ongoing crisis of care?” Drawing on twelve interviews with students socialized as women, the essay shows how care expectations within immigrant families shape students’ academic strategies and obligations. It conceptualizes care as both exploitative and liberatory, revealing how students balance personal sacrifices and collective commitments. The findings underscore how the care crisis redefines feminized students’ navigation of college, forcing them to compromise in strategic ways while pursuing the collectivist immigrant bargain."

Honors Project in Sociology
Advisor: Erika Busse-Cárdenas
Sociology Department

Elizabeth Curiskis

Generational Remigration of the Latvian Diaspora: Tracing the Confluence of Cultural Identity and Economic Opportunity

Latvia’s population is declining at one of the fastest rates in Europe, prompting the government to introduce policies engaging with the country’s global diaspora with the hope that some will remigrate. Through surveys and interviews, this paper explores the extent to which these initiatives acknowledge generational differences in remigrants’ motivations to return to their ancestral homeland, and whether they are successful in easing the transition to life in Latvia. Findings suggest that remigrants display strong links to their heritage and have a desire to strengthen these connections in the future by residing in Latvia, regardless of government program efficacy.

Honors Project in Geography
Advisor: Holly Barcus
Geography Department

Faye Dingle

Industrial Parks and Domestic Power: An Analysis of Work, Industrialization, and Intimate Partner Violence in Nigeria

This paper examines the effect of industrial zone openings on women's employment, relative earnings, and intimate partner violence (IPV) in Nigeria. I exploit variation in the timing of industrial zone openings to use a staggered difference-in-difference model. I compare women near industrial zones to women near not-yet-built industrial zones and capture the effect of the average treatment effect on the treated. I perform this analysis for women within 10, 15, 20, and 25 kilometers of an industrial zone. I find that women within all distances of industrial zones experience higher earnings compared to their partner compared to women in non-industrialized areas. Women within 20 and 25 km of industrial zones also experienced significantly less emotional violence and more sexual violence than those in non-industrialized areas. The percentage of women who experienced any form of violence was also lower for those in industrial areas. However, the possible presence of pre-trends threatens the validity of these results.

Honors Project in Economics
Advisor: Amy Damon
Economics Department

Petar Elenkov

The Effects of Depleted Peripheral Macrophages on Alcohol Addiction Reward-Seeking Behaviors in Mice

Alcohol addiction negatively impacts mental and physical health worldwide, yet specific functions of the immune system contributing to addiction remain mostly unexplored. We hypothesize that suppressing innate immune components increases addiction vulnerability. Liposomal Clodronate (LC) was administered to the mice, depleting macrophage function and modifying inflammatory responses. Behavioral analysis was completed using the correlative relationship between behavioral paradigms Drinking in the Dark (DID) and Ethanol Conditioned Place Preference (eCPP). Molecular analysis examined neuronal activation using cFos and analyzed blood cytokine levels. These results aim to clarify the effects of inflammation and immune modulation on alcohol related behaviors and context associations.

Honors Project in Neuroscience
Advisor: Phillip Rivera
Biology Department

Gavin Engelstad

Gaps in Knowledge: Topological Insights into the Structure of Science

Understanding scientific development is essential to ascertaining the mechanisms leading us into the future. Building this understanding requires both methodological developments and empirical research. This thesis contributes in both aspects using a topological approach to examine scientific knowledge. The first section presents a new algorithm to find optimal cycle representatives for homological features in complex networks, a context for which we demonstrate existing algorithms can be inadequate. The second section applies a number of topological methods, including our cycle optimization algorithm, to data on individual scientific fields, demonstrating the value of topological approaches and highlighting new insights about how science evolves.

Honors Project in Mathematics, Statistics, and Computer Science
Advisor: Lori Ziegelmeier
Mathematics, Statistics, and Computer Science Department

Gavin Englestad

Cross-Sectional Household Heterogeneity in the Business Cycle

Research into the effects of business cycles often focuses on aggregate macroeconomic consequences. This paper explores the heterogeneous effects of business cycles on households at different wealth and income levels. I perform a Bayesian estimation on a HANK model to identify business cycle forces. Then, I decompose the business cycle shocks and transmission channels driving changes in household decision rules using variance and historical decompositions. I find the factors causing changes in consumption decisions vary substantially across the income distribution and the factors causing changes in savings decisions vary substantially across the wealth distribution. In addition, I find fiscal determinants, including transfers, spending, and taxes, are most impactful for low income and low wealth households while supply-side and monetary determinants, including markups and the interest rate, are most impactful for high income and high wealth households.

Honors Project in Economics
Advisor: Mario Solis-Garcia
Economics Department

Sophia Esquenet

New U-Pb Detrital Zircon from the Skaggs Springs Schist

The Californian Franciscan Complex represents an accretionary wedge formed during subduction of the Farallon Plate beneath North America, and is marked by an eastward increase in metamorphic grade and depositional age. The Skaggs Springs Schist crops out ~50 km west of rocks of similar age and metamorphic grade, occupying an anomalous position. U-Pb detrital zircon isotopic analyses were conducted using LA-ICPMS. Three samples (878 analyses) reveal a maximum depositional age of 122-125 Ma, ~20-25 Ma younger than previously reported. New data are consistent with interpretations that the Skaggs Springs Schist represents an erosional remnant of a structurally high thrust sheet.

Honors Project in Geology
Advisor: Alan Chapman
Geology Department

Josephine Fernholz

Understanding Franciscan Complex Subduction Zone Recycling via Micro-Sampled Garnet Geochronology from Jenner Beach, California

The Franciscan Subduction Complex preserved in California contains mélanges which include high-grade mafic lithologies, such as those on Jenner Beach. These rocks display evidence of multiple cycles of subduction such as varied garnet mineral inclusions and manganese growth zoning. Garnet cores and rim were separated by microdrill and dated with Lu-Hf geochronology to 158.35±0.46 Ma, with no significant difference in age between garnet core and rim fractions. The garnet core and rim age equivalence strongly suggests that this sample of eclogite likely experienced a single quick episode of subduction instead of multiple cycles of burial and exhumation.

Honors Project in Geology
Advisor: Alan Chapman
Geology Department

Matthew Flowers

Petrology and Geochemistry of Anorthosite Xenoliths from the Proterozoic Midcontinent Rift (Beaver Bay Complex, MN)

Purple and green anorthosite xenoliths occur along the North Shore of Lake Superior. A comparative study was conducted of their mineralogy, texture, and geochemistry to explore color-correlated differences. Samples contain >95% plagioclase and primary Fe-Ti oxides, with secondary minerals indicating hydrothermal alteration. One sample includes trace olivine and pyroxene. Major and trace element abundances are broadly similar among samples. Alteration of primary ilmenite distinguishes the samples: hematite occurs in purple xenoliths, titanite in green. While the link between alteration products and color remains uncertain, differences may reflect variation in pressure, temperature, or fO_2, and merit further investigation.

Honors Project in Geology
Advisor: Emily First
Geology Department

Atticus Friendly

Refracting State Development: Alliances in the Virtual World *EVE Online*

By probing the process of state development in a virtual world (EVE Online), this paper explores state building in the absence of social or physical infrastructure that ties people together, what Michael Mann calls “the social cage.” In doing so, it demonstrates support for the idea that violent competition drives state development. However, it also shows that due to a lack of social caging EVE organizations are far less stable than their real world counterparts. Through a qualitative analysis, this paper shows how virtual worlds might be useful for social science study, and it contributes vocabulary to understand virtual worlds by appropriating Stephanie Mudge's term refraction. It argues refraction is a contingent interpretive process solving problems generated in moments of uncertainty. In all, this paper shows that in the absence of social caging, the users of EVE Online built states to solve the coordination and resource problems of territorial conquest.

Honors Project in Sociology
Advisor: Erik Larson
Sociology Department

Ori Friesen

On the Hölder Continuity of the Brascamp-Lieb Constant

The Brascamp-Lieb inequality is a generalization of many well-known multilinear functional inequalities. The Brascamp-Lieb constant is the best constant that works for the Brascamp-Lieb inequality for a given tuple of input linear maps and powers. If we keep the powers constant while varying the input linear maps, the Brascamp-Lieb constant becomes a function of the linear maps. In this thesis, we explore the Hölder continuity of the Brascamp-Lieb constant. Specifically, we prove that the general 4-linear case of the Brascamp-Lieb inequality is locally Lipschitz continuous. Additionally, we provide an improvement of a previous result on the local Hölder continuity of the Brascamp-Lieb constant.

Honors Project in Mathematics, Statistics, and Computer Science
Advisor: Taryn Flock
Mathematics, Statistics, and Computer Science Department

Baela Funk

Benzo[1,5]diazepin-2-one Derivatives as hP2X4 Receptor Antagonists

The P2X4 receptor (P2X4R), a trimeric ATP-gated cation channel expressed in immune and central nervous system cells and tissues, is an emerging target for neuropathic pain management and cancer detection. Here, several benzodiazepinone-based compounds were synthesized to support a structure-activity relationship (SAR) study built on the initial hit of the screening campaign. However, the SAR study yielded unexpectedly low antagonistic activity. The results of the SAR are discussed and in-silico molecular docking (MD) simulations are used to explore the potential mode of action of the benzodiazepinone-based compounds, which may explain the low antagonistic activities.

Honors Project in Chemistry
Advisor: Dennis Cao
Chemistry Department

Ethan Glass

Towards a Better Computational Model of Phonation

Phonation contrasts have proven difficult for linguists to accurately and adequately categorize cross-linguistically. While particular acoustic features may robustly distinguish one phonation type from another in a given language, no known acoustic features robustly distinguish all phonation types in all known languages with phonemic phonation-type contrasts. This study presents an exploration of possible resolutions to the challenge of classifying phonation types in a cross-linguistically consistent manner. A novel adaptation of the ExSTraCS learning classifier system demonstrates some similarities between Black Miao modal voice and Yi lax voice. This model also demonstrated, surprisingly, that CPP was the most effective predictor of Black Miao and Yi phonation types, but that it loses effectiveness in the presence of low values of H1*. A second experiment utilizes the same model with a balanced dataset generated by the ROSE resampling algorithm. This experiment demonstrates that, while class imbalance does pose a challenge for the construction of models that can accurately classify phonation types, the primary challenge remains cross-linguistic inconsistency in the acoustic measures used to classify phonation. This study concludes by using the results from the previous two experiments to propose a new phonation-type paradigm which is designed to be as cross-linguistically consistent as possible while maintaining within-language phonemic distinctions.

Honors Project in Linguistics
Advisor: Christina Esposito
Linguistics Department

Naomi Glunz-Kennedy

Who Do Children Believe? Exploring Testimonial Injustice Toward Characters with Disabilities

Children develop attitudes about disability from a young age, which may shape how they evaluate others' knowledge and credibility. This study examines testimonial injustice (TI) in children aged 5 - 8, focusing on whether disability status influences epistemic trust. Sixty-four children evaluated claims made by non-disabled and disabled characters in video scenarios. Results revealed that belief patterns differed by disability condition and statement type. Children also anticipated TI from third-party listeners and judged such acts as morally harmful. These findings reveal early-emerging biases in children's epistemic trust and moral evaluations related to disability.

Honors Project in Psychology Department
Advisor: Steve Guglielmo
Psychology Department

Merrick Gormley

Unam Magnam Scutellam de Onichio: The Many Lives of the Tazza Farnese

The Tazza Farnese is a large-scale sardonyx phiale (a shallow bowl) with a diameter of about 22 centimeters. The Tazza has caught the attention of numerous historical figures throughout antiquity, but despite how coveted the object may have been, records of its provenance before the 1400s are dissatisfactory or entirely nonexistent. This project seeks to shape a number of clear, thorough timelines for the object, as a synthesis of the many conflicting scholarly theories for its chronology. Furthermore, it examines the Tazza in the contexts of the cultures it was immersed in and investigates the way it was interpreted by its proprietors.

Honors Project in Classical Mediterranean and Middle East
Advisor: Beth Severy-Hoven and Andy Overman
Classical Mediterranean and Middle East Department

Ram Guruprasad

The Effect of Acute Ischemic Stroke on Olfactory Bulb Extracellular Matrix and Olfactory Memory Dysfunction

Stroke, a leading cause of death globally, can impair olfactory memory through damage to olfactory brain regions, such as the olfactory bulb (OB). Perineuronal nets, extracellular matrix (ECM) structures that enwrap neurons, are known to maintain memory post-stroke. This study examined the effects of stroke on OB ECM and olfactory memory (OM). Results indicated that an increase in the size of the stroke resulted in greater OM impairment, and that increased ECM disruption correlated with greater OM impairment. These results suggest that ECM integrity in the OB may protect against stroke-related memory dysfunction and represent a potential therapeutic target.

Honors Project in Neuroscience
Advisor: Michelle Tong
Biology Department

James Hernandez

Geographies of Deservingness: The Role of State Contexts in Asylum Court Decision Making

This paper examines how state-level conditions shape asylum adjudication, a process I situate within broader racial and economic hierarchies. Prior work shows judges' demographics shape asylum decisions. Informed by legal realist theories, I argue judges are also influenced by local social, economic, and political contexts. Using judicial data, I analyze spatialized variables' effects on asylum grant odds using logistic regressions and a random forest model. Affluent liberal states are found to have higher odds of relief, indicating that deservingness is defined differently across US societies. By bridging judicial behavior and geographic context, I offer new insights into asylum adjudication disparities.

Honors Project in Sociology
Advisor: Erika Busse-Cárdenas
SociologyDepartment

Riley Hodin

The Law of the Biggest Pump: Legal Consciousness and the Texas Groundwater Dilemma

Texas's localized system of groundwater regulation is complicated by its strong tradition of property rights. This paper examines the legal consciousness of the everyday people subjected to that system. It relies on semi-structured interviews with local water authorities as well as an analysis of public comments made by stakeholders. When conflicts emerge, stakeholders tend to attribute negative outcomes to a failure to properly follow legal procedure, or to the improper intrusion of some non-legal entity. Authorities, however, blame the law itself. Both groups experience the law's presence but struggle to locate its specific source or meaning.

Honors Project in Political Science
Advisor: Patrick Schmidt
Political Science Department

Laszlo Jentes

Capital and Ritual: Unlikely Partners on the Commercial Dancefloor

How do individuals at million-dollar festivals and in basements find connection and care on their respective dancefloors? This research into dance music culture analyzes how commercialization shapes participants' spiritual experiences, and responses to drug usage, violence and perceived erosion of shared values. Current literature focuses on either spiritual or commercial aspects of dance music, but has not combined them. I qualitatively examine a continuum of dance music venues, finding continuity, rather than contradiction. I find that mainstream events center commercial activity, using spectacle to produce spiritual experience, and utilizing formal authority to police events; however, attendees act where institutional authority cannot, using norms of non-violence and responsibilization to dictate what constitutes "authentic" dance music culture. Underground events deemphasize commercial activity, generating spiritual experience by cultivating shared purpose, and use aforementioned norms as foundations for organizing, creating decentralized authority with self-policing attendees.

Honors Project in Sociology
Advisor: Erik Larson
Sociology Department

Huihui Jiang

Writing the Buddha: Interplay of Body, Space, and State in Medieval East Asian Buddhism

Textual objects occupy a central position in East Asian Buddhism. This thesis analyzes scriptural texts, material objects, and historical accounts to argue that written Buddhist sūtras are means through which medieval East Asian Buddhists negotiate the compatibility of Buddhism and their cultural and political landscapes. In addition, it argues that the materiality of written sūtras responds to Buddhological developments on Buddha bodies and expresses interpretations on scriptural prescriptions, which in turn productively shape popular receptions of certain scriptural texts

Honors Project in Religious Studies
Advisor: Susanna Drake
Religious Studies Department

Olivia Johnson

Genocide Under the Gavel: The International Court of Justice and the Evolution of the Genocide Convention

The Convention on the Prevention and Punishment of the Crime of Genocide is a vital tool for addressing genocide. As mechanisms of global governance fail to stop atrocity, the International Court of Justice has become a legal and political arena for the enforcement of the Genocide Convention. This study asks the question how the use of the Genocide Convention at the International Court of Justice changed over time? In the four cases that come before the Court, this paper identifies four key developments: a shift toward viewing genocide as a continuum; South Africa vs. Israel strengthened the Court's jurisdiction; increased use and evolving significance of provisional measures; and greater third-party engagement through Articles 62 and 63 of the Statute of the Court. While the Convention and ICJ can be powerful mechanisms of change for shaping how genocide is understood, they often fall short of ensuring accountability.

Honors Project in Political Science
Advisor: Wendy Weber
Political Science Department

Birdie Keller

The Dead Bird Museum and Other Stories

How can speculative elements help to interrogate real world experiences? How can literary techniques (character interiority, relationships, form and framing devices, nonlinearity, and attention to prose) be used to strengthen fantasy writing? What is "weird fiction?" This speculative short story collection explores these questions, with an additional focus on the craft and strategies of revision.

Honors Project in English
Advisor: Emma Törzs
English Department

Rachel Kelly

Neither Here nor There: Passing through Race, Culture, Transnationalism, and Generational Inheritance in Mixed-Race Japanese American Literature

My honors project explores the concept of passing in post-WWII Japanese American mixed-race literature, focusing on Ruth Ozeki's My Year of Meats, Asako Serizawa's Inheritors, and Brian Komei Dempster's Topaz. The first chapter interrogates physical manifestations of mixed-race identity in all three texts, inspecting the ways the experiences of these books' characters, through the shifting understandings of their own mixed-race identities, evoke the discursiveness and instability of social constructions of race. My second chapter considers transnational identity, investigating how movement across the Pacific and within the U.S., impacts self-understandings and explorations of family history. My third chapter analyzes these authors' use of varied literary genres and forms as a reflection of Japanese American mixed-race experiences, while resisting the notion that mixed-race individuals are fractured by their multiple coexistent racial identities.

Honors Project in English
Advisor: Michael Prior
English Department

Evelyn Kent

Who Grows There? Rethinking Forest Types beyond Biomass and Composition in Coastal Ecuador

Tropical dry forests (TDFs) are highly threatened ecosystems, rich in biodiversity but vulnerable to deforestation, and climate change. This study quantifies forest types and aboveground biomass (AGB) in a fragmented TDF landscape in Coastal Ecuador, focusing on two forest reserves and their adjacent areas. Using tree inventories and PlanetScope imagery, we defined forest types based on community composition, and mapped two categorizations with a Random Forest classification. Plot-level ABG was calculated with allometric equations and mapped with a Random Forest regression. This research provides foundational information to delineating forest types and disentangles complex community composition to help conduct conservation initiatives.

Honors Project in Geography
Advisor: Xavier Haro-Carrion
Geography Department

Minseo Kim

Breaking the Barrier: The 2024 NAR Ruling's Implication for Home Prices and Market Quality

On August 17, 2024, a court ruling changed real estate practices by prohibiting the concealment of agent commission rates and requiring buyer-agent contracts. These commissions represent intermediary transaction costs, and the ruling aimed to reduce them. Using a difference-in-differences model and data from Zillow, Realtor.com, and the Ramsey County Property Tax database, I analyze single-family home sales in Saint Paul, Minnesota. I find no short-term effects of the ruling on home prices, liquidity, frictions, or price discovery. Robustness checks using non-single family properties, price-based treatment groups, and neighborhood-level visualizations support the main results.

Honors Project in Economics
Advisor: Liang Ding
Economics Department

Veronica Kruschel

Anxiety Among Sexual Minoritized Subgroups: An Investigation into the Disproportionately High Rates of Social Anxiety Among Emerging Identity Populations

Sexual minoritized individuals report higher rates of social anxiety than the general population, and research suggests that those belonging to emerging sexual identities are particularly vulnerable. The few existing interventions targeting anxiety in sexual minoritized populations ignore subgroup differences, so the present study proposes an adaptation of an existing CBT-based intervention tailored to pansexual individuals. The researcher conducted a survey that found emerging identity populations experience significantly higher social anxiety than established sexual minoritized populations. Quantitative and qualitative results reveal it is essential to study emerging identity populations' experiences of social anxiety and integrate these findings into tailored treatment designs.

Honors Project in Psychology
Advisor: Jaine Strauss
Psychology Department

Kyra Layman

Courage Under Crisis: Examining Altruistic Resistance in Mass Atrocities

Why do individuals resist in different ways during mass atrocities? I theorize that variation in altruistic resistance is shaped by organizational membership, access to platforms, and personal connections to victims. Focusing on bystanders who choose to intervene, I develop a new typology of "Helpers" and construct an original global dataset. Using a mixed-methods approach, I test my hypotheses through regression analysis and triangulate my statistical evidence with individual Helper case studies. This research advances scholarship on resistance by systematically analyzing variation in altruistic behavior, contributing to our understanding of the social and institutional factors that may affect Helpers' actions.

Honors Project in Political Science
Advisor: Lisa Mueller
Political Science Department

Owen Lindstrom

The Effect of School Shootings on Academic Outcomes for Students of Varying Socioeconomic Status

Shootings in schools have risen dramatically over the last two decades and are one of the most pressing issues today. Between 2006 and 2016, Texas high schools suffered from 19 shootings and one fatality on school grounds. This study analyzes the impact of school shootings on educational outcomes for students of different socioeconomic status using public education data from Texas at the high school campus level. I first used matched difference in differences and matched triple difference in differences methods, however, these suffer from biases because of heterogeneous timing of treatment. To adjust for this, I include an event study analysis as the primary empirical method. I find that attendance rates, dropout rates, four year graduation rates, and enrollment are unaffected, but some evidence may show dropout rates increased after a shooting for the first two years. Students of different socioeconomic backgrounds are not differently impacted by school shootings, showing that any effects are widespread across the student body contrary to theory in psychology. Enrollment of economically advantaged students falls after a school shooting compared to economically disadvantaged students, showing potential mobility differences between the two groups. Overall, my findings suggest that little to no effects of school shootings on academic outcomes are detectable at the campus level.

Honors Project in Economics
Advisor: Sarah West
Economics Department

Fuxuan Liu

Engineering Dye-Decolorizing Peroxidase Activity into an Artificial LmrR-hemin Enzyme

Artificial metalloenzymes (ArMs) have gained growing interest due to their tunability and versatility. This study employs the lactococcal multidrug resistance regulator (LmrR) as a scaffold for heme-based catalysis, focusing on its peroxidase-like activity and the impact of distal mutations. Two engineered variants, LmrR_A11H_A92H and LmrR_HEHH, showed enhanced oxidation of ABTS, Reactive Blue 19, and o-aminophenol. UV-Vis and tryptophan fluorescence titrations confirmed 1:1 heme binding, with active variants significantly modifying the heme environment. Distal mutations F54L and N88Q, which improve hydrazone formation, did not enhance peroxidase activity. Collectively, these results indicate the catalytic tunability of LmrR-hemin enzymes.

Honors Project in Chemistry
Advisor: Kathryn Splan
Chemistry Department

Marisa Luft

Preliminary Investigation of Marine Reptile Fossils from the Upper Cretaceous Bearpaw Formation, Montana

In 2024, a partial skeleton of a marine reptile was recovered from exposures of the Late Cretaceous Bearpaw Formation within the Upper Missouri River Breaks National Monument (Montana). The specimen includes vertebrae, ribs, limb elements, and ballast stones. My research focused on the vertebrae, which are diagnostic for marine reptile groups and enabled identification of the specimen as an elasmosaurid member of Plesiosauria. Vertebral morphology indicates that the sample contains cervical, pectoral, dorsal, and caudal elements. The specimen compares favorably with other plesiosaurs from the Bearpaw Formation, including the small-bodied Nakonanectes and the similarly large Albertonectes.

Honors Project in Geology
Advisor: Kristina Curry Rogers
Biology Department

Liam Lynch

Timeless

For my honors project, I will write an urban fantasy novel that seeks to interrogate the ideas of acting in service of the "greater good" and what it means for powerful people to act "morally". The goal of this novel isn't to arrive at a specific conclusion about what is moral, but rather it is to provoke thought and force the reader to confront perspectives on morality that they have never considered before.

Honors Project in English
Advisor: Emma Törzs
English Department

Joe Madell

Improved Computational Modeling of the Kinetics of the Acetonylperoxy Hydroperoxy Reaction

The acetonyl peroxy (CH3C(O)OO) + HO2 reaction has many impacts on the chemical composition of the troposphere, with both a triplet and singlet surface pathway. The radical termination triplet pathway (R1) leads to the production of a hydroperoxide species and O2. This pathway competes with two singlet surface pathways. The first produces OH radical, O2, and acetoxy (R2), the second results in the formation of ozone and acetonol (R3). We utilized MultiWell2021 to solve the master equation for this reaction and RRKM theory to find microcanonical rate constants (k (E)). We used both the ωB97X-D and DLPNO-CCSD(T1) levels of theory to find the energies of all species. By including extensive conformational analysis of the system in our RRKM/ME simulations, we were able to find strong agreement between the predicted rate constant of the singlet surface using DLPNO-CCSD(T1) level of theory (1.31 x 10-12 cm-3 molecule-1 s-1) and experimentally found values (1.65 ± 0.50 x 10-12 cm-3 molecule-1 s-1). Our predicted rate constants for DLPNO-CCSD(T1) for the triplet surface, however, were in poor agreement with experimental results. As were the simulations conducted with the ωB97X-D level of theory

Honors Project in Chemistry
Advisor: Keith Kuwata
Chemistry Department

Clara Schilder Manning

Motivating Pro-Environmental Behavior: The Roles of Emotions, Habits, and Status in Consumer and Lifestyle Choices

Given the urgency of addressing climate change, identifying determinants of pro-environmental action is paramount. Study 1 examined the effects of message frame, commitment level, and behavior type, finding that while self-focused emotions predicted pro-environmental intent, intent was unaffected by message framing. Study 2 investigated the roles of visibility, expense, and behavior type, revealing that expense was positively associated with pro-environmental willingness, but only when visibility was high. Both studies found that lifestyle behaviors were more challenging to motivate than consumer behaviors, but the underlying reasons for this effect remain unclear. Overall, findings underscore the complexities of motivating sustainable behavior.

Honors Project in Psychology
Advisor: Steve Guglielmo
Psychology Department

Gustavo Marchant Allende

Rock-Melt Interactions in Mantle Xenoliths from Two Intraplate Settings (Tariat, Mongolia and Kilbourne Hole, New Mexico)

Interactions between Earth's lithospheric mantle and migrating melts contribute to mantle heterogeneity. Mantle xenoliths from Tariat, Mongolia, and Kilbourne Hole, New Mexico, record distinct melt-rock interactions. Tariat xenoliths (equilibrated at 930–950°C) contain a pyroxenite vein formed by prolonged equilibration with Si-rich melts. Kilbourne Hole xenoliths (1050–1150°C) show evidence of brief basaltic melt interactions. Mineral chemical profiles near melt interfaces exhibit elevated Mg in orthopyroxene (Mg# > 90), Ti depletion in clinopyroxene, and elevated Cr in spinel (Cr# > 23), indicating localized melt depletion. Diffusion modeling and geospeedometry constrain melt-rock interaction timescales, spanning decades at Kilbourne Hole and thousands of years at Tariat.

Honors Project in Geology
Advisor: Emily First
Geology Department

Giovanny Martinez Rodriguez

The Effect of Employment Shocks on Earnings: Evidence from the Covid-19 Pandemic

Peer effect within the context of battery electric vehicle adoptions can provide increased efficiency of incentives but can also contribute to the inequality in electric vehicle adoption. My analysis in the state of Washington shows significant positive peer effects in this space. More specifically, using my two-stage-least-squares approach, an additional BEV in a Census tract yields 0.145 additional BEV in the next year, and peer effects are stronger in richer peer groups. This confirms previous studies in other green goods markets and informs policymakers on the higher cost-efficiency of tax incentives for these vehicles and their unwanted spillovers.

Honors Project in Economics
Advisor: Elizabeth Engle
Economics Department

Claire McDayter-Hunter

An Integrated Study of Olivine Crystal Habits in Piton de Caille Oceanite (La Reunion Hotspot)

The texture and chemistry of olivine crystals from Piton de la Fournaise volcano (La Reunion hotspot) were examined to constrain their magmatic environment. The crystals were photographed in the three dimensions, and their faces mapped individually in Photoshop to calculate their whole surface area, surface area-to-volume ratio, and surface energy. It was found that the crystals usually have {120} and {001} forms, which were rarely reported in previous studies, and that they often have significant differences in surface area between symmetrically-equivalent faces. These new observations and calculations suggest that these olivine crystals grew in close proximity from a strongly undercooled magma.

Honors Project in Geology
Advisor: Ben Welsch
Geology Department

Reece McKee

Seas of Lemongrass: Impacts of Urban Agriculture on Immigrant Food Security in the Twin Cities, Minnesota

In this study, I examined how different forms of urban agriculture (UA) affect food security for immigrants in the Twin Cities, Minnesota. Using a three part survey given to 57 participants, I found that a simplistic definition of food security fails to reveal differences between UA and the control. However, a multidimensional approach shows that UA helps immigrants access crucial micronutrients and can increase agency in the food system. While this agency effect is stronger for community gardens, farm stands can provide a wider variety of vegetables. Overall, this analysis shows significant potential for UA to substantially increase food security with increased land access, season extension, and by providing additional food groups.

Honors Project in Geography
Advisor: William Moseley
Geography Department

Carling McQuinn

A Slight Pinch

This honors project is a short story collection centered around growing into adulthood and discovering what independence truly means. It explores these themes through the genre of magical realism with an emphasis on deeply felt relationships with oneself and others. Each story is fiction, but they all hold personal experiences and emotions at their core.

Honors Project in English
Advisor: Peter Bognanni
English Department

Nicolas Moiseyev

Encountering the Imaginary: Félix Régamey and the Legacy of Japonisme

This thesis critically examines Félix Régamey's transformative role in the development of Japonisme, highlighting his pivotal position in bridging Western perceptions and authentic Japanese culture during the late nineteenth century. Drawing on his firsthand experiences in Japan, Régamey utilized his skills as an artist, educator, and author to reshape the narrative surrounding Japanese art and cultural exchange. He significantly reformed the appreciation of Asian art in France, challenging prevailing Orientalist stereotypes. This study aims to rectify the historical oversight of Régamey's impact, underscoring his essential role in fostering cross-cultural artistic practices.

Honors Project in Art and Art History
Advisor: Joanna Inglot
Art and Art History Department

Keelin Murphy

A Thermal Control SYstem for ATLAS HGTD Module Construction Process

In the aim of simplifying the production process of 2000 HGTD (High Granularity Timing Detector) modules at IJClab for the high luminosity phase of the ATLAS experiment at the CERN Large Hadron Collider, I designed, coded, and constructed an automatic temperature control system for module assembly and testing. To this end, I examined the module's thermal response to changes in air temperature using a climate chamber and to various currents fed through a Peltier device situated under the module. I adapted the Peltier setup into a fully independent control system driven by an Arduino microcontroller running a PID feedback loop.

Honors Project in Physics and Astronomy
Advisor: James Heyman
Physics and Astronomy Department

Minh Nguyen

Peer Effects in Electric Vehicle Adoption: Evidence from the State of Washington

Peer effect within the context of battery electric vehicle adoptions can provide increased efficiency of incentives but can also contribute to the inequality in electric vehicle adoption. My analysis in the state of Washington shows significant positive peer effects in this space. More specifically, using my two-stage-least-squares approach, an additional BEV in a Census tract yields 0.145 additional BEV in the next year, and peer effects are stronger in richer peer groups. This confirms previous studies in other green goods markets and informs policymakers on the higher cost-efficiency of tax incentives for these vehicles and their unwanted spillovers.

Honors Project in Economics
Advisor: Gabe Lade
Economics Department

Renee Nicholson

Quantum Chemical and Statistical Rate Theory Modeling of Isoprene Ozonolysis

Isoprene is the most abundant alkene in the troposphere. It primarily reacts with hydroxyl radicals, nitrate radicals, and ozone. Ozonolysis of isoprene is a major nighttime source of hydroxyl radicals, especially over forests. Hydroxyl radicals act as atmospheric detergents, oxidizing pollutants so they can be removed from the atmosphere through precipitation. This project aims to calculate hydroxyl radical yields from isoprene ozonolysis using energetic calculations and MultiWell simulations with RRKM theory. Key Criegee intermediates include methyl vinyl ketone oxide (MVKO), methacrolein oxide, and formaldehyde oxide. MVKO is predicted to yield the most hydroxyl radical, through favorable hydrogen shifts.

Honors Project in Chemistry
Advisor: Keith Kuwata
Chemistry Department

Katherine Norquist

Crowded Air: Poems

My honors project is a collection of poems which draw from my experiences as a women's basketball player to explore the personal and political resonances of sport, delving into its gendered physicality. The poems document the intimate metamorphoses through which the body passes to reach the edges of its possibilities, and examine the race and gender-based structures which are inextricable from the sporting world. In creating this poetic landscape, I fuse two worlds which I've kept separate in my mind, but continually find their way towards a kind of interweaving — my creative self and my life as an athlete.

Honors Project in English
Advisor: Michael Prior
English Department

Bram Nutt

Household Debt and Growth: A Deep Learning Analysis

The relationship between growth and household debt is nonlinear; research examining household debt and GDP utilizes linear techniques. Using a DeepVAR model, I analyze the relationship between household debt and GDP using quarterly data from 39 countries over 40 years. The Deep VAR outperforms linear alternatives, providing evidence that the relationship between these variables is non-linear. Impulse response functions support Minsky's financial instability hypothesis and highlight the effects of relaxed borrowing conditions. Moreover, I identify a cyclical pattern in household responses to GDP shocks, where households deleverage during periods of economic growth and increase leverage during contractions.

Honors Project in Economics
Advisor: Mario Solis-Garcia
Economics Department

Christine Oduor

The Employment Effects of Non-Pharmaceutical Interventions and Economic Support Policies during the COVID-19 Pandemic in the United States

This paper analyzes the impacts of Non-Pharmaceutical Interventions (NPIs) and Economic Support policies on employment across U.S. states during and after the COVID-19 pandemic. It utilizes a Two-Way Fixed Effects estimator to assess the overall impacts of these policies, along with sector-level analysis over different time snapshots to understand the effects on various employment sectors at different time periods, extending to August 2024. The results show that stricter NPIs negatively affected employment, especially in close-contact industries like leisure and hospitality. Business services employment sectors were the least affected and recovered quicker post-pandemic. Economic support policies partially mitigated these effects, with their interaction playing a crucial role in shaping labor market outcomes. These findings underscore the complex trade-off policymakers faced between safeguarding public health and maintaining economic stability during COVID-19.

Honors Project in Economics
Advisor: Gary Krueger
Economics Department

Chris Olson

Changes in Dialect Usage Across Generations in the Osaka Dialect of Japanese

Sociolinguistic research on Japanese regional dialects has generally found that regional dialects are assimilating to Standard Japanese, but that recently an increase in the popularity of dialects has led to reverse trends of "de-standardization" as well. This paper aims to utilize quantitative and qualitative analysis of a corpus of Osaka dialect interviews in order to observe how usage of the dialect differs across generations. The quantitative results find that some dialect features are falling out of use among younger generations, while others stay consistent, and some features are actually used more by younger speakers than middle-aged generations. The qualitative analysis then examines the ways in which individual speakers of various ages switch between dialect and standard forms strategically in order to add additional meanings to their speech, demonstrating the complex linguistic evolution of the Osaka dialect.

Honors Project in Asian Languages and Cultures
Advisor: Satoko Suzuki
Asian Languages and Cultures Department

Talia Ostacher

A Vanguard of All Progressive Humanity: Youth Culture, Mobilization, and the New Soviet (Young) Person in the Post-Stalin USSR

Amongst the many changes which shook the Soviet Union in the aftermath of the death of Josef Stalin in 1953, one of the least researched is the changing role of youth. The post-Stalin era saw a mass reappraisal of youth, who were increasingly positioned as central to the creation of a communist society in the Soviet imaginary. In this Honors Project, I analyze Soviet youth culture in the post-Stalin period, examining the varying strategies employed by the Soviet state to stimulate youth participation and create the New Soviet (Young) person in an era where coercion and force had been discarded in favor of individual initiative and grassroots participation.

Honors Project in History
Advisor: Ernesto Capello and Maria Fedorova
History Department

Jerry Park Piao

(Un)Imagined Nationalisms: Space, Class, and Capital in the Joseonjok Ethnicity

The Joseonjok are ethnic Koreans with Chinese citizenship who have lived in China for generations. This thesis traces their historical formation, examines their negotiation of identity under exclusionary material conditions and ideological systems, and explores the potential for them to navigate irreconcilable tensions through historical analysis, power analysis, and translation. To do so, the thesis centralizes power, nation, and capitalism as key concepts, scrutinizing their roles in the Joseonjok's struggles and resistance across three contexts: pre-communist China, the People's Republic of China, and South Korea. Finally, it proposes cosmopolitanism as a potential resolution to the community's ongoing challenges.

Honors Project in International Studies
Advisor: Ahmed Samatar
International Studies Department

Alexandra Parr

Vesicle Analysis of the 1973 Eldfell (Iceland) Tephra: Comparison of the Opening Fissure and Late-Stage Cone

Long manifested as a fissure swarm, Iceland's Vestmannaeyjar volcanic system is slowly evolving into a central volcano. This study quantified tephra density, vesicularity, and vesicle volume distribution (via 2D image analysis) from the most recent Vestmannaeyjar eruption (Eldfell, 1973) to assess both pre- and syn-eruptive magma dynamics. Tephra from the late-stage cinder cone is dominated by bubble coalescence textures, consistent with the observed shift to a Strombolian eruptive style later in the Eldfell eruption. Tephra from the opening fissure preserves evidence of bubble ripening, which requires long term magma residence at shallow depths, a characteristic of central volcanoes.

Honors Project in Geology
Advisor: Emily First
Geology Department

William Marie Pierce

How Ballot Measure Wording Affects Preference-Consistent Voting: Experimental Evidence from the United States

Why do some people vote for ballot measures that are inconsistent with their policy preference while others do not? It is important to explore this question in order to understand how well direct democracy translates the will of the people into policy outcomes. Drawing on electoral theories and cognitive science, I hypothesize that people are more likely to vote against their policy preferences when the language of a ballot measure is more complex. I test this hypothesis, along with causal mechanisms and heterogeneous treatment effects, using a survey experiment on a quasi-representative sample of voters in the United States.

Honors Project in Political Science
Advisor: Lisa Mueller
Political Science Department

Ari Pincus-Kazmar

Transformations of Bound Quivers

A quiver Q is a directed multigraph. Representations of Q are assignments of vector spaces and linear maps to the vertices and arrows of Q; these are categorically equivalent to the modules over the path algebra kQ. The indecomposable representations of a given quiver and the irreducible morphisms between them are summarized combinatorially in the Auslander-Reiten quiver which, in the case of algebras of finite representation type, gives almost complete information about the category of representations. We introduce an intuitive transformation from a family of bound quivers to a family of A-type quivers which preserves properties of the Auslander-Reiten quiver.

Honors Project in Mathematics, Statistics, and Computer Science
Advisor: Yariana Diaz
Mathematics, Statistics, and Computer Department

Natalie Pollock

Good Grief: Loving the Dead

Can we have a relationship with the deceased? Can we love them? In this thesis, I examine the ontology and relationality of departed beings. I argue in favor of a realist view of the dead, specifically positing that it is possible to continue both loving and relating to the dead because the personal identity of the survivor enables a relational conception of the deceased and facilitates their continued existence. I refer to this view as the relational theory of identity, asserting that the dead remain real and therefore relationally viable because of the identity-constituting nature of our relationships.

Honors Project in Philosophy D
Advisor: Geoffrey Gorham
Philosophy Department

Anna Rakowski

Immune Biomarkers Associated with Ethanol Consumption in Monkeys and Mice

EtOH exposure establishes addiction-like behaviors across multiple species, but it is unknown what specific immune signaling pathways are involved in EtOH susceptibility. As both mice and non-human primates (NHP) experience similar addiction-like behaviors, similar indicators of previous EtOH exposure are expected. Both mice and NHP completed behavioral paradigms exposing them to EtOH, and nail and plasma samples were collected. Total protein was extracted from nail samples, and cytokine concentration in grouped tissue samples was measured via membrane-bound ELISA. Significant differences were identified across all groups based on EtOH consumption, highlighting connections between the immune system and reward learning.

Honors Project in Biology
Advisor: Phillip Rivera
Biology Department

Aidan Reynolds

Frontier Healthscapes: Competing Narratives of Disease, Environment, and Wellbeing in Early Minnesota

Across settler societies, health narratives were shaped by evolving tensions between lay and expert knowledge, frameworks of disease causation, and perceptions of the environment as both a source of health and a threat. In the decades following Euro-American settlement (1850-1900), Minnesota became a focal point for these debates, with its landscape fostering complex and competing narratives on health, wellbeing, and disease. This study explores how public health discourse developed in Minnesota through the perspectives of institutions, economic interests, and the public. These intersecting narratives reveal how societal and environmental forces influenced public health policy and practice, contributing to enduring place-based conceptions of health on the North American frontier.

Honors Project in Geography
Advisor: Eric Carter
Geography Department

Noah Riccardi

Provenance of Clastic Rocks of the Inner Hornsund Trough, Svalbard

To better understand Arctic paleogeographic history, ~1800 detrital zircon grains were dated via U-Pb analysis, from six samples of upper Devonian sedimentary rock in Hornsund, southern Svalbard. The majority of analyzed grains fall between 1.0-2.0 Ga, with peaks at ca. 1.65, 1.45, and 1.15 Ga. These ages are comparable to local Neoproterozoic basement rocks, suggesting the studied formations likely represent reworked locally- and/or regionally-derived material. These results differ from age spectra from basins in north-central Svalbard and more distal potential sources in the Arctic, suggesting non-connectivity with those locales during the Devonian.

Honors Project in Geology
Advisor: Alan Chapman
Geology Department

Cain Rinkowski

Examining Multi-Wavelength Variability and Magnetic Interactions in the Polar ST LMi

Magnetic cataclysmic variable (MCV) stars are interacting binary systems where mass transfer from a donor star onto a white dwarf drives dramatic variability. As rich laboratories for various astrophysical processes, MCVs have been generally well studied but remain underexplored in the radio. We present time-resolved optical and radio observations of MCV ST LMi to investigate its emission mechanisms and geometry. We find strong optical ($\Delta M \approx 1.31 \pm 0.02$) and radio ($\Delta I \approx 238.5 \pm 27$ μJy) variability, which strengthens current theories regarding emission mechanisms in MCVs and puts new constraints on the spatial and temporal structure of the radio-emitting regions.

Honors Project in Physics and Astronomy
Advisor: Anna Williams
Physics and Astronomy Department

Connery Ritter

Vienna in the New Century: From Public Housing Haven to Neoliberalized Mega Projects

While Vienna is often presented as a utopia for social sustainability, the urban developments after the turn of the century have revealed the variegated nature of Neoliberalization. Since the fall of the USSR, Vienna has privatized municipal bodies and engaged with financialized urban development projects. While this Neoliberalized urban governance approach has met with resistance, the resistance ironically has also enabled the city to capitalize on its social-welfarist past. Vienna nowadays brands itself as a sustainable and livable city for corporations, which leads to land assetization and new economic segregation.

Honors Project in Geography
Advisor: I-Chung Catherine Chang
Geography Department

Victor Robles

Elected to Die: The Effect of Municipal Assassinations on Remittance Incomes in Mexico

This paper looks at localized violence in Mexico through both a qualitative and quantitative approach. Looking at some motivating factors behind violence against political institutions at the municipal level in Mexico. In addition, this paper looks at the relationship between assassinations of municipal mayors in Mexico to see if their assassination leads to changes in remittances in those municipalities in the following periods. This paper uses various difference in difference models to come to its conclusion. There is suggestive evidence of a relationship between remittance growth in municipalities in the periods following an assassination of a mayor currently in office.

Honors Project in Latin American Studies
Advisor: Amy Damon
Economics Department

Anna Runquist

Gastronomy in Gaul: Investigating Diet and Social Identity in Nîmes, France (2nd-5th Century CE) through Stable Isotope Analysis

Roman Gaul underwent significant changes under the Roman Empire, influencing individuals' lives and access to food. This research utilizes stable isotopes from human bone samples (n = 25) to explore diet by sex, age, and socioeconomic status at the Guynemer cemetery (2nd – 5th century CE). δ13C values ranged from -20.3 to -18.6‰ and δ15N from 10.0 to 13.7‰. Female (n = 14) mean carbon and nitrogen values ($\overline{x}$ = -19.1‰, $\overline{x}$= 11.2‰) indicate a slight enrichment over males (n=8) ($\overline{x}$ = -19.3‰, $\overline{x}$ = 10.8‰); however, regardless of biological sex, age, and socioeconomic status, individuals consumed an isotopically similar diet.

Honors Project in Anthropology
Advisor: Jane Holmstrom
Anthropology Department

Ashlyn Ryan

Corporate Social Responsibility: Are there Financial Incentives?

In the early 2000s, consumer trends increasingly influenced corporations to engage in Corporate Social Responsibility (CSR). More recently, however, this trend has shown signs of reversing, which is puzzling, given that engagement in CSR may lead to enhanced company financial performance through channels of competitive advantage or risk reduction. Using event study methods, I analyze how investors respond to signals in the form of third-party recognitions for companies' CSR activities. Third-party recognitions, may provide new information, altering investor behaviors and decision making. I find no statistically significant relationship between the announcement of these recognitions and either abnormal stock returns or changes in log stock prices.

Honors Project in Economics
Advisor: Mario Solis-Garcia
Economics Department

Lila Schisgal

Galactic Building Blocks: Disturbed HI and Hierarchical Assembly in DDO 68 and NGC 5238

Using new HI spectral line imaging from the Very Large Array, I examine low-mass galaxies NGC 5238 and DDO 68. These are two unique dwarf galaxies with disturbed stellar morphology suggestive of a history of interaction events. I present an in-depth analysis of their HI kinematics, comparing gaseous and stellar structures, as well as a synthesis of the results of simulations constrained with these new HI data. I find that both galaxies have a highly disturbed gaseous structure that can be well explained through a history of mergers, making NGC 5238 and DDO 68 flagship examples of hierarchical assembly on the smallest of scales.

Honors Project in Physics and Astronomy
Advisor: John Cannon
Physics and Astronomy Department

Adam Schroeder

Stability Analysis of Turbulent Fluid Flow

Hydrodynamic stability refers to the study of when and how laminar flows transition to turbulence. This includes the mechanisms of transition, as well as the classification of known flow configurations as either stable or unstable. In this thesis, we introduce the mathematical theory behind fluid dynamics and dynamical systems. We apply these concepts to the stability analysis of flat plate flow via numerical simulations in OpenFOAM, discussing both theoretical and numerical issues. We conclude by discussing the prospect of using topological data analysis to characterize flow snapshots in real time.

Honors Project in Mathematics, Statistics and Computer Science
Advisor: Will Mitchell
Mathematics, Statistics and Computer Science Department

Camellia Schwartzman

Electropolymerization of Nile Blue and Toluidine Blue dyes for Hydrogen Evolution Reaction Electrocatalysts

This work investigated electropolymerized (EPD) organic conductive polymers poly(Nile Blue), PNB, and poly(Toluidine Blue), PTB, on fluorine tin doped oxide (FTO) glass substrates as electrocatalysts for the hydrogen evolution reaction (HER). We investigated the effect of changing the heteroatoms in the pi-conjugated structure of poly(Neutral Red), PNR. UV-vis spectroscopy was used to estimate film thickness. Catalytic activity was quantified by Tafel slope and formal redox potential. PNB and PTB exhibited low current densities and small standard rate constants. Although neither showed highly active catalysts for HER, future directions should continue to pursue similar structures to PNR for HER electrocatalysts.

Honors Project in Physics and Astronomy
Advisor: James Doyle
Physics and Astronomy Department

Meira Smit

Responsibility to the Land: Perspectives of Farmers on Climate Change and Land Transition

Agriculture is a defining aspect of Minnesota and Wisconsin's identity, characterized by family run farms and their adaptable spirit. As global climate change intensifies by the rise of greenhouse gas concentration in the atmosphere, the agricultural sector has significant potential to reduce emissions and ensure a resilient food system. This project explores Minnesota and Wisconsin farmers' perspectives on climate change using semi-structured interviews and Grounded Theory analysis. While farmers care for land, environment, and their businesses, climate change is only one threat to succeeding at stewardship.

Honors Project in Environmental Studies
Advisor: Christie Manning
Environmental Studies Department

Marta Louise Sorenson

Sunbathers

Sunbathers is a Studio Art Honors project that explores the awkward intimate nature of introspective life through autobiographical, figurative ceramic sculptures. The forms capture the relationship between body and reality. The project consists of seven portraits, varying in size and display, arranged together on pink pedestals. Each figure communicates a part of self, embodying the internal interactions of everyday existence. The sculptures perform as objects yet speak with the specific sense of being seen/presented. Features shift in and out of focus—glossy glazes draw the eye, while matte colors move inward; the exaggerated, slumped forms are adorned with bright, illuminating glazes. Sunbathers depicts the experience of being alive - fully and honestly, with compassion and introspection.

Honors Project in Art and Art History
Advisor: Lela Pierce
Art and Art History Department

Christina Spicher

Risk, Routes, and Media Reports: The Impacts of Perceptions of Crime on Bus Ridership in Minneapolis and Saint Paul.

By collecting data on media reports about crimes on or near public transit, I study how changes in perceptions of crime affect bus ridership at the route level in Minneapolis and Saint Paul between 2015-2019. Treating the publication dates of these media reports as events, I perform panel event studies. Based on these models, I find no statistically significant evidence that media reporting about crimes on or near bus routes impacts ridership. With that said, my work points out important gaps in the literature where researchers and policymakers still have the opportunity to more deeply understand a key determinant of public transit ridership.

Honors Project in Economics
Advisor: Sarah West
Economics Department

Samina Stack

An Overlapping Generations Approach to the Burden of Knowledge

Innovation drives economic growth. It propels technological improvements, scaling up the efficiency of factor inputs to production. Recently innovations have been perceived as becoming less and less disruptive. I explore this perceived phenomenon by implementing an overlapping generations approach to model the increasing burden of knowledge and gauge its impact on innovation and indicators of economic growth. I find increasing knowledge to generate difficulty discovering new ideas and negative impacts on the indicators, implying slowing economic growth. Furthermore, I show that the burden of knowledge impacts developed economies more than developing economies.

Honors Project in Economics
Advisor: Mario Solis-Garcia
Economics Department

Laura Sullivan

Neuroinflammation in a Chronic Vulvar Pain Model

We utilized a model of vulvodynia to increase understanding of chronic vulvar pain development. Chronic pain is partly maintained, in part, by central sensitization, which can be caused and maintained through neuroinflammation. Immunofluorescence data reveal increased microglial abundance in the chronic phase, without detectable inflammatory gene expression changes. Thus, repeat local tissue inflammation can lead to long-term changes in the central nervous system, leading to chronic pain. Our work will contribute to the development of improved therapeutic strategies not only for vulvodynia, but also for other chronic pain conditions accompanied by inflammation.

Honors Project in Biology
Advisor: Elena Tonc
Biology Department

Mia Tanner

Who gets to have fun? The Alternative Earmarking of a Memecoin Marketplace

Cryptocurrencies are regarded as socio-technologies, projects linked to online communities resembling social movements. Established cryptocurrencies highlight their technological disruption, but what occurs when these promises are absent? Memecoins thrive without claims of institutional legitimacy, deriving their value from memetic branding. Pump.fun, a platform enabling low-barrier memecoin creation, exemplifies this shift. Analyzing pump.fun's interface, promotional content, and top coins from a 30-day period, I demonstrate how the platform constructs alternative legitimacy through subcultural language and gamified site mechanics—divorcing crypto's value from technological innovation and redefining it as a participatory spectacle. This redefines legitimacy as communal performance, not institutional critique.

Honors Project in Sociology
Advisor: Erik Larson
Sociology Department

Aahanaa Tibrewal

Multifunctionality

Multifunctionality is a project that explores the intersection of art and design through a versatile dining table that transforms into a gaming table. Built with accessibility in mind and using Red Oak for its warmth and grain, the table features a rolling tambour top that serves as a dining surface when closed and reveals a felt-covered gaming area when open. This piece was shaped by my needs and the desire to create a space for connection and shared experiences. This project reflects my broader approach to art – constantly exploring new materials and methods, driven by curiosity and a love of learning.

Honors Project in Art and Art History
Advisor: Ruthann Godollei
Art and Art History Department

Aahanaa Tibrewal

Mashed Potato Gravy Boat and Cream Cheese Fish: Modifying a 3D Printer to Print with Unconventional Materials

3D printing is growing beyond plastics into fields like food and construction, bringing rapid additive manufacturing to various industries and consumers. However, high costs and the need for specialized knowledge limit access for many. My project aimed to modify a low-cost 3D printer to print with paste-like materials using commonly available parts and simple processes. I tested the modification with clay, mashed potatoes, and cream cheese, and found that it successfully worked with all three. This modification has three key benefits: it allows users to print with unconventional materials, helps researchers create low-cost proof of concepts, and contributes to the open-source 3D printing community.

Honors Project in Mathematics, Statistics and Computer Science
Advisor: Susan Fox
Mathematics, Statistics and Computer Science Department

Megan Twomey

Home on the Road: Nomad Place Identities in the Vanlife Movement

Aspirations for living in a van have gained popularity as more people discover vanlife as a means of escape from mainstream society to explore America while posting on social media. Using surveys and ethnographic interviews, this study investigates how mobility, place, and place identity influence vandwellers' concepts of home while living in a van. Additionally, it explores the various experiences of, and reasons for, joining vanlife and the role social media plays in the movement. In a fundamentally placeless lifestyle vanlifers are challenging geographic concepts and creating new ideas of how place, place elasticity and mobility factor into one’s identity.

Honors Project in Geography
Advisor: Holly Barcus
Geography Department

Unitas Vang

First Report of Cave-Dwelling Mite Harvesters from Aotearoa New Zealand and an Examination of Species Boundaries in Aoraki

Mite harvesters are tiny arachnids known to be poor dispersers with species ranges typically no larger than 50km in any dimension. These animals commonly inhabit leaf litter environments throughout New Zealand, one of the world's biodiversity hotspots. In this study, we explore two topics in relation to the diversity of the mite harvester genus Aoraki by employing DNA barcoding techniques to sequence the mitochondrial loci COI and 16S: first, to assess the species status of the first cave-dwelling mite harvesters in New Zealand, and second, to examine species boundaries and biogeographical trends in eleven species of Aoraki.

Honors Project in Biology
Advisor: Sarah Boyer
Biology Department

Sofia Vaz

Before We Forgot Eden

This is a climate fiction novel that details the intertwined narratives of Avani, (Mother Earth) and Eden, her daughter (the Planet's Heiress). Employing dual timelines, the novel juxtaposes Avani's past of rebellion, love, and betrayal with Eden's present as she flees the US government's exploitation of Earth's power. Drawing inspiration from Andean and Hindu traditions, this novel explores themes of love, motherhood, human nature, and consequence. Using a family tragedy as a rich metaphor for the climate crisis, this project aims to provoke its audience's humanity and deepen our understanding of the human race's responsibility in Earth's destruction.

Honors Project in English
Advisor: Peter Bognanni
English Department

Ramier Villarama

Kain Tayo

Kain Tayo (“Let’s eat!” in Tagalog) is a sculptural installation inspired by the Filipino tradition of Kamayan—a communal feast eaten with one’s hands and served on banana leaves. Using found and discarded objects, the work reimagines a shared dining experience as a celebration of cultural memory, sustainability, and participation. Each piece mimics traditional Filipino dishes like lumpia and lechon, inviting viewers to touch, rearrange, and reflect on the meaning of value, waste, and connection. This honors project merges my background in Studio Art and Environmental Studies, transforming everyday scraps into a joyful expression of identity and storytelling.

Honors Project in Art and Art History
Advisor: Lela Pierce
Art and Art History Department

Khant Wai Yan

Martyrs, Dictators, and Revolutionaries: The Scramble for State Legitimacy in Postcolonial Myanmar.

This thesis examines the ways in which the struggle for state legitimacy in Myanmar has shaped the trajectory of the postcolonial nation's future. It analyzes how the disregard for the country’s deeply heterogeneous social, economic, cultural, and religious public by the Tatmadaw contributed to the recurring patterns of oppression and repression. Synthesizing methods such as critical theory, historical analysis, and discourse analysis, I argue that the fragmented Burmese state maintains power by institutionalizing Bamar supremacy in three distinct yet interconnected mechanisms—the historical erasure of non-Bamar agency, the ideological destruction of religious discourse, and the economic fragmentation of ethnic territories. In addition, I introduce the concept of the "Peripheral Paradox," that occurs when the Bamar-Buddhist core offers ethnic minorities in the peripheries conditional inclusion in the national project in exchange for their oppression of other subaltern groups, undermining counter-hegemonic coalescence and fracturing potential solidarity across stratified communities. As the world enters an era of unprecedented upheaval, Myanmar’s struggle to forge a unified national identity can offer us a blueprint to confront emerging legitimacy crises across the entire world-system.

Honors Project in International Studies
Advisor: Ahmed Samatar
International Studies Department

Jeff Wang

Simulation of the first steps of β-pinene ozonolysis and efficient geometry optimization with reinforcement learning

β-pinene is the second most abundant biogenic monoterpene released into the atmosphere. Its ozonolysis reaction produces non-photolytic hydroxyl radicals and secondary organic aerosols (SOA), both crucial in atmospheric chemistry. We constructed a potential energy surface (PES) for our stereochemically diverse open shell and closed shell pathways with Density Functional Theory (DFT) and then utilized Rice-Ramsperger-Kassel-Marcus/Master Equation (RRKM-ME) simulations in the MultiWell suite to predict the reaction outcomes of β-pinene ozonolysis under tropospheric conditions. We identified a novel source of hydroxyl radical (~9.5%) before forming Criegee Intermediates (CI) at 298.15K and 15 torr. This research also presents a first attempt at implementing a deep reinforcement learning model to reduce the computational cost of geometry optimization calculations.

Honors Project in Chemistry
Advisor: Keith Kuwata
Chemistry Department

Amanda Week

Holding Moral Responsibility for Implicit Bias and Configuring a Functional Blaming World

In this thesis, I outline an approach to understanding implicit bias, accepting moral responsibility for them, and taking corrective actions to address the harm that they produce. After defining implicit bias and underscoring their concerning nature, I argue that we can and should hold ourselves morally responsible for our implicit biases. I apply Manuel Vargas's constitutive instrumentalist account to the context of implicit bias to explain how responsibility cultivates a valuable agency that enables us to create a more just world. I then discuss what moral obligations follow from our holding responsibility for our implicit biases.

Honors Project in Philosophy
Advisor: Samuel Asarnow and Sumeet Patwardhan
Philosophy Department

Verity Wray-Raabolle

Archaeology By the Book, But Which Book?: Archaeology and Nation Building in Germany and Israel

Archaeology is a powerful tool wielded by nations to tell their own stories. How can two countries in different situations harness archaeology to tell their own national narratives? By looking at the archaeological heritage of both Israel and Germany I have discovered the different ways in which nation states can utilize ancient materials to their advantage. By choosing to excavate well-known sites, only display certain artifacts, or claim modernity through the science of the discipline, both nations strengthen their national identities through the use of archaeology.

Honors Project in Classical Mediterranean and Middle East
Advisor: Nanette Goldman and Andrew Overman
Classical Mediterranean and Middle East Department

Kai Eizo Martin Yamanishi

Theatre for the People: Exploring the Need for a New National Theatre

The Covid-19 pandemic sent shockwaves through the theater industry that have seen dozens of theaters across the country laying off workers, shortening seasons, and even closing altogether. Costs have risen, audiences have been slow to return, and traditional sources of funding have dried up. What then, are theaters to do? By conducting an economic analysis and examining published and original interviews with theater practitioners, this paper explores this crisis as it has affected the regional nonprofit theater sector, specifically the members of the League of Resident Theaters (LORT). It concludes that LORT's model of regional theater is no longer sustainable because of its failure to engage and develop a supportive and diverse theater community of artists and audiences. Based on this research, it proposes a new model for the theater funded by the government that brings together ideas from community-engaged theater, Broadway, 365 Days/365 Plays, the Federal Theater Project, We See You White American Theater, and the live music industry that aims to rebuild the theater community from the local level up to the national.

Honors Project in Theater and Dance
Advisor: Cláudia Tatinge Nascimento
Theater and Dance Department

Aiden Yang

Falling in Line: The Model Minority Myth and Asian American Political Alignment

The "Model Minority" Myth portrays Asian Americans as successful, disciplined, and hard-working, reinforcing racial hierarchies and distancing them from other marginalized groups. This study explores how belief in the myth, anti-Black attitudes, and prioritizing collective group identity shape Asian American political alignment, particularly conservative lean. Using 2020 ANES data, I find that anti-Blackness, more than the myth itself, strongly predicts conservative affiliation. While the Model Minority narrative encourages alignment with whiteness and individualism, its political effects are uneven, shaped by racial consciousness. This research highlights how internalized stereotypes and racial positioning shape political behavior, emphasizing the need for more nuanced understandings of Asian American political identity.

Honors Project in Sociology
Advisor: Erik Larson
Sociology Department

Louise Yang

Navigating Institutional Apathy: Resisting the Co-optation of Decolonial and Liberatory Frameworks in Higher Education

Amidst nationwide challenges to DEI programs, frameworks of decolonization , and liberation have been simultaneously employed and depoliticized by institutions of higher education to falsely build a progressive façade while dismissing the values associated with these terms. To explain this dynamic I introduce institutional apathy, which I define as the tendency of colleges to reproduce the status quo, denying the potential of an ongoing commitment to decolonial, and liberatory values. Using interviews with staff and faculty at a liberal arts college, I explore how actors in the institution resist co-optation using foundations of solidarity, community partnerships, and incorporations of incremental change.

Honors Project in Sociology
Advisor: Erika Busse-Cárdenas
Sociology Department

Graham Holland Yater

Effects of Ethanol and Sucrose Reward Devaluation on Sign-Tracking and Goal-Tracking in Long-Evans Rats

This study examined whether ethanol or sucrose reward devaluation affects Pavlovian conditioned approach behaviors, specifically sign-tracking (lever approach) and goal-tracking (reward port entry), in Long-Evans rats. Male and female rats underwent Pavlovian conditioning with ethanol or sucrose, followed by conditioned taste aversion to devalue the reward. Despite successful devaluation, neither sign-tracking nor goal-tracking behavior significantly decreased, suggesting behavioral inflexibility. Ethanol transferred conditioned taste aversion effects more effectively across contexts than sucrose. These findings highlight ethanol's utility as a Pavlovian reward and suggest that extended training or contextual mismatch may limit sensitivity to devaluation, even in typically flexible goal-tracking behavior.

Honors Project in Neuroscience
Advisor: Jean-Marie Maddux
Psychology Department

Cynthia Zhang

Estimating the Gender Wage Gap: A Comparative Analysis of Different Estimators

The gender wage gap between males and females has been well-studied by labor economists. We take a multi-prong approach to evaluate three estimators—a regression-imputation estimator, a weighting estimator, and a doubly robust estimator—in estimating the gender wage gap. Using the Panel Study of Income Dynamics, we conduct an empirical study of the estimators' performance. In a simulation study, we evaluate the properties of estimators and study whether bootstrapping is an appropriate measure of the uncertainty of each estimator. The findings show that while the estimators provide different results, the doubly robust estimator provides reliable and consistent results under model misspecification.

Honors Project in Mathematics, Statistics and Computer Science
Advisor: Brianna Heggeseth
Mathematics, Statistics and Computer Science Department

Lily Zugschwert

Documenting Tiny Feeding Traces on Small Bones from Vertebrate Microfossil Bonebeds, Upper Cretaceous (Campanian) Judith River Formation, Montana

A large collection of vertebrate microfossils (mm to cm-scale bones, teeth, scales) from the Cretaceous Judith River Formation of north-central Montana was studied to document evidence of bone modification. The fossils accumulated in freshwater aquatic basins (lakes, swamps) as time-averaged assemblages. The focus was on feeding traces (e.g., tooth scores, furrows, pits, punctures, crush marks, gnaw marks, and crenulated edges). Evidence of feeding is abundant, with ~12% of the sample showing these features. Potential "tracemakers" include theropod dinosaurs, crocodilians, fish, and even the occasional Mesozoic mammal. Vertebrate microfossils are a previously untapped source of this type of paleoecological information.

Honors Project in Geology
Advisor: Raymond Rogers
Geology Department