UNDERGRADUATE RESEARCH & INTERNSHIP SYMPOSIUM

WEITZ CENTER FOR CREATIVITY COMMONS
4:30 - 6:30 PM
OCTOBER 13, 2023
October 13, 2023

Welcome to the 2023 Student Research and Internship Symposium at Carleton.

Today we honor the many students who have explored career paths and engaged in advanced work in their respective fields, building on the knowledge and skills they acquired throughout their work at Carleton and beyond.

Experiential learning via research, internships, and fellowships are at the heart of a Carleton education. Through their posters and oral presentations these students reveal the habits of mind that an outstanding liberal arts education provides – curiosity, adaptability, careful observation, reflection, and compelling communication. We are proud of their many accomplishments.

We also wish to acknowledge and celebrate the great diversity of experiences represented here. Staff and faculty from many different departments and programs have supervised student research and internship projects, and community members have helped students grapple with the myriad ways their knowledge, skills, and values play out in the complexity of the real-world. Taken together, the work of these students attests to the breadth of experiential learning opportunities afforded by Carleton and the many ways in which faculty and staff throughout the College inspire and support student scholarship and plant the seeds for life-long learning.

Finally, we call attention to the many significant mentoring relationships that fostered this work and were deepened as a result of it. As generations of Carleton students will attest, the opportunity to work closely with faculty and staff is among the most impactful and memorable of their experiences here. Behind each of these presentations is a faculty, staff, or community member whose guidance, encouragement and coaching enriched the education of students and inspired them to go further than they imagined they could. We are grateful for the dedication and attentiveness of all these mentors.

We invite you to engage with these students, to ask them about their work and its significance to them and the world. In this way, we hope you will join them, at least briefly, on the journey they have undertaken.

Thank you for joining us for this symposium and celebration.

Michelle Mattson, Provost & Vice President for Academic Affairs

Carolyn H. Livingston, Vice President for Student Life and Dean of Students
Abstract: 1001

Title: Hennepin County Public Defenders Office Investigator

Presenter(s): Mustafa Abbashar ’24

This internship experience was beyond vital to my development as a student and as a future professional. I came to Carleton searching for a field that would allow me to utilize my skills. During high school, I developed a variety of differing interests ranging from biology to the visual arts. Unfortunately, I never envisioned these passions to translate into feasible long-term goals. I was immediately struck by how engaged I was in my case discoveries. I went through body-cam footage, security camera footage, police reports, jail calls, and eyewitness testimonies. I also conducted in-field casework including subpoena serving and jail interviews. Every assignment I received was been different and compelling. Deploying skills that I learned in Constitutional Law, I was able to read through police and investigator supplements and spot possible holes in facts and arguments consistently. During a moot court exercise in the course, I had experience with being highly critical of a side that I didn’t necessarily disagree with. This skill is crucial in law and it has been crucial for the cases that I conducted discovery on.

This experience was funded by: Class of 1964 Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 1

Abstract: 1002

Title: Finding Voice in the Middle Ages: Collating William of Fly’s Commentary on Lamentations

Presenter(s): Tim Abbott ’26

Supervisor(s) and affiliation or institution: William North (Professor of History, Carleton College)

This summer Professor William North and I worked on an edition of a 12th-century Latin commentary on the book of Lamentations. Collating the two known manuscripts of this work, MS B (at the Bibliothèque Nationale) and MS V (at the Vatican Library), we found that, although they differed in conventions of abbreviation and spelling as well as script, they did not present radically different texts of the work. We conclude that neither manuscript is original because each occasionally lacks what appears to be the right reading. Nonetheless, MS B may be closer to William’s original version as it contains more complete readings in several places. A full collation will reveal this relationship more clearly.

This experience was funded by: Humanities Center

Presentation time: 5:45 - 6:30 p.m.
Poster number: 1

Abstract: 1003

Title: Bacterial Expression of Helminth Aminoacyl-tRNA Synthetases

Presenter(s): Sara Abraha ’25, Jack Nelson ’24
Helminths are a group of parasites, including flatworms, hookworms, tapeworms, flukes, and whipworms. The WHO classifies infections caused by helminths as “Neglected Tropical Diseases” because they affect about 60% of people living in tropical and subtropical regions, particularly in developing countries. Helminths can cause lymphatic filariasis, gastrointestinal symptoms, blindness, and sometimes death.

Aminoacyl-tRNA synthetases (ARSs) are crucial enzymes for protein biosynthesis in any organism. Since ARSs are essential enzymes, inhibiting parasitic ARSs is a potential strategy for treatment of infection. Several helminth ARSs are significantly different from their human homologs. In order to characterize these enzymes, we are attempting bacterial protein expression. Initial work has resulted in soluble expression of the cytosolic enzymes, but further work is needed to express and isolate the mitochondrial proteins.

This experience was funded by: Summer Science Fellowship

Presentation time: 4:30 - 5:15 p.m.
Poster number: 2

**Abstract: 1004**

**Title: Machine Learning in Education**

**Presenter(s): Aadi Akyianu ’25**

Other Authors/Contributors: Jared Arroyo Ruiz ’26, Tori Shen ’25

Other Authors/Contributors: Noah Mueller ’23
Supervisor(s) and affiliation or institution: Joseph Chihade (Professor of Chemistry, Carleton College)

Our research looked to modify an existing machine learning model to make better use of data from standardized assessment. By making those modifications, we aimed to improve the model's prediction accuracy on untrained data with the hope of reducing the amount of training the model would need. Additionally, we explored the intersection between fairness and machine learning by looking at various fairness metrics. The aim was to gain a better understanding of not only our model's fairness but of fairness in general.

This experience was funded by: Summer Science Fellowship and The Towsley Endowment

Presentation time: 5:45 - 6:30 p.m.
Poster number: 2

**Abstract: 1005**

**Title: Patient Messaging and Bias: Enhancing Medical Communication Through the use of Large Language Models (LLMs)**

**Presenter(s): Amira Aladetan ’24**

Other Authors/Contributors: Jared Arroyo Ruiz ’26, Tori Shen ’25
Supervisor(s) and affiliation or institution: Anna Rafferty (Associate Professor of Computer Science, Carleton College)

This experience was funded by: Summer Science Fellowship and The Towsley Endowment

Presentation time: 5:45 - 6:30 p.m.
Poster number: 2
I will discuss the two projects I worked on during the SREP program. Project 1: Among patient-provider messaging, does bias exist? AND Project 2: How can we improve the efficiency of patient-provider messaging? During the ten weeks, I analyzed patient messages and biases within messages and created a research plan. I’ll discuss the methods, results, and what we know.

This experience was funded by: Multicultural Alumni Network (MCAN) Fellows Program

Presentation time: 4:30 - 5:15 p.m.
Poster number: 3

Abstract: 1006

Title: Marketing and Digital Design

Presenter(s): Star Alvarez-Zavala ‘24

STOP KILLING BLACK TRANS WOMEN. Marketing and Digital Content for Social Outreach

This experience was funded by: Multicultural Alumni Network (MCAN) Fellows Program

Presentation time: 4:30 - 5:15 p.m.
Poster number: 4

Abstract: 1007

Title: Global Middle Ages: Travelling Texts and Narratives

Presenter(s): Abdullah Ansar ‘25

Other Authors/Contributors: Alex Wilson ‘24, Evan Orjala ‘24, Griffin Momsen-Hudson ‘25, Nicholas Spezia-Shwiff ‘24, Hope Yu ‘26

Supervisor(s) and affiliation or institution: Victoria Morse (Professor of History, Carleton College)

This research project delves into the intricate web of translation movements (such as Graeco-Syro-Arabic) and their profound impact on textual transmissions across Eurasia in the Middle Ages. Through a comprehensive exploration of historical sources, manuscripts, and cultural exchanges, this study uncovers the rich tapestry of linguistic and cultural intersections that shaped the intellectual landscape of the region.

As a focal point, the Alexander Legend is examined as a case study to elucidate the complexities of cross-cultural translation and the diffusion of knowledge. The investigation reveals how Greek narratives, particularly the Alexander Romance, were translated into Syriac and Arabic, adapting and incorporating diverse cultural elements. These translations served as bridges that facilitated the dissemination of classical knowledge into the Islamic world, ultimately influencing the development of medieval literature, science, and philosophy.

By shedding light on the Graeco-Syro-Arabic translation movements and their role in textual transmissions, this research contributes to a deeper understanding of the interconnectedness of Eurasian cultures and the enduring legacy of ancient knowledge in the modern world.

This experience was funded by: Humanities Center
Abstract: 1008

Title: Using Ordinal Pattern Analysis to Reveal Symmetry Families in Experimental Time Series

Presenter(s): Benjamin Ansbacher ’26

Other Authors/Contributors: Marcos Acero ’25, Sean Lyons ’25
Supervisor(s) and affiliation or institution: Arjendu Pattanayak (Professor of Physics, Carleton College)

Brain EEGs, climate change, ecosystem behaviors, and our area of study, the Duffing Oscillator, are all examples of non-linear dynamical—or chaotic—systems. Given any time series we can extract ordinal patterns and their populations to compute the permutation entropy (PE) which is experimentally robust and powerful in characterizing dynamical complexity including chaos and periodicity. We extend this technique by analyzing subpopulation dynamics of ordinal pattern populations in a symmetry space as a function of parameter and thus revealing in a compressed manner information about changes in phase space structure.

This experience was funded by: Carleton Physics & Astronomy Department

Abstract: 1009

Title: Summer Internship at Saykid: Designing and Coding a Website

Presenter(s): Gideon Antwi ’26

During my SayKid internship, I gained a wealth of technical skills. I delved into search engine optimization (SEO), becoming adept at optimizing online content for visibility. I also mastered JavaScript and HTML, essential languages in modern web development. Surprisingly, I even acquired design skills, translating ideas into visually appealing interfaces. However, what truly set this experience apart was our collaborative spirit. Working closely with colleagues, we cohesively created an educational product we all take pride in.

This experience was funded by: Robert E. Will ’50 Endowed Internship Fund in Social Entrepreneurship

Abstract: 1010

Title: Responses to Vitamin D in Colonic Organoids

Presenter(s): Maricarmen Arce ’27

Supervisor(s) and affiliation or institution: University of Chicago
Background/Aim: Environmental factors, such as vitamin D contribute to chemoprotective CRC, yet there is gaps on responses to the effects within health disparities from diverse ancestries. Colonic organoids are an ideal experiment treatment approach to contribute to health disparities research with diverse ancestries and vitamin D colon responses.

Methods: Two colonic lines, SK276 (POLB insertion) and SK242 (deletion) were cultured and treated to differentiating media followed by vitamin D and ethanol treatment. Organoids were harvested for RNA, made into cDNA for qPCR analysis. QPCR analysis was analyzed using the Livak method.

Results: Results Validated previous finding in the differences of POLB expression with vitamin D based on the indel variants. Organoid lines with the deletion showed no significant increase expression of POLB after Vitamin D treatments at 6 hours and 24 hours while Organoid lines with the insertion showed significant increased expression with of POLB after vitamin D treatment at 6 hours and 24 hours. Conclusion: Current and previous results provide better understanding for future ongoing studies in colon response to vitamin D in POLB. More studies in POLB differences can determine differences in enzyme activity and base excision repair in organoids with the use of western blotting to help identify protein levels.

Presentation time: 4:30 - 5:15 p.m.
Poster number: 5

Abstract: 1011

Title: Groundwater Modeling Simulation in Karst Systems

Presenter(s): Beck Arnow ’24

Other Authors/Contributors: Xiaoying Qu ’25
Supervisor(s) and affiliation or institution: Chloé Fandel (Assistant Professor of Geology, Carleton College)

Modeling karst conduits is a relatively new way of attempting to understand how these systems function. This past summer, with Professor Chloé Fandel, Xiaoying Qu and Beck Arnow attempted to create general open-source modeling code using MODFLOW and packages for MODFLOW to model a groundwater system containing a karst conduit system. The long-term goal is to simulate contaminant transport through aquifers in southeastern Minnesota.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 5

Abstract: 1012

Title: Internship at Institut Imagine’s Ophthalmological Genetics Laboratory, Paris, France

Presenter(s): Allison Audette ’25

This summer I completed an internship at Institut Imagine’s Ophthalmological Genetics Laboratory in Paris, France. As a research intern, I assisted with the daily tasks associated with the overall research projects of the lab. This included doing several different types of lab manipulations each day, along with understanding the goal of each project as a whole. I also assisted with proof reading papers written in English, and other smaller tasks. Finally, I improved my French speaking skills greatly by speaking with my coworkers in only French every day.
Abstract: 1013

Title: Autonomy + Freedoms in A Tracked Education System

Presenter(s): Faridah Azeez ’25

What degree of autonomy do students possess in shaping their educational and personal paths within and outside of a tracked education system? Tracking, one of the most prevalent education models in the West, categorizes students based on perceived intelligence (IQ) and academic achievement. Tracking has been criticized by researchers in education studies for perpetuating socioeconomic and race inequalities. Within this framework, white students, and students from affluent backgrounds have maintained a status within the high track, whereas Black, Indigenous, People of Color, and students from a low socio-economic class have been placed within the middle to low track. My research examines what concept of autonomy and freedoms do students have within and beyond the tracked education system to choose their own good? I will argue that the practice of tracking encroaches upon the freedoms and personal autonomy of students when it does not allow the students to choose their own good and reinforces a history of racial and class-based oppression. Further, my research addresses related questions: what are the social life prospects of these students?, how do they perceive their possibilities while being tracked?, and beyond that?, and what are the parallels between segregation of race and segregation of intellect?

This experience was funded by: Mellon Mays Fellowship

Abstract: 1014

Title: Sablefish Summer

Presenter(s): Conor Babcock O'Neill ’24

I was a research assistant at the NOAA Federal Manchester Research Station. I attended talks, read papers, designed experiments, and assisted wherever I was necessary, culminating in me designing and running my own experiment at the end of the summer. I learned about research and it's challenges in a governmental context, and about the interplay between the US government and tribal sovereign governments.

This experience was funded by: Helen M. Golde ’85 Endowed Internship Fund and the Trustee Endowed Internship Fund

Abstract: 1015

Title: The Effects of Setting on Tic Frequency in Individuals with Tic Disorders
**Presenter(s): Grace Bacon ’25**

Other Authors/Contributors: Alison Pryor
Supervisor(s) and affiliation or institution: Christine Conelea (Associate Professor, Department of Psychiatry & Behavioral Sciences, University of Minnesota Medical School), Brianna Wellen (Postdoctoral Fellow, CAN Lab, University of Minnesota)

Introduction: Tics manifest differently across settings because they are reactive to context. Symptoms observed in clinical visits may differ from those experienced in daily life, making it hard for clinicians to accurately treat patients.

Objective: We hypothesized that tic frequency would be lower during clinical interviews than during the Free Tic Task (FTT) condition.

Methods: Video recordings of clinical assessments from a larger study were compiled (N = 10); these included 15 minute clips of YGTSS administrations and MINI-5 interviews (interview assessing DSM-5 psychiatric diagnoses), and three minute clips of the FTT condition. During the FTT, participants were recorded alone in lab while asked to tic naturally. All recordings were coded for tic frequency, type, complexity, and quantified for average tics per minute for each participant and condition.

Conclusion: These results suggest that tic expression during clinical assessments can markedly differ from tics when participants are alone.

Presentation time: 4:30 - 5:15 p.m.
Poster number: 6

**Abstract: 1016**

**Title:** Preliminary study: The Effect of Rhyme context on Word Recall in a complex span divided attention task

**Presenter(s): Marta Bacon ’25**

Supervisor(s) and affiliation or institution: Jayanthi Sasisekaran (Associate Professor, Department of Speech-Language-Hearing Sciences, University of Minnesota)

The Phonological Similarity Effect (PSE), is the inhibitory effect of similar sounding words on word recall tasks. There is some discrepancy whether PSE inhibits or facilitates working memory. Previous research that reported that phonological similarity facilitates word recall or working memory required participants to complete a simple span task. In a simple span task participants are only storing and maintaining items in their memory; they are asked to recall a series of stimuli directly after the last item is presented. The study examined if PSE inhibited word recall in a version of the complex span reading task involving two tasks (1) word recall and (2) sentence judgment. The context cue was provided by the last word of each sentence that either rhymed or not with the word preceding it. The interaction between the hippocampus and other regions of the brain supporting working-memory processes in decision making are not well understood. The altered version of the complex span task allows us to investigate the influence of PSE in this process.

Presentation time: 4:30 - 5:15 p.m.
Poster number: 7
Abstract: 1017

Title: Beyond the Classroom: The Micro- and Macrosystem of the School-to-Confinement Pathway

Presenter(s): Audrey BadjouenDzouabet ’24

Other Authors/Contributors: Wes Markofski (Associate Professor of Sociology, Carleton College), Cherlon Ussery (Associate Professor of Linguistics, Carleton College), Anita Chikkatur (Professor of Educational Studies, Carleton College)

The school-to-confinement pathway details how racial, gender, and socioeconomic inequities intersect to marginalize black girls in their learning environments. Many proponents of equitable education have cited the exploitation and criminalization of black femininity for the disproportionate mistreatment of black girls in schools, which frequently manifests in various forms of confinement (i.e., detention centers, out-of-school suspensions, electronic monitoring, etc.). While patterns of exclusionary discipline have been found to produce similar outcomes between black girls and black boys, narrative-based research seems to provide a more nuanced picture. To highlight the different experiences black girls encounter within the educational and carceral systems, I use a black feminist framework to interview students/educators, non-profit workers, and policymakers. The findings of four preliminary interviews reveal that intervention practices align with key tenets of black feminism: (1) intersectionality, (2) critiquing conventional pedagogical practices, and (3) implementing tools/programs to create liberating and emancipatory learning environments.

This experience was funded by: Mellon Mays Undergraduate Fellowship

Presentation time: 4:30 - 5:15 p.m.
Poster number: 8

Abstract: 1018

Title: Community Organizing Internship

Presenter(s): Julius Bakke ’24

During my internship with Cooperation Cannon River, a nonprofit dedicated to social justice in the Twin Cities Metro area, I honed vital interpersonal skills and learned a lot about the nature of community organizing. This transformative journey equipped me with communication, problem-solving, and critical thinking abilities essential for further volunteer work and future law school aspirations. Collaboration with diverse stakeholders reinforced teamwork and relationship-building, and I learned to adapt to unforeseen circumstances. Supported by the Alsdorf Internship, this internship empowered me to pursue a path in law and social justice, poised for a lasting positive impact.

This experience was funded by: Alsdorf Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 9

Abstract: 1019

Title: Decoding the Minimal Cell: Construction of a CRISPRi Library for JCVI-syn3B
Many of the genes that are essential for life still have unknown function. Targeted gene repression systems such as CRISPRi used in cells with minimal genomes such as Mycoplasma mycoides JCVI-3.0 offer a path to determine these elusive functionalities. Before these functionalities can be determined, a library of clones with an embedded inducible CRISPRi system for each of the 473 genes in the genome must be established. This process includes designing a gene-specific CRISPRi construct with a random 8 bp barcode, using it to transform and establish clones, and then genome sequencing to confirm the integrity of the engineered region and to determine uniqueness. A completed library includes three successfully transformed, unique clones for each gene. To date, 48 genes satisfy this goal, 254 genes have no transformed clones, and 153 genes are somewhere in between.

This experience was funded by: Class of 1970 Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 9

**Abstract: 1020**

**Title:** *Designing a Synchronous Integrated Development Environment for a Small-Scale Startup*

**Presenter(s):** Batmend Batsaikhan '24

This summer, I served as a part-time full-stack intern at a small tech startup. Over 12 weeks, my primary focus was the development of a synchronous shared Integrated Development Environment (IDE). Building a synchronous system was very challenging and the process greatly expanded my familiarity with both foundational and novel technologies.

This experience was funded by: Welsh Family Endowed Internship Fund for High Growth Industries

Presentation time: 5:45 - 6:30 p.m.
Poster number: 10

**Abstract: 1021**

**Title:** *Policy Analyst Intern at Mutual Aid Myanmar*

**Presenter(s):** Nate Bauer '24

Other Authors/Contributors: Tun Myint (Professor of Political Science, Carleton College)

I prepared policy briefs for Mutual Aid Myanmar's core team on American foreign policy regarding Myanmar — specifically the National Defense Authorization Acts from 2022 & 2023, and pending legislation being debated in both chambers. I also counseled leadership on leveraging opportunities for receiving federal funding from the Department of Defense.

This experience was funded by: John '55 and Bonnie Raines Endowed Internship Fund
Presentation time: 4:30 - 5:15 p.m.
Poster number: 10
Abstract: 1022

Title: Modeling Ventilation Times of ICU Patients

Presenter(s): Natalie Bax ’24

Supervisor(s) and affiliation or institution: Felipe Rodrigues (Assistant Professor of Operations Management and Analytics, Western University), Camila de Souza (Assistant Professor of Statistical and Actuarial Sciences, Western University)

Predicting ventilator availability in intensive care units (ICUs) is important for scheduling surgeries and maximizing the efficiency of care. We use a cascading tree model to estimate the number of days an ICU patient will stay on a ventilator. Our data includes the patient’s Age, Sex, Multiple Organ Dysfunction Score (MODS), Nine Equivalents of Nursing Manpower Score (NEMS), their diagnosis upon admission to the ICU, and the source from which the patient was admitted to the ICU. The cascading tree model consists of a series of decision trees, where each tree is used to model whether a patient will still be on a ventilator the following day. We used an 80-20 training-test split, where the training data for the nth tree includes only patients who were on ventilation of at least n – 1 days. Our model gives insight into which features are most relevant for prediction throughout the stay.

This experience was funded by: Abeona Endowed Fund for International Internships

Presentation time: 4:30 - 5:15 p.m.
Poster number: 11

Abstract: 1023

Title: Consulting Internship

Presenter(s): Eden Bergene ’25

I worked as a summer associate this summer. During this time I worked on projects for insurance data provider and digital intelligence providers for life sciences companies.

This experience was funded by: Kathryn Christen Ramstad ’79 Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 11

Abstract: 1024

Title: Towards Understanding the Photoluminescent Behavior of F8BT in Air

Presenter(s): Alana Berger ’24

Supervisor(s) and affiliation or institution: Gordon Hedley (Senior Lecturer in Chemical Physics, University of Glasgow)

The Hedley Lab at the University of Glasgow uses single molecule spectroscopy to understand the photoluminescent behavior of various conjugated polymers. These polymers are used in OLEDs which are increasingly used for digital displays in modern TVs and smartphones. The aim of the research is to
ultimately increase the light emission of such polymers. My work with the group focused on a green-yellow light emitting polymer called F8BT, specifically comparing its emission properties in nitrogen and in air. I found that F8BT emission is not significantly affected by the presence of oxygen and can thus be reliably measured in either environment. The research enabled me to improve my scientific and digital literacy as well as my written and oral communication skills. It helped me consider research as a possible career and it allowed me the chance to form new and strengthen existing relationships with professors, peers, and friends in Glasgow.

This experience was funded by: The Elizabeth and George Frost Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 12

**Abstract: 1025**

**Title: Investigative Intern of Hennepin County Public Defender Office**

**Presenter(s): Jonathan Birgen ’26, Nate Ellis ’24**

The summer of 2023 was spent by both Nate and me working hand-and-hand with Public defenders, paralegals, and Investigators on projects regarding citizens of the county. Along with this, we would spend time observing attorneys in court, while also handing out subpoenas.

This experience was funded by: Trustee Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 12

**Abstract: 1026**

**Title: Warm and Fuzzy Dark Matter during Cosmic Dawn**

**Presenter(s): Malachy Bloom ’24**

Supervisor(s) and affiliation or institution: Sahil Hegde (Graduate Researcher, UCLA), Steven Furlanetto (Professor of Physics and Astronomy, UCLA)

The search for dark matter (DM) lays at the forefront of cosmology, astrophysics, and particle physics and has provided us with a wide catalog of candidate DM models. Apparent problems in each of these fields with the dominant ΛCDM (Λ cold dark matter) picture has reinvigorated interest in exploring models that look beyond the CDM paradigm. To better understand the impacts of various DM paradigms in this era, we employ a semi-analytic model for the formation of population-III (pop-III) and pop-II stars from z~50 to z~6 (roughly 50 Myr to 1 Gyr after the Big Bang). We find that the halo mass functions induced by CDM, warm dark matter (WDM), and fuzzy dark matter (FDM) cosmologies significantly impact pop-III and pop-II star formation rate densities (SFRDs). We present predictions for astrophysical observations such as UV luminosity functions and the brightness temperature of the 21-cm line for these respective DM cosmologies.

This experience was funded by: Marrella Endowed Internship Fund
Presentation time: 5:45 - 6:30 p.m.
Poster number: 13
Abstract: 1027

Title: *Parallel Algebraic Multigrid for Fusion and Higher Order Partial Differential Equations*

Presenter(s): Sophie Boileau ‘24

Multigrid methods play a key role in large-scale scientific simulation because they are among the fastest and most scalable approaches for solving the underlying sparse linear systems of equations that arise from a wide array of Partial Differential Equation (PDE) discretizations. Algebraic multigrid (AMG) is a special type of multigrid method that depends only on the description of the linear system, giving it better portability and broader applicability than geometric multigrid, as it requires no explicit knowledge of the problem geometry. Even though these methods are widely used today, there are still applications where further development is needed. In this poster, we focus on PDEs with higher-order terms, concentrating on a PDE that arises in tokamak edge plasma simulations. Standard AMG methods struggle with the aforementioned higher-order PDEs. We investigate cyclic coarsening and interpolation heuristics, as well as new iterative approximation methods of refining the solution at each grid to improve the existing multigrid approach.

Presentation time: 4:30 - 5:15 p.m.
Poster number: 13

Abstract: 1028

Title: *Interning at Northern Clay Center*

Presenter(s): Mariko Bolton ‘25

For ten weeks this summer, I worked as the Dona Turbes Summer Studio Intern at Northern Clay Center in Minneapolis. My responsibilities as an intern were centered around the kids’ camp programming, specifically loading and firing work made by the campers and packing everything at the end of the week to be picked up. I also mixed clay and performed other studio maintenance tasks in between managing the kilns. I also volunteered as a teaching assistant for the clay camps for the first five weeks.

This experience was funded by: Andy, Kim and Alex Wilson Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 14

Abstract: 1029

Title: *Collection and Analysis of Biological Samples in Hydrothermal Vents*

Presenter(s): Max Borden ‘25

Supervisor(s) and affiliation or institution: Rika Anderson (Associate Professor of Biology, Carleton College)

Creating infection networks from metagenomes of hydrothermal vent samples (Tiny Towers) as part of a multi-year time series project. Using CRISPRs to connect viral and microbial DNA in addition to studying how populations and their genes change over time.
Abstract: 1030

Title: Multifamily Marketing

Presenter(s): James Bradle ’24

Summer 2023 I spent my time learning about the nuances of marketing within the realm of multifamily. Multifamily poses a key challenge to the very framework of marketing in that your ability to target is very limited (if targeting exists at all). This very notion spins marketing upside down (quite literally) and changes the focal point of marketing. Building operations and positioning become so much more important to drive successful marketing.

This experience was funded by: Raymond Plank Chair in Incentive Economics Funding for Internships

Abstract: 1031

Title: BPA modulation of the cytokine environment

Presenter(s): Paloma Bravo ’24

Other Authors/Contributors: Sydney Bieber ’25, Paloma Bravo ’24, Bailey Harmon ’23, Hongshen Wang ’23

Supervisor(s) and affiliation or institution: Debby Walser-Kuntz (Herman and Gertrude Mosier Stark Professor of Biology and the Natural Sciences, Carleton College)

The widespread use of bisphenol-A (BPA) in the mass production of polycarbonate plastics and its presence in surface water and wastewater runoff poses a threat to human and wildlife health. Our lab is interested in BPA’s effect on immune response and wound healing in murine and zebrafish models. Previously, we found that BPA exposure downregulates the expression of a neutrophil-recruiting chemokine in both mice (KC) and zebrafish (cxcl8) and that BPA exposure decreases neutrophil recruitment upon injury. Neutrophils are essential for the removal of damaged tissue and invading microbes, thus facilitating tissue regeneration of the tail fin. We hypothesized that neutrophil recruitment could be tied to regeneration by altering the expression of inflammation- and/or regeneration-related genes. We analyzed the mRNA expression of these genes in zebrafish with and without BPA exposure on 2 and 6 days post fertilization (dpf), and found that BPA exposure altered the cytokine environment in early and late development. We also designed protocols for isolating neutrophils from the bone marrow of C57Bl/6 mice to assess the modulation of these genes by BPA.

Abstract: 1032

Title: Project80 3.0: An Updated Student-Driven Framework for Creating Multimedia Educational Resources from Primary Literature
Presenter(s): Micah Brown ’27

Supervisor(s) and affiliation or institution: Luke De (Project Manager, Meta Reality Labs), Paul Hauser (Science Instructor, The Nueva School)

Conventional high-school pedagogy focuses primarily on teaching codified theory, and doesn’t place an emphasis on current scientific discourse. Project80 is a student-run team that digests high-level current scientific discourse to create nuanced, accessible podcasts for the high-school audience. To evaluate the success of our podcast-creation protocols, we leveraged the action-research paradigm by polling a random sample of students across our institution to assess our podcasts on their “accessibility,” “quality,” and “nuance.” Our initial 21-week protocol (P1) was shown to be somewhat more effective than a revised 6-week protocol (P2). Here, we introduce protocol 3 (P3), a restructured 8-week schedule, allocating more time for the research and storyboarding phases. Our mixed-methods surveying showed significant improvements of P3 over P2 in both qualitative and quantitative metrics, suggesting a protocol of improved efficacy (over P2) and expediency (over P1).

Presentation time: 5:45 - 6:30 p.m.
Poster number: 15

Abstract: 1033

Title: Quinceañera: Past and Present

Presenter(s): Lillian Buchman ’24

The Northfield Public Library hosted an exhibit about the quinceañera, a Latine tradition that celebrates a girl’s transition to womanhood. This exhibit can be described as an extension of public history. Public history is an area of study that exists outside the academic environment; it is a history that is meant to be consumed by the general public. Historically, knowledge has been reserved for those of high status, both in economic and social terms. Public history seeks to deconstruct this tradition and make knowledge accessible to everyone. Thus, public history does not just serve the individual and their personal pleasure, but the larger political and social strata as a collective. It works towards undoing past injustices through education and theoretical reform. Quinceañera: Past and Present (or Quinceañera: Pasado y Presente) gave Northfield community members the opportunity to learn about a fun custom, but furthermore it introduced them to a tradition that originated from a foreign culture and is now celebrated in the United States. Patrons of the library experienced an immersive exhibit that gave them easy access to knowledge they otherwise may not have known where to look for.

This experience was funded by: Eric '85 and Sue Munis '86 Nord Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 17

Abstract: 1034

Title: Impact of Oscillatory Fluid Flow on the BMP2 Signaling Pathway

Presenter(s): Kate Burton ’24

Mechanical loading is an important factor in the regulation of bone metabolism and turnover. Mechanotransduction is the process by which mechanical stimuli being done on a cell are converted to
or induce cell signaling. The \( \text{tgf\beta} \) signaling pathway is well understood as it relates to mechanical stimulation. The SMAD2/3 activates very quickly with mechanical stimulation. There is far less understanding of how the BMP (specifically BMP2) pathway is impacted by mechanical stimulation. Our work aims to provide new insights into the relationship between mechanical stimulation and the BMP2 signaling pathway.

This experience was funded by: Jean Phillips Memorial Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 18

**Abstract: 1035**

**Title: Death in the Margins: On Academic and Civic Engagement with the Resting and the Living**

**Presenter(s): Taia Bush ’24**

Supervisor(s) and affiliation or institution: Jordan Lynton Cox (Assistant Professor of Cultural Anthropology, Mississippi State University), Ubaida Abdallah (PhD Student, Mississippi State University), Kris Gary (PhD Student)

The Brush Arbor Community Engaged Field Program, “examine[d] the use of [the] Brush Arbor Cemetery in Starkville, MS through archival, archaeological, historical, and anthropological work.” Through a three year, cohort-facilitated research process, the program seeks to focus community engagement, decolonial praxes, and cultural heritage preservation as the grounding for future restoration of the cemetery, its history, affiliated institutions, and descendants.

Year one of the research process included extensive network building, GPS mapping, oral history conduction, archival research, and numerous excursions and sessions with partnered scholars. The first research period resulted in completed educational curriculum materials fit for K-12 students, two community dialogues, a news report and connection with descendants of those buried in the cemetery, a complete map of all surface artifacts in the cemetery, and a comprehensive report summarizing the biographical, historical, and geographic information collected during our five weeks.

This experience was funded by: Nini’s Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 19

**Abstract: 1036**

**Title: Long Time, No See! Resilience of Cotton-Top Tamarins' Memory Over a Two-Month Period**

**Presenter(s): Megan Cablk ’25, Liam Kennedy ’24, Maddy LoRusso ’23, Anita Obor ’24, Anka Raicevic ’25**

Supervisor(s) and affiliation or institution: Julie Neiworth (Laurence McKinley Gould Professor of Natural Sciences and Psychology, Carleton College)

We used an object familiarity paradigm to test tamarin monkeys’ memory of items they had seen and explored 2 months ago. In this paradigm, forgetting would engender more exploration of items because they should seem new again. The findings indicated that the monkeys could remember the older
familiar objects and only explored novel objects as compared to familiar ones. More research testing different types of memory over longer periods of time will be used in the future to determine the limits of memory of these aging primates.

This experience was funded by: NIH NIA AREA Grant

Presentation time: 4:30 - 5:15 p.m.
Poster number: 20

Abstract: 1037

Title: Attitudes Toward Mexican Immigrants: The Role of Christian Nationalism and Religiosity

Presenter(s): Huanchen Cai ’24

Supervisor(s) and affiliation or institution: Clara Wilkins (Professor of Psychology, University of Washington)

In the US context, Christian nationalism (CN) consistently predicts negative attitudes toward Latinx immigrants, while the association between religiosity and attitudes toward immigrants is inconsistent. We examined how CN and religiosity predict attitudes in a sample of White Christians who evaluated a prospective immigrant from Mexico who was either Christian or non-religious. We found that regardless of the target’s religion, Christian nationalism predicted more negative attitudes toward the target, while religiosity, operationalized as the importance of participants’ religious faith, predicted more positive attitudes. Our results demonstrate that while the belief that America should be a Christian nation is conflated with the desire to maintain racial and cultural purity, resulting in the rejection of non-White Christians, the strength of personal faith that does not involve connection with a national identity leads to more welcoming attitudes and positive evaluations of Latinx immigrants, including non-religious ones.

This experience was funded by: Kolenkow-Reitz Fellowship and the Class of 1963 50th Reunion Fund for Internships

Presentation time: 4:30 - 5:15 p.m.
Poster number: 21

Abstract: 1038

Title: Looking for Roman Mosaicists From the Ground Up

Presenter(s): Bee Candelaria ’24

Other Authors/Contributors: Jake Morton (Assistant Professor of Classics, Carleton College)

The craftsmen of Roman mosaics are invisible to the historical record. However, their existence is seen in inscriptions, political shifts, and, principally, the mosaics themselves. I examine the network of mosaicists, which changes from being primarily Greek craftsmen (Kondoleon 2018) in the 2nd century B.C. to mainly Italian craftsmen in the 1st century A.D., as Rome politically shifts from Republic to Empire. Inscriptions attest to a network of artisans involved in marble mining, tesserae (“tiles”) manufacturing, and mosaic designing, constructing, and trading. Earlier mosaics, painting-like works of small, colorful, imported tesserae, reflect the Greek influence coming to Rome after annexing Greece in the 2nd century B.C. Once Augustus took sole command of Rome, he championed conservative Roman values, seen in an austere aesthetic combining Romanness with Greek artforms. Mosaics beginning in
the 1st century A.D. exemplify this aesthetic in geometric patterns of black-and-white, large, local tesserae.

This experience was funded by: Mellon Mays Undergraduate Fellowship

Presentation time: 4:30 - 5:15 p.m.
Poster number: 22

Abstract: 1039

Title: The Gridded Pandemic: Understanding Grassroot Party Organ’s Experience During the Zero-Covid Campaign

Presenter(s): Kristoff Cao ’25

Other Authors/Contributors: Jiaqi Liu ’25 (transferred to Johns Hopkins University)
Supervisor(s) and affiliation or institution: Huan Gao (Assistant Professor of Political Science, Carleton College)

For the past three years, the CCP has pursued policies that aim to contain the spread COVID-19 pandemic in absolute terms, known as the Zero-COVID campaign, which includes frequent use of city-wide lockdowns, mass testing, and many other draconian measures. This project aims to further explore and analyze how China’s Zero-COVID policy was implemented on a grassroots level, focusing on street-level and sub-street level governments’ experience in responding to COVID-19. We conducted fieldwork in the cities of Shanghai and Suzhou respectively, acquiring rich qualitative data through participation observation as well as informal interviews with local staff. We found that the street level and sub-street level (i.e. residential committees) had characteristically different experiences regarding the enforcement of Zero-COVID policies, demonstrating the “fragmented authoritarianism” and challenging the conventional perception that Zero-COVID power is monolithic. Our first-hand experience also provides insights for further research on residential committees’ relative capacity and autonomy.

This experience was funded by: The Chang Lan Fellowship

Presentation time: 4:30 - 5:15 p.m.
Poster number: 23

Abstract: 1040

Title: Interning In Juvenile Court

Presenter(s): Ryan Cechini ’25

This summer I spent about two months with Judge Manning ’96 interning in his juvenile court. My poster displays what I did, what I learned, and what I took away from the experience.

This experience was funded by: Jean Phillips Memorial Internship Fund
Presentation time: 4:30 - 5:15 p.m.
Poster number: 116

Abstract: 1041

Title: The Ethics of Paternalism
Presenter(s): Ryan Cechini ’25

Paternalism occurs in cases where one actor does something for the benefit of another in a way that limits or hinders that other person’s freedom or agency. These situations are all around us; drug bans, helmet laws, and distribution requirements to graduate from college are all examples of paternalism. The questions that then arise are when and why, if at all, are such interventions in someone’s agency justified? Over the course of my fellowship, I researched different philosopher’s takes on the matter and have constructed a poster to outline the most common positions taken on the matter and the subsequent complications that follow from each.

This experience was funded by: Dale ’60 and Elizabeth Hanson Fellowship in Ethics

Presentation time: 4:30 - 5:15 p.m.
Poster number: 117

Abstract: 1042

Title: Investigating the Effects of Positive Feedback on Gender-Based “Brilliance” Acquisition and Self-Efficacy in Children

Presenter(s): Ben Chamberlain Zivsak ’24

Gender stereotypes related to academic performance and cognitive abilities begin to develop as early as age 6 in both boys and girls. Across cultures, males, but not females, are associated with “brilliance,” or the high-level intellectual ability assumed necessary for STEM fields. This stereotype may influence women’s pursuit of and engagement with STEM-related careers and disciplines. This study uses performance-based positive feedback to explore the underpinnings of the STEM gender gap in 5 and 7-year-olds while examining “brilliance” acquisition and self-efficacy by providing difficulty and interest choices for math and reading activities. We found preliminary evidence that acquisition of the "brilliance" stereotype develops between 6-7 years of age for girls, that difficulty choices in academic activities is not entirely mediated by positive feedback, and that self-efficacy is dependent on age with a decrease in positive academic-related performance perceptions from 5 to 7 years of age. Our findings suggest an increasing role of social factors on academic-related self-concept as children get older and that, while positive feedback may be a powerful behavioral motivator, there are likely other mechanisms including parent-child interactions and stereotype integration by which the STEM gender gap develops and is perpetuated.

This experience was funded by: Jackson and Warren Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 24

Abstract: 1043

Title: Financial Representative Intern at Northwestern Mutual

Presenter(s): Miriam Chasnov ’25

Over the summer, I was a Financial Representative (FR) Intern at Northwestern Mutual. As an economics major, I wanted to gain exposure to the financial industry and increase my knowledge of tax-conscious planning. Though I did not know what to expect, I figured I would at least learn about managing my
personal financial life. Ultimately, I've gained more from this experience than I predicted. The premise of the internship is to work towards building your book of business by starting with your existing network and getting referrals from there. Through having meetings and interacting with other FRs in the office, interns can increase their knowledge of offensive and defensive planning strategies while interacting with increasingly complex cases. Overall, this summer, I have learned so much about financial planning, witnessed the value of networking, and better appreciate workplace culture as something I will value in my future career.

This experience was funded by: Multicultural Alumni Network (MCAN) Fellows Program

Presentation time: 4:30 - 5:15 p.m.
Poster number: 25

Abstract: 1044

Title: Parasite Loads Vary by Reproductive Score in Threespine Stickleback

Presenter(s): Amy Chen ’24, Cate Patterson ’23

Other Authors/Contributors: Shira Dubin ’25, Gwen Casey ’25
Supervisor(s) and affiliation or institution: Amanda Hund ’10 (Visiting Research Assistant Professor of Biology, Carleton College), John Berini (Postdoctoral Fellow in Ecology and Evolution, Carleton College)

The tapeworm parasite Schistocephalus solidus has a complex, multi-host life cycle that includes threespine stickleback fish, copepods, and common loons. Parasite, landscape, and limnological data was collected this past summer across 47 different lakes on Vancouver Island to investigate questions such as why do some organisms get sick while others stay healthy? Why does the amount of disease change across space or between populations? How do hosts and parasites evolve together? Data on immune response, worm and fish mass, and other parasites present were also collected in the stickleback, but this current research is specifically focused on investigating: how does the S. Solidus load vary as a function of reproductive score? It was found that there is parasite load variation between males only, females only, and males and females combined. These findings provide insight on how S. Solidus can affect the stickleback’s ability to survive, grow, and reproduce.

This experience was funded by: NSF-EEID Grant

Presentation time: 5:45 - 6:30 p.m.
Poster number: 16

Abstract: 1045

Title: Information Security at SYSCOM

Presenter(s): Lyn Chen ’26

I worked as an Assistant Information Security Engineer at Syscom Computer Engineering Co. in Taipei, Taiwan. As an intern at Syscom, I learned to use Threat Simulator, a BAS, Nessus, a vulnerability scanner, and Metasploitable, and used Threat Simulator to test WAFs, EDRs, and firewalls from a few vendors. I then demonstrated how to use Threat Simulator and justified the specific simulations I used to test the aforementioned security tools in a 30 minute presentation to the president of Syscom, a senior VP/CDDO of Yuanta Financial Holdings, and a few other coworkers and superiors.
This experience was funded by: Chang-Lan Endowed Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 26

**Abstract: 1046**

**Title: Plan For Every Project (PFEP)**

**Presenter(s):** Jasmine Choi ’24

This summer I did supply chain data analysis with Daikin Applied in Faribault, MN. My co-intern and I worked with different departments to gain perspectives and experiences for our project, which was presented to our supervisors and managers. Our project was called Plan for Every Part and the objective was to make a data tool that allowed the company to find the most efficient way every part is used, stored, and ordered, which can lead to maximizing profits. I did data collecting/research in my office but also worked in the warehouse to see where actual production happened. Our main focus was to do data collection on fans and furnaces because we had an excess supply of these products and they are extremely expensive to keep and take up space in the warehouse.

This experience was funded by: Multicultural Alumni Network (MCAN) Fellows Program

Presentation time: 5:45 - 6:30 p.m.
Poster number: 17

**Abstract: 1047**

**Title: EYL Internship**

**Presenter(s):** Woohyeok Choi ’26

EYL is a company that uses quantum technology to extract entropy from a radioactive element called americium, then generating quantum random numbers based on the entropy. They also develop security related products by applying their quantum random numbers. During my intern, I was able to learn raw socket programming and applying the quantum random numbers in raw socket programming to enhance security protocols.

This experience was funded by: Dolores D. Oswald ’46 and Hanan D. Wedlan Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 27

**Abstract: 1048**

**Title: RoboCup and IYRC: Exploring Professional Robotics in Taiwan**

**Presenter(s):** Dorothy Si-Jhen Chou ’25

Delta Technology Industries Ltd. is an educational engineering organization based in Taipei, Taiwan. Its goal is to teach robotics from the basics and prepare them to compete in international robotics competitions. For a seven-week internship, I was an Assistant Coach at DRTM for the RoboCup Soccer Junior and International Youth Robotics Competition. I introduced the students to various programming languages and oversaw their progress for the competitions in July/August. Furthermore, I volunteered at
RoboCup 2023 in Bordeaux, France, and gained valuable insight into the professional robotics world. As a coach and a volunteer at Robocup 2023, my key lessons were the significance of communication and flexibility to adapt lesson plans to students’ capabilities.

This experience was funded by: Jean Phillips Memorial Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 28

Abstract: 1049

Title: *Interner at Slingwave, Inc.: Working Within a Marketing Analytics Startup*

Presenter(s): Evan Christensen ’24

I worked as a data analyst intern supporting critical infrastructure and client deliverables for Slingwave’s Agile Marketing Attribution and Data-Driven Media Execution suite of capabilities. I played a role in the development and evolution of reporting solutions and data visualization, and worked in collaboration with the senior team at Slingwave. Specifically, I worked on creating and optimizing SQL queries, creating data visualizations, researching tools which could be used in the future, performed basic market research, and filled in on other tasks as required.

This experience was funded by: Robert E. Will ’50 Endowed Internship Fund in Social Entrepreneurship

Presentation time: 4:30 - 5:15 p.m.
Poster number: 29

Abstract: 1050

Title: *Land Access, Community, and Environmental Stewardship at Sharing Our Roots Farm*

Presenter(s): Luisa Cichowski ’24

This summer I had the opportunity to intern at Sharing Our Roots, a nonprofit organization in Northfield. Sharing Our Roots owns over one hundred acres of farmland which they lease in parcels at a highly subsidized price to emerging and immigrant sustainable farmers hoping to build their businesses. Sharing Our Roots also connects these farmers to resources and educational materials. The farm itself operates as a site of community and learning for sustainable agriculture because Sharing Our Roots’ farmers work in such close proximity to one another. As an intern, I sent most of my time assisting Sharing Our Roots’ leadership team with tasks that had to happen on the farm. I spent a lot of time helping them manage the property — mowing shared spaces to keep the farm tidy and weeds out of the farmers’ fields, weeding and mulching the organization’s perennial crops like elderberry and hazelnut, fixing and organizing equipment, and mitigating thistle in their prairie restoration field. Overall I really enjoyed my internship this summer and feel like I got a lot out of it. More than anything, I am grateful for the connections I made with Sharing Our Roots staff members, who are all such generous, caring, intelligent people and taught me so much.

This experience was funded by: Robert E. Will ’50 Endowed Internship Fund in Social Entrepreneurship

Presentation time: 4:30 - 5:15 p.m.
Poster number: 30
Abstract: 1051

Title: Improving Electron Diffraction Methods by Accounting for Beam-Induced Lattice Reorientation

Presenter(s): Arden Clauss '24

Supervisor(s) and affiliation or institution: Jose Rodriguez (Professor of Biochemistry, UCLA)

Electron diffraction presents a new approach to the determination of high-resolution bimolecular structures. Atomic resolution structures determined from microcrystals by electron diffraction (MicroED) offer new perspectives into biochemical processes such as the conformation and binding behaviors at inhibitor-enzyme interfaces. More facile diffusion and lower crystal size thresholds present significant advantages over analogous x-ray diffraction (XRD) methods. However, analysis of fine details is greatly limited by lower data quality and higher errors than in XRD. We hypothesize that identifying and accounting for conventionally overlooked limiting phenomena will lead to more accurate resolution of interesting structural qualities of molecules. We studied a variation in diffraction patterns consistent with a changing orientation of the crystal lattice induced in stationary crystals by incident electrons. The results of this analysis will present a roadmap for improvement of MicroED data and the more accurate determination of biologically relevant molecular structures.

This experience was funded by:

Presentation time: 5:45 - 6:30 p.m.
Poster number: 18

Abstract: 1052

Title: Vermont: Income and Obligation Support During the COVID-19 Pandemic

Presenter(s): Suwannee Conroy-Baarsch '26

Other Authors/Contributors: Manoka Kozaki '26, Andy Yang '24, Elsa Snowbeck '25, Brayden Stark '24, Eric Yuan '25.

Supervisor(s) and affiliation or institution: Juan Diego Prieto (Oden Postdoctoral Fellow in Political Science and International Relations, Carleton College)

This research project focused on examining state-level initiatives in the United States that provided economic support or obligation relief during the COVID-19 pandemic. Using data compiled by Oxford and additional research surrounding public policies and programs, we reviewed and revised the coding levels for social welfare support during the years of 2020 and 2021. These coded levels were then peer-reviewed across the research group before being used in statistical analysis. From that analysis, several case studies were chosen in order to examine the level of support given in different states and to look for reasons why there were differences in the policies enacted. The case study presented here, on Vermont, looks at the specific policies (and the reasonings behind them) of a generous state with a horizontally divided government. Through both economic support and obligation relief, the implementation of policy was often accompanied by calls for unity and solidarity while retrenchment actions were justified by a desire to return to normalcy and for residents to return to work. Vermont additionally had unique justifications for some of its policies, including a forward thinking look in which new policies were implemented with the intention of them making it easier for people to return to normal later on.

This experience was funded by: Humanities Center
Abstract: 1053

Title: Impact of Fructose Consumption on Liver Function

Presenter(s): Caroline Crampton

Studies have demonstrated that ingesting high fructose corn syrup results in an increase in fat deposits and inflammation in your liver. Fructose overconsumption can result in a variety of metabolic disorders, including non-alcoholic fatty liver disease (NAFLD), where there is an excessive accumulation of fat in the liver. If left untreated, NAFLD can progress to nonalcoholic steatohepatitis (NASH), characterized by increased hepatic inflammation, fibrosis, and immune cell infiltration. Understanding the mechanisms involved in the metabolism of fructose and the role it plays in producing an inflammatory phenotype and the onset of fatty liver disease can help scientists develop ways to prevent and treat similar metabolic disorders.

This experience was funded by: Eugster Endowed Student Research and Internship Fund

Abstract: 1054

Title: Investigating the role of β-tubulin post-translational phosphorylation on chromosome segregation fidelity

Presenter(s): Natalia Crimmel ’24

Cell division is a process central to life that requires proper chromosome segregation. Dynamic filaments called microtubules bind to kinetochores on chromosomes to facilitate cell division, and errors in this mechanism can lead to birth defects and cancer. However, much remains unknown about microtubule-kinetochore interactions and the essential residues of microtubules. In this project, mutagenesis was used to investigate the role of phosphorylation sites on β-tubulin, one of two tubulin subunits. Phosphorylation affects the charge, and therefore interactions, of a residue, but β-tubulin phosphorylation has been poorly characterized. The GalS-GalS system, a novel method of tubulin overexpression to investigate mutants, was used to study phosphorylation sites. Phosphomimics and phosphonulls of potential β-phosphorylation sites were created, and viability assays and spindle length were used to study phenotype. One mutant, S56D-S63D, was lethal when expressed in yeast cells but showed a normal spindle length, suggesting these residues might play an essential role in microtubule-kinetochore interactions.

This experience was funded by: Eugster Endowed Student Research and the Office of the Provost
**Abstract: 1055**

**Title:** Parental, Academic, and Societal Influences on Chinese Adolescents Mental Health

**Presenter(s):** Linzhu (Anna) Cui ’24

I was a research assistant at The China Collaborative Innovation Center for Basic Education Quality Monitoring for 8 weeks, during which I assisted in the design of the research, modification of the questionnaires, and data collection.

This experience was funded by: Chang-Lan Endowed Fund

**Abstract: 1056**

**Title:** Curbs, Compost, and Contentment!

**Presenter(s):** Ella Cunningham ’24

This summer I interned with Curbside Compost Cooperative where I learned all about composting, local climate change solutions, and activism in and around Northfield.

This experience was funded by: Class of 1964 Endowed Internship Fund

**Abstract: 1057**

**Title:** Studying Ellipsis with Indonesian Syntax

**Presenter(s):** Maika Danford ’24

Other Authors/Contributors: Cati Fortin (Associate Professor of Linguistics, Carleton College)

This summer we focused on gathering linguistic data for an ongoing study on Indonesian ellipsis. Ellipsis is a syntactic phenomenon where a repetitive segment of a sentence is assumed to be deleted, but still accessible to the speaker. For example, in the sentence “Mary ate more cookies than Mark,” there is an elided “ate cookies” after “Mark.” We first familiarized ourselves with the existing literature on this kind of ellipsis and past experiments done with corpora. After finding a compatible corpus for our research, we processed it and organized it. The corpus we used was from the Leipzig Corpora Collection, which uses wikipedia entries. We are currently in the process of manually combing through 7500 sentences of Indonesian to find examples of ellipsis. For future research we will analyze the data we collected and form hypotheses about the structure of ellipsis in Indonesian.

This experience was funded by: Humanities Center
Abstract: 1058

Title: Communing with Others in Alaska's Southeast

Presenter(s): Ella Daniels-Koch ’25

I volunteered at the Tidelines Institute, an academic program in southeast Alaska. My role mainly consisted of tending the campus garden, which fed students, staff and community members. However, I also cooked, worked maintenance, painted, and did other various necessary tasks. I was also lucky enough to go on some adventures with students and staff, despite just being a volunteer. Over time, I felt a part of the community. This experience reinforced my belief of community as being one of the most important things humanity takes part in.

This experience was funded by: Wiebolt Endowed Internship Fund

Abstract: 1059

Title: Investigating the Function of of Arginine Methylation at Mutated Sites of the IBiD Domain of the CBP by CARM1

Presenter(s): Nicole Dawson ’26

DLBCLs (Diffuse Large B-Cell Lymphomas) are a common form of lymphoma that affects older people. This work examined the mechanisms surrounding the activation of transcription to better understand DLBCLs. CREB Binding Protein (CBP), encoded by the CREBBP gene, along with another protein, P300, encoded by EP300, are co-activators necessary for the activation of transcription that is frequently mutated in DLBCLs. Because methylation is an important mechanism for transcription processes, we investigated the role of Co-activator Associated Arginine Methyltransferase 1 (CARM1) which is known to methylate arginine residues in CBP. Two arginine to lysine point mutations in the IBiD domain of CBP were prepared and experiments to characterize the effects of these changes on methylation and subsequent transcription activation have begun.

Abstract: 1060

Title: Bernard Williams on Morality and Alienation

Presenter(s): Micah Day-O’Connell ’25

Supervisor(s) and affiliation or institution: Daniel Groll (Professor of Philosophy, Carleton College)

Does studying ethics really make you a better person? Can it make you worse? Framing choices in terms of strict and unchanging moral principles can often separate us from everyday non-moral concerns, like
personal integrity and interpersonal relationships - an effect referred to as "moral alienation". Bernard Williams and other moral philosophers in the late 20th century saw alienation as a foundational objection to way we do moral philosophy. This project investigates the work of Williams and other recent virtue ethicists that seek to challenge the alienating aspects of morality, and consider new possibilities for ethical language and decision making.

This experience was funded by: Hanson Ethics Fellowship

Presentation time: 5:45 - 6:30 p.m.
Poster number: 120

Abstract: 1061

Title: Cultivating Creativity: Reflections on a Graphic Design Internship

Presenter(s): Seven Delgado ’24

Through BrandLab, a non-profit helping marginalized students, I interned this summer with Periscope as their art director. Over a span of 10 weeks, I got hands-on experience creating graphics, concepting ideas for videos, and executing productions among other things related to the marketing industry.

This experience was funded by: Multicultural Alumni Network (MCAN) Fellows Program

Presentation time: 4:30 - 5:15 p.m.
Poster number: 34

Abstract: 1062

Title: Characterizing Mutations in Human Mitochondrial Alanyl Aminoacyl-tRNA Synthetases

Presenter(s): Spencer Delle Fave ’25, Jemsy Mathew ’25

Supervisor(s) and affiliation or institution: Joe Chihade (Professor of Chemistry, Carleton College)

The human AARS2 gene codes for the human mitochondrial alanyl tRNA synthetase—enzymes that are crucial for the proper translation of mitochondrial proteins containing alanine. Mutations in AARS2 can result in clinical conditions of varying severities, including infantile cardiomyopathy, leukodystrophy, and ataxia. We are interested in why different mutations in AARS2 result in different disease phenotypes. This summer we explored the correlation between the thermal stability of four mutant proteins that have clinical manifestations of different severities.

This experience was funded by: Department of Chemistry and the Office of the Provost

Presentation time: 5:45 - 6:30 p.m.
Poster number: 23

Abstract: 1063

Title: Global Sensitivity Analysis

Presenter(s): Theo Demetriades ’26
Supervisor(s) and affiliation or institution: Deepak Bastola (Visiting Assistant Professor of Statistics, Carleton College)

In this project we are concerned with identifying the most important variables (parameters) to the variance of a given response variable. To this end, we use global sensitivity analysis, in the field of uncertainty quantification. The literature has provided us with several different GSA measures and indices, two of which we explore in depth: the Shapley Effects and Proportional Marginal Effects. The strengths and weaknesses of each are then discussed in the context of a real-world example.

This experience was funded by: Department of Mathematics and Statistics and the Office of the Provost

Presentation time: 4:30 - 5:15 p.m.
Poster number: 35

Abstract: 1064

Title: *Late-flowering asters (Symphyotrichum oolentangiense) escape pre-dispersal seed predation but maintain successful pollination*

Presenter(s): Lara Dominguez ’25, Linnea Williams ’26

Supervisor(s) and affiliation or institution: Mark McKone (Towsley Professor of Biology, Carleton College)

Asters (*Symphyotrichum* spp.) are among the latest species to bloom in prairies. Such late flowering could reduce pollinator success, but also allow escape from specialist pre-dispersal seed predators. We compared the success of marked flower heads of *S. oolentangiense* that opened early versus late in the in the flowering season in 2022. After flowering, heads were collected and dissected to assess seed predation and pollination success. Seed predation was heavy, mostly from larvae of case-bearer moths (*Coleophora*). Percent of heads with insect damage dropped from 54.5% to 24.5% between early and late flowering, while individuals seeds predated by insects dropped from 27.8% to 9.2%. There was no difference in the percent of pollinated seeds across the same time period. These results support our hypothesis that late flowering plants can avoid seed predation with little reduction in pollination, establishing seed predation as the primary selective pressure toward later flowering.

This experience was funded by: William Muir Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 24

Abstract: 1065

Title: *Individual Cerebellar Granule Cell Activity Changes as Mice Learn Reward Timing*

Presenter(s): Luke Drake ’25

Supervisor(s) and affiliation or institution: Mark Wagner (Stadtman Investigator, National Institute of Neurological Disorders and Stroke, NIH)

We conducted a computational analysis of cerebellar granule cells in mice using two-photon microscopy to investigate their activity during associative learning. Water-restricted mice were trained to perform a lever-pushing task, receiving water rewards one second after task completion. Over a week, we imaged
the same cerebellar region daily, focusing on the one-second delay period preceding water delivery. As mice learned the task, they increasingly predicted water arrival, consistent with previous findings. Analyzing individual cells across consecutive days revealed no consistent daily trends in anticipatory responses. However, examining the entire week, a distinct subset of cells exhibited anticipatory signals. Notably, while the average anticipatory response activity remained constant, cells displayed longer periods of sustained activity over the one-second interval, indicating increased signal uniformity as learning progressed. Our findings illuminate the complex dynamics of granule cell responses during associative learning, highlighting non-linear changes and suggesting specific cell subsets contribute to anticipatory behaviors.

This experience was funded by: Trustee Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 25

Abstract: 1066

Title: Simulating the HD 163296 Planet-Forming Disk

Presenter(s): Gabe Driscoll '24

Other Authors/Contributors: Jake Schaefer '26
Supervisor(s) and affiliation or institution: Evan Rich (Professor of Practice, University of Nebraska)

The star HD 163296 is surrounded by a disk of dust and gas. The disk contains features which suggest the presence of young planets; an understanding of the disk structure is therefore desirable for developing theories of planet formation. We generate computer simulations of the disk structure and component dust grains to place constraints on the system. Our results suggest a linear relationship between disk height and radius and a grain size on the order of 10 nanometers.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 26

Abstract: 1067

Title: Forest Composition Influences Bird Diversity

Presenter(s): Shira Dubin '25

Other Authors/Contributors: Amy Chen '24, Cate Patterson '24, Gwen Casey '25
Supervisor(s) and affiliation or institution: John Berini (Postdoctoral Fellow in Ecology and Evolution, Carleton College), Amanda Hund '10 (Visiting Research Assistant Professor of Biology, Carleton College)

The tapeworm parasite Schistocephalus solidus has a complex, multi-host life cycle that includes threespine stickleback fish, copepods, and common loons. Parasite, landscape, and limnological data was collected across 47 different lakes on Vancouver Island to investigate questions such as why do some organisms get sick while others stay healthy, why does the amount of disease change across space or between populations and how do hosts and parasites evolve together? Looking at anthropogenic influences on bird communities across the island, such as lake’s distance to a road, forest age, and forest type (diversity), we found that forest composition influences bird diversity, while distance to roads had no effect. However, most roads on Vancouver Island are infrequently used and likely have a negligible effect on bird communities as a result.
Abstract: 1068
Title: Workers’ Rights and Labor Organizing at Colorado Jobs With Justice
Presenter(s): Julia Dunn ’25

This summer, I participated in the Colorado College Summer Activist Institute, an internship program that enables students to engage in activist and/or advocacy work. Through this program, I worked with Colorado Jobs with Justice, a non-profit community organization that focuses on labor rights and union organizing. In my role, I helped generate interest in CoJWJ’s “Know Your Rights” presentation through canvassing visits to construction sites and food banks, as well as filled out wage theft intake forms to collect case information from potential victims. This experience was invaluable as it offered me hands-on experience in community organizing and the grassroots struggle for justice, one which will be useful as I seek to further pursue a career in social change work.

This experience was funded by: John ’55 and Bonnie Raines Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 36

Abstract: 1069
Title: Modeling Uncertainty in Spatial Data
Presenter(s): Collin Eldridge ’25, Samantha Sheridan ’24

Supervisor(s) and affiliation or institution: Claire Kelling (Assistant Professor of Statistics, Carleton College)

Data providers often anonymize spatial data, consisting of geographical coordinates, by randomly moving each point with a process known as “jittering”. Geocoding, or the process of converting addresses to coordinates, can also unintentionally result in positional errors in the resulting point locations. The processes of jittering and geocoding can result in typical statistical models being inaccurate when the data is treated as original. Our research seeks to understand the nature and effects of these kinds of uncertainty, and we account for these effects within the statistical models. We also reviewed and implemented privacy evaluation metrics used by previous spatial statisticians in order to compare radial perturbation — a commonly used jittering method — with “constrained jittering,” an alternative jittering method introduced by Professor Claire Kelling. Finally, we implemented Professor Kelling’s constrained jittering method using the R programming language and compiled our work into an R package.

This experience was funded by: The Towsley Endowment and the Kolenkow-Reitz Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 28
Abstract: 1070

Title: Refugee Resettlement: Summer Internship at the International Institute of Minnesota

Presenter(s): Grace Enz ’26

I interned at the International Institute of Minnesota in the refugee resettlement department. Specifically, I worked in the vulnerable populations division to set up medical appointments, research public housing options, apply for insurance benefits, complete intake assessments, and create case files. I gained insight into the experiences of New Americans and the challenges they face. This internship will help prepare me for a future career in public service where I hope to work with diverse communities either in the United States or abroad.

This experience was funded by: Barbara A. Will ’70 Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 37

Abstract: 1071

Title: What We Can Learn from French College Admissions Data

Presenter(s): Albert Ezem Osakwe ’25

Pantheon-Assas University is a French university with over 23000 students. Every year, French students apply to this university (and others) through Parcoursup, a web platform for college applications (like Americans with the Common App). In this project, Parcoursup data was used to gain insights into student applications, specifically which academic, socioeconomic, or geographic factors correlated with a student’s capacity to succeed in university, noting if there is a correlation between non-academic factors and a student's grades in French (oral and written).

This experience was funded by: Abeona Endowed Fund for International Internships

Presentation time: 4:30 - 5:15 p.m.
Poster number: 38

Abstract: 1072

Title: Segmental Labeling of Large Disordered Proteins using Sortase A

Presenter(s): Julian Flanagan ’27

Intrinsically disordered regions (IDRs) are regions within protein that lack a single defined 3D structure. While these regions are important for protein function, their instability and dynamic nature make them difficult to characterize. This summer, I helped to develop a method for NMR analysis of disordered proteins using N15 segmental labeling. We used a sortase-mediated ligation technique to join labeled and unlabeled fragments of dematin, a cytoskeleton protein in red blood cells.

Presentation time: 4:30 - 5:15 p.m.
Poster number: 39
Abstract: 1073

Title: The Anne Boleyn Illusion: Multisensory Integration, Somatotopic Remapping, and Body Schema Manipulation

Presenter(s): Isabel Folger ’24

Supervisor(s) and affiliation or institution: Jared Medina (Associate Professor of Psychology, Emory University)

In the Anne Boleyn illusion, an individual’s hands are placed on either side of a right-facing mirror and stroked synchronously from the thumb to the empty space neighboring the reflected fifth finger, creating the perception of a supernumerary finger. The hidden fifth finger is stroked on the medial and lateral sides, which is thought to enable the remapping of touch onto the fifth and “sixth” finger on the somatotopic map. The percept induced is robust enough to withstand biologically implausible manipulations that break other visuotactile illusions, making the illusion a promising avenue for exploring multisensory integration and illusory embodiment. The present study investigates three aspects of its underlying cognitive mechanisms. First, although embodiment was theorized to require tactile stimulation of two discrete fifth finger locations, we found that stroking only one location does not abolish the illusion or significantly reduce it. Second, we examined location-dependent top-down influences of body representations on illusory body part type. Stroking from the elbow or wrist enhanced embodiment of an extra arm or finger respectively, while the forearm supported both types. Thus, stroking from a synovial joint constrained embodiment compared to non-joint starting locations, suggesting that stored information about body parts modulates the qualia of embodiment. Third, identifying factors underlying the illusion’s robustness will enhance our understanding of illusory embodiment mechanisms, and we hypothesized that the sixth finger’s proximity to the real hand may be the critical distinction. While the data did not show a proximity effect, they extend the known scope of the illusion’s durability.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 29

Abstract: 1074

Title: From Confusion to Clarity: ChatGPT and R for Academic Advising

Presenter(s): Ty Folks ’25

Supervisor(s) and affiliation or institution: Adam Loy (Associate Professor of Statistics, Carleton College)

This summer, we developed a web application in R Studio to help mathematics and statistics majors, and their advisers navigate the department’s webpage to answer common questions. To do this, we built a R Shiny interface to ChatGPT. We scraped and cleaned data from the Carleton College Mathematics and Statistics webpage and used this as the reference text for the questions submitted to ChatGPT 3.5. In addition to creating the web application, I investigated web accessibility standards, the ethical use of A.I., future A.I. applications, and how large language models like ChatGPT really work.

This experience was funded by: NSF LSAMP Grant

Presentation time: 5:45 - 6:30 p.m.
Poster number: 30
Abstract: 1075

Title: Chines Medicine

Presenter(s): Taaja Foster ’24

Other Authors/Contributors: Shaohua Guo (Associate Professor of Chinese, Carleton College)

In China, during the Covid-19 epidemic, Chinese Traditional Medicine (CTM) was used at every stage, from prevention to treatment, in the battle against the disease. The history of the practice dates back thousands of years, yet still accounts for around 40% of the health care delivered in modern China. With the government of China having a continued interest in promoting policies to further develop CTM, one wonders how the average Chinese views the practice. We can see the general perception tends towards positivity in relation to CTM. There is evidence of some age bias but general consensus in perception.

This experience was funded by: Chang Lan Fellowship

Presentation time: 4:30 - 5:15 p.m.
Poster number: 40

Abstract: 1076

Title: Summer Internship at Boston Outdoor Preschool Network

Presenter(s): Anna Frankel ’24

This summer I had an internship at the Boston Outdoor Preschool Network in Wellesley, MA. BOPN is a nature-based preschool with multiple locations in the Boston area. Children at BOPN learn through exploring and playing in the natural world. My primary role in the toddler class I worked in was to ensure the kids safety as they engaged in their environment. Common activities included digging in the dirt, climbing logs, playing in puddles, throwing rocks in the river, reading books, and doing arts and crafts. Through this experience, I witnessed what learning can look like in a non-traditional setting.

This experience was funded by: Class of 1970 Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 41

Abstract: 1077

Title: Characterization of Atmospheric Aerosols from Consumer Products in New York City

Presenter(s): Teddy Friedman ’24

Other Authors/Contributors: Jeewani N. Meepage (University of Iowa), Josie K. Welker (University of Iowa), Saeideh Mohammedi (University of Iowa)

Inhalation of pollutant aerosol compounds is linked to the onset of numerous human health risks including COPD, cancer, and pneumonia. Oxidized volatile methylsiloxanes (oVMS) are a particular type
of compound found in aerosols with a diameter of 2.5 microns (PM2.5). They are formed via precursor compounds (most commonly D5) often found in household and industrial products (deodorants, hairsprays, car cleaners, inks, etc.) participating in oxidation reactions with other atmospheric compounds. To assess the presence and concentrations of these compounds, aerosol samples were collected in New York City, a location where aerosol compounds are thought to exist in large concentrations. Lab-grade D5 was additionally oxidized in an oxidation flow reactor (OFR) to determine which oVMS products may be created in a lab setting compared to a field setting in NYC. After extraction of both the NYC and OFR samples, electrospray ionization-mass spectrometry (ESI-MS) was then performed on the samples and analyzed to determine the molecular formulas of possible oVMS products. 15 formulas were generated within the specific criteria of the compound discover software. 13 possible structures were generated as a result, with 8/13 being present in only the NYC air sample and 5/13 being present in the OFR sample. Those present in both samples were oVMS products of cyclic volatile methylsiloxane precursors. Those present in only the NYC sample stemmed from both linear and cyclic precursors. This indicates that both linear and cyclic oVMS products exist airborne in NYC air samples, though their concentrations remain unknown.

Presentation time: 4:30 - 5:15 p.m.
Poster number: 42

Abstract: 1078

Title: Magnetic Configuration in Mesoscale Magnetic Dots

Presenter(s): Grace Gatewood ’24, Charlie Ruppe ’26

Other Authors/Contributors: Petros Van den Heuvel ’25
Supervisor(s) and affiliation or institution: Barry Costanzi (Assistant Professor of Physics, Carleton College)

At length scales around 100’s of nm, the magnetostatic and exchange interactions compete to create unique magnetic configurational states in ferromagnets. We have previously used Anisotropic Magnetoresistance (AMR) to probe the configuration of square Permalloy (Ni80Fe20) dots of side length 200-250 nm and thickness ~10 nm, but AMR has limitations which prevent precise measurements in dots below 200 nm. Giant Magnetoresistance (GMR) would provide an increase in signal strength and angular resolution, providing a remedy to these issues. However, GMR requires a larger number of deposited materials than AMR, necessitating a custom sputter chamber where we have control over all sputter materials available. Our current efforts focus on transitioning to an in-house sputter chamber that will allow us to begin producing AMR and eventually GMR dots at Carleton.

This experience was funded by: The Clinton Ford Research Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 43

https://docs.google.com/presentation/d/1XaoodtaAiRXsDECN2mEGvHDmb7RrX18Y4ZjRsZGB24Q/edit#slide=id.p

Abstract: 1079

Title: Summer Research Partnership in Cinema and Media Studies. The Wandering House ~ Sonic Archive
Presenter(s): Jeremy Gautama ’26, Drew Rodriguez-Michel ’25

Supervisor(s) and affiliation or institution: Cecilia Cornejo (Lecturer in Cinema and Media Studies, Carleton College)

In the realm of unedited testimonials, our team embarks on a transformative journey in the realm of audio editing. Armed with the tools of the trade, including Premiere Pro and Final Cut, we masterfully bridge audio channels, deftly trim lingering silences, and artfully harmonize pacing. Throughout this process, our unwavering commitment is to preserve the authentic voices that resonate within each testimony, shaping them into precious gems for the Sonic Archive.

Presentation time: 4:30 - 5:15 p.m.
Poster number: 44

https://sonicarchive.thewanderinghouse.com/

Abstract: 1080

Title: Molecular Dynamics Study of Cation Sites in Zeolites

Presenter(s): Katherine Geist ’24

Supervisor(s) and affiliation or institution: Daniela Kohen (Professor of Chemistry, Carleton College)

Zeolites are microporous crystalline aluminosilicate materials that are available in a variety of structures and chemical compositions and have a high degree of stability. Due to their porous nature and the presence of extra-framework cations, zeolites have the ability to selectively adsorb and store gases within their framework, opening the door to a plethora of industrial applications. Our research uses computational chemistry to investigate the role that extra-framework cations play in selective adsorption with the hope of being able to better characterize adsorption and synthetically design zeolites tailored for carbon capture industrial applications.

This experience was funded by: NSF Grant

Presentation time: 5:45 - 6:30 p.m.
Poster number: 31

Abstract: 1081

Title: Carving Out Space: Freedom and Property of POC in Early America

Presenter(s): Riley Gibson ’26, Ambar Galaviz ’26

Supervisor(s) and affiliation or institution: Serena Zabin (Professor of History, Carleton College)

This summer, we worked with Professor Serena Zabin from the History department on a new project organizing and analyzing a database of petitions from eighteenth and nineteenth-century Virginia. The opportunity was unexpected since Serena offered us the opportunity to work for her during office hours. However, we were both so excited to be able to explore American history outside of the classroom. The work consisted of ten weeks of research, primarily sifting through an enormous number of Virginia petitions that covered topics from railroads to slavery. The first three weeks we worked together closely as it involved intensive reading of manuscript petitions and creating a system of
organization. This was a challenging part of the project for us both, as it sometimes felt like we were groping in the dark for an understanding of these manuscripts. Finally, thankfully, we each found several stories that we thought were worth exploring further.

This experience was funded by: Humanities Center

Presentation time: 5:45 - 6:30 p.m.
Poster number: 32

Abstract: 1082

Title: Not Afraid to Look: A Theological and Eschatological Interpretation.

Presenter(s): Sam Gilbert ’24

Supervisor(s) and affiliation or institution: Colleen Carpenter (Benedict Distinguished Visiting Professor of Environmental Studies, Carleton College)

My Summer research engaged with critical interpretations of Charles Recountre’s sculpture Not Afraid to Look, a several-ton concrete sculpture depicting a human figure looking out across Lake Oahe and the Missouri River. It also looks out at the Dakota Access Pipeline, which transports 470,000 barrels of crude oil every day underneath the Missouri River, and Lake Oahe, the Standing Rock Sioux tribe’s primary reservoir of drinking water. My research engages with the ways that this sculpture articulates a unique theological vision in an era of climate catastrophe, delving into the ways that it addresses questions of accountability, morality, and the presence of God in a world where pipelines are prioritized over watersheds.

This experience was funded by: Humanities Center

Presentation time: 4:30 - 5:15 p.m.
Poster number: 45

Abstract: 1083

Title: “La Jeune Journaliste Américaine”: Broadcasting on French National Radio as a Journalism Intern in Paris, France

Presenter(s): Abigail Goff ’25

As a journalism intern at Beur FM, I wrote and presented daily chronicles about international headlines on a French political talk show in French. During my time at the radio station, France was forced to reckon with racism within French society after a teenager of North African descent was shot by the police. I had the opportunity to observe the debates between journalists, activists, politicians and union leaders at the round table of the political talk show. Furthermore, I planned my own projects. One week, I interviewed students who immigrated to France from North African countries and presented their profiles on one of the morning shows.

This experience was funded by: Fred D. Andersen Foundation - The Visiting Professor of American Studies

Presentation time: 4:30 - 5:15 p.m.
Poster number: 46
Abstract: 1084

Title: *A Broadband Microwave Alvarez Metalens*

Presenter(s): Zev Goldhaber-Gordon ’24

Supervisor(s) and affiliation or institution: Hou-Tong Chen (Center for Integrated Nanotechnologies, Los Alamos National Laboratory), Mohammad Mokim (Center for Integrated Nanotechnologies, Los Alamos National Laboratory), Abul K. Azad (Center for Integrated Nanotechnologies, Los Alamos National Laboratory)

A metamaterial is a structure composed of arrays of unit cells designed to operate at a specific target range of radiation frequencies, whose behavior is determined by the structure of the material, not its chemical properties. A metamaterial is composed of periodic, typically square unit cells of subwavelength edge length, made of small shapes of a conductive metal mounted on a substrate which is transparent at the target frequency. Since the unit cells are smaller than the incident radiation, the output radiation can be tailored precisely, producing strange and unique optical properties including negative refractive indices, invisibility, and (in this case) lens behavior. When two such metalens are combined, this creates an Alvarez metalens: two lenses which when moved laterally to each other change their combined focal length. This last summer, I designed a frame for, tested, and analyzed an Alvarez metalens.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 33

Abstract: 1085

Title: *Financial Crimes Advanced Intern at PwC*

Presenter(s): Alejandro Gonzalez ’24

The Advanced Internship at PwC is an internship that exposes interns to a specific practice of the firm. In my case this was the Financial Crimes Unit. I was matched to a project where I helped with client work (that I can’t talk much about). Additionally, there was an intern competition within the FCU, we were given bank data and tasked with finding suspicious activity, my group took a machine learning approach and took the crown. The internship also had events that facilitated networking with full-time employees, from associates to partners!

This experience was funded by: Trustee Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 47

Abstract: 1086

Title: *Mapping parameter dependence for tunneling and entanglement dynamics in the kicked top*

Presenter(s): Alex Gran ’25, Ryan Quinn ’25

Other Authors/Contributors: Alex Kiral ’20, Noah Pinkney ’22
Supervisor(s) and affiliation or institution: Arjendu Pattanayak (Professor of Physics, Carleton College)
Bifurcation diagrams for tunneling and entanglement dynamics in the kicked top

Abstract: We study the Quantum Kicked Top (QKT) as a function of nonlinearity $K$. Using adiabatic evolution of the parameter, we uncover the phenomenon even when the original spectrum is recovered the states have been shuffled(also termed exotic quantum holonomy). Further, we use measures of spectral bunching and averaged inverse participation ratios across phase-space to identify $K$ values that yield unusual many-body quantum dynamics. In particular, for the 4 qubit QKT we find unusual dynamics for both linear entropy and tunneling at non-obvious $K$ values $4\pi /3$, $2\pi$, $\sim 2.76\pi$, $4\pi$ corresponding to sharply-defined local minima in $K$ for spectral bunching. We also see differing $K$-periodicities for the 4 qubit QKT with the period of $4\pi$ for the linear entropy, $8\pi$ for measures of tunneling and spectral bunching, and $16\pi$ for the adiabatically unrave led spectrum itself. Finally, we show that with increasing number of qubits $n$, the density of these local minima increases along with the $K$ period, nonlinearly accelerating the number of $K$ values with these degeneracies. We discuss the $N \to \infty$ limit.

This experience was funded by: The Clinton Ford Research Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 34

Abstract: 1087

Title: Field Trial of Enhanced Silicate Weathering as a Carbon Dioxide Removal Technology

Presenter(s): Anna Greenlee ’24, Rachel Gregg ’25, Adele Fredericks ’25, Crystal Wu ’24, Emma Watson ’23

Supervisor(s) and affiliation or institution: Dan Maxbauer (Assistant Professor of Geology, Carleton College)

Carbon removal technologies are needed to limit the impacts of climate change on our planet. One promising method is enhanced weathering, a technology where rock and industrial waste products are crushed and spread on agricultural fields to react with carbon dioxide leading to permanent storage in soil and eventually the ocean. This research is designed to test two materials: basalt, a naturally occurring mafic igneous rock, and steel slag, a waste product of the steel industry. We report data from the second year of an ongoing field study on agricultural land that is part of the Carleton arboretum. During the summer of 2023, our research group actively monitored changes in soil pore water chemistry and changes in CO2 gas flux, and we also evaluated changes in the carbon content of the soil from the first year of this study. This research is ongoing, but preliminary results suggest that the slag treatment is effectively buffering soil pH, increasing pore water alkalinity, and therefore providing initial evidence of carbon removal.

This experience was funded by: NSF Grant (NSF-EAR # 2208133)

Presentation time: 5:45 - 6:30 p.m.
Poster number: 35

Abstract: 1088

Title: Testing the potential of synthetic data to classify and predict breast cancer mortality based on repeat queries while evaluating ML algorithm performance

Presenter(s): Ben Griesel ’24
Breast cancer is a major cause of female mortality, necessitating accurate risk prediction for effective disease management. Synthetic data, provided by companies like MDClone, addresses the limitations of sparse clinical data in large-scale clinical bioinformatics. This study evaluates the efficacy of Machine Learning (ML) models trained on multiple MDClone-generated synthetic queries using EPIC clinical breast cancer data to predict mortality.

Three synthetic data queries (rs1, rs2, rs3) and three real data samples (r1, r2, r3) were used. Various ML models were trained and assessed with different combinations of synthetic and real datasets. Findings show a reduction in model performance when trained on combined synthetic data, possibly due to disturbances in the artifact subspace structure. Shapely Additive exPLanations (SHAP) reveal distinct decision-making processes between models trained on individual versus combined queries. This study underscores the importance of accurately representing subgroups in synthetic data for improved algorithm performance in clinical bioinformatics. Further research is needed to enhance the application of synthetic data for breast cancer prediction.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 36

Abstract: 1089

Title: The Virtual Viking Longship Project

Presenter(s): Jack Ochoa-Andersen ’24, Lily Haas ’24, Kritika Pandit ’26, Maddie Smith ’24

The Virtual Viking Longship Project aims to research the social and cultural roles of Viking Age longships, digitally model objects from that era, and create an educational virtual reality experience. Over the summer, students learned various types of software to contribute to the project during the year. Students worked as programmers, 3D artists, and subject matter researchers. Each team contributed to the sample experiences according to their role. Over the summer the team developed two VR experiences that will be part of the larger project.

This experience was funded by: Digital Humanities Advancement Grant from the National Endowment for the Humanities, Humanities Center

Presentation time: 5:45 - 6:30 p.m.
Poster number: 37

Abstract: 1090

Title: Re-Interpreting Borehole Breakouts from Well Logs in Central California: Implications for Stresses in the San Andreas Fault System

Presenter(s): Hannah Hackenmueller ’25
Boreholes breakouts are an important tool for characterizing stress directions in the shallow crust. By assuming homogeneous and isotropic host rocks, most workers infer that breakouts parallel the minimum horizontal stress direction. In central California, studies in the 1990s found breakout directions approximately parallel to the San Andreas fault. We re-examine logs from some of those same wells in central California using modern, and slightly different, criteria for picking breakouts. In addition, we compile the sedimentary bedding and/or fractures directions from dipmeter logs whenever possible for comparison with breakout directions. We apply statistical tools to compare breakouts and bedding from individual wells as well as to compare results between the original studies and our own. Our findings may add nuance to the discussion of stresses in central California and what they imply about the strength of the San Andreas fault.

This experience was funded by: NSF Grant

Presentation time: 5:45 - 6:30 p.m.
Poster number: 38

Abstract: 1091

Title: *Simulating a 6T SRAM Circuit with a Novel, Light-Effect Transistor*

Presenter(s): Youssef Haddad '25

Supervisor(s) and affiliation or institution: Yong Zhang (Professor of Electrical Engineering, University of North Carolina)

Current scaling and addition of complementary metal oxide semiconductor based field effect transistors (FETs) are not meeting today's demands for high speed and energy efficient chips – such as the Static Random-Access Memory found on chip processors. Issues with speed and energy costs stem primarily from Resistor-Capacitor (RC) delays and ultra-thin gate oxide tunneling currents, leading to severe leakage, and dielectric gate delay inherent to FETs. Integration of both photonic and electronic components with the use of a novel, light effect transistor (LET) has simulated promising resolutions to these issues, namely by abolishing the need for gate biasing voltages and unnecessary word line wires. A single unit of a 6T SRAM circuit is simulated with two access photodiodes, and resulting access voltages drastically decrease from 4 to 0.48 volts and 2.6 to 0.64 volts. Rise times for read and write functions decrease by 0.9 nanoseconds, proving a slightly faster access time.

This experience was funded by: Trace McCreary '89 and Alissa Reiner Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 48

Abstract: 1092

Title: *Reprocessable, Disulfide-Containing Polyimides*

Presenter(s): Margaret Hall ’25
Supervisor(s) and affiliation or institution: Broderick Lewis (PhD Candidate in Materials Science and Engineering, Northwestern University), Kenneth Shull (Professor of Materials Science and Engineering, Northwestern University)

Polyimides are a polymer with high thermal stability, making them ideal for various high temperature applications, but also difficult to reprocess or recycle. However, adding disulfide bonds into polyimides creates a dynamic covalent network that allows for reprocessability. To determine if disulfide-containing polyimides can demonstrate reprocessability while retaining the favorable thermomechanical properties present in non-dynamic polyimides, various dynamic and non-dynamic polyimides were synthesized and their degradation temperature, glass transition temperature, shear modulus, viscoelastic phase angle, reprocessability via heat and pressure, and reprocessability via reduction were analyzed and compared in this study.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 39

Abstract: 1093

Title: Order-by-order Continuum Normalization of NEID Solar Spectra with RASSINE

Presenter(s): Jackie Harris ’26

Other Authors/Contributors: Max Kingston ’26
Supervisor(s) and affiliation or institution: Ryan Terrien (Assistant Professor of Physics and Astronomy, Carleton College)

Measuring the radial velocity shifts of spectral lines is a primary method of detecting exoplanets; however it is often difficult to discern if these shifts are due to the gravitational wobble of a planet pulling on a star or if they have been caused by magnetic activity. We can more closely examine the relationship between stellar magnetic activity and radial velocity shifts by studying solar spectra. In order to do this, we must produce a precisely normalized version of the solar continuum. RASSINE is a program that algorithmically determines the continuum. We optimized RASSINE and analyzed its effectiveness for use on a selection of “clean” (taken on clear days) solar spectra from the NEID spectrograph and solar telescope from the past two years by splitting up every spectrum into individual spectral orders. We found that RASSINE improved upon our simplified method of continuum normalization.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 40

Abstract: 1094

Title: Simulation of Diffusion-Reaction Systems In Protein Crystals for X-Ray Crystallography

Presenter(s): Simon Hempel-Costello ’24

Diffusive mixing serial crystallography experiments allow biophysicists to explore structural changes in protein-ligand reactions. To successfully perform these experiments, users must determine and control the timescales in these reactions. This paper describes a simulation of a ligand diffusing into a crystal system, as well as methods to determine optimal conditions for serial crystallography experiments.
**Abstract: 1095**

**Title: Paralegal Intern at Streefland Law Firm**

**Presenter(s): Emma Henry ’24**

This summer I worked as a Paralegal Intern for an Immigration Lawyer in solo practice at Streefland Law Firm in Minneapolis, Minnesota. I was responsible for a wide range of tasks and projects throughout the course of my internship. These included assisting in preparing, organizing, and filing immigration cases, which involved completing immigration forms, obtaining supportive evidence, drafting cover letters, and translating documents. I reviewed and prepared responses for government correspondence, contacted and communicated with or interviewed potential clients, current clients and witnesses. I drafted letters, affidavits, arguments, and briefs to support client cases. I maintained client files and participated in hearings and client meetings. The hearings I was able to observe and partake in spanned several different fields of law, including immigration law and both the prosecution and defense sides of criminal law. I also conducted research to support client cases. For example, I researched various countries and their living conditions, as well as the larger societal topics of domestic violence, mental health, and trauma. Finally, I was given various administrative duties: answering and returning phone calls, emails, running office errands, maintaining client files and file systems, and contacting USCIS and EOIR customer service for clients. Although the majority of my work this summer was in the field of immigration law, I was also able to experience the daily duties of and network with criminal law attorneys, employment law attorneys, civil law attorneys, law clerks, judges, and a lobbyist.

This experience was funded by: Jean Phillips Memorial Internship Fund

**Abstract: 1096**

**Title: Algorithms for Exemplar-Based Modeling**

**Presenter(s): Andrew Hong ’24**

Other Authors/Contributors: Yang Tan ’25
Supervisor(s) and affiliation or institution: David Liben-Nowell (Professor of Computer Science, Carleton College) and Anna Rafferty (Associate Professor of Computer Science, Carleton College)

There exist a variety of situations in which we might wish to decompose something into characteristic parts, such as the themes in why a student takes a particular class or the cuisines represented by a recipe. We can formulate such a problem by using bit vectors to represent “individuals” and “exemplars.” Each entry of a bit vector indicates the presence or absence of a characteristic. Given a set of exemplar bit vectors and a target individual, we aim to answer how optimally we can represent the individual as the union of some subset of exemplars. Using tools from computational complexity theory, we determine that the problem as described is hard—i.e., the time to solve it likely grows exponentially with the size of the problem. We also show that the problem is hard even when constrained to exemplars containing at most two characteristics. We move to examining approximation algorithms, finding that the greedy algorithm is a tight $\frac{3}{2}$-approximation for small instances of the constrained problem.
Abstract: 1097

Title: Affordable Housing in Northfield

Presenter(s): Molly Howard '24

This summer I worked for the City of Northfield's Community Development Department. Specifically, I worked under Melissa Hanson the Housing Coordinator for the city. My internship consisted of lots of research on a huge variety of topics related to housing, such as global affordable housing solutions, manufactured housing, sustainable building policy, Airbnbs, equitable renters policy, zoning, and more. In addition, I updated rental listing information, attend Housing and Redevelopment Board meetings, and Northfield community events.

This experience was funded by: Trustee Endowed Internship Fund

Abstract: 1098

Title: Juvenile Justice and Advocacy in the Fourth Judicial District

Presenter(s): Mattias Hoz '25

This summer, I interned with Judge Bruce Manning (Class of '96) in Minneapolis, MN. Judge Manning serves Minnesota's Fourth Judicial District, which encompasses most of Hennepin County. Juvenile delinquencies, adoptions, records expungements, and CHIPS (child in need of protective services) make up the majority of his caseload. As a judicial intern, I observed daily trials and hearings, drafted court orders, and assisted clerks around the courtroom. In between hearings, I debriefed with Judge Manning and helped analyze the facts of each case.

This experience was funded by: Jean Phillips Memorial Internship Fund

Abstract: 1099

Title: Enhancing Macrophage Phagocytosis of Leukemia Cells

Presenter(s): Margaret Hu '26

Innate immunity plays an important role in cancer immunotherapy. Macrophages specifically are promising due to their ability to phagocytose cancer cells, although cancers can evade macrophage detection through expression of anti-phagocytic ligands. Existing treatment strategies aim to bolster phagocytosis by blocking specific inhibitory checkpoints but exhibit limited efficacy. Consequently, there
exists a critical need to identify novel "don't eat me" signals that can be therapeutically leveraged with greater success. In our initial screen, CD43, C1GALT1, and C1GALT1C1 were pinpointed as genes whose loss enhances phagocytosis. As CD43 is heavily glycosylated and C1GALT1/C1 are involved in O-linked glycosylation, this project explores whether CD43 synergizes with C1GALT1/C1 in regulating phagocytosis. We find dual knockout of CD43 with C1GALT1/C1 is not synergistic, which suggests CD43 and C1GALT1/C1 act on the same pathway in phagocytosis regulation and C1GALT1/C1 inhibit phagocytosis specifically through modification of glycosylation patterns on CD43.

This experience was funded by: Class of 1964 Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 42

Abstract: 1100

Title: Catalytic Aerobic C-H Bond Activation by Tris(Phosphinimato) Copper Complexes

Presenter(s): Cassie Huang '24

The activation of strong C-H bonds has long been an area of interest due to the difficulty in breaking these bonds, and the potential for selective C-H bond activation in organic synthesis. In this project, we utilized Cu(I) complexes stabilized by a tris(phosphinimato) ligand. Through substrate screening of various amines, including indole, hexylidene, and n,n-dimethylethanediamine, we have shown successful C-H bond activation. The products of the reactions were determined to be indole, coupled products of indole and indole, N-Hexylidene-1-hexanamine, N-benzyl-2-(benzylideneamino)ethan-1-amine with other minor products, respectively. We found that these activations occur exclusively at positions near the N-H groups.

Presentation time: 4:30 - 5:15 p.m.
Poster number: 53

Abstract: 1101

Title: Perceptions and Censorship of Marlene Dietrich in Nazi Germany and the Irish Free State

Presenter(s): Scott Hudson ’24

In June and July 2023, I conducted archival research at the Deutsche Kinemathek in Berlin, the Deutsches Filminstitut in Frankfurt, and the National Library and National Archives of Ireland in Dublin. I was examining the motivations behind the interwar censorship of Marlene Dietrich films in each case. My research is building towards a comparative History Comps in Winter 2024.

This experience was funded by: Carleton Fellowship

Presentation time: 5:45 - 6:30 p.m.
Poster number: 43

Abstract: 1102

Title: The Proline-Rich Region of Hybrid Proline-Rich Proteins Drives Protein Localization to Chloroplasts in Plants
**Presenter(s): Abby Ignasiak**

Hybrid Proline-Rich Proteins (HyPRPs) have three domains: the N-terminal, hydrophobic domain (HD, in blue), the proline-rich region (PRR, in pink), and the C-terminal, lipid transfer-like protein (LTP, in yellow). Several of these HyPRPs are involved in plant immune defense and have been seen to localize to both the chloroplast outer envelope and the endoplasmic reticulum (ER). The mechanism for chloroplast targeting is a bipartite signal made up of the N-terminal HD and the PRR. In classically ER and chloroplast-targeting proteins (with no PRR) the region of localization is determined by the hydrophobicity of the HD, also known as the transmembrane domain. ER-targeting proteins have greater hydrophobicity than chloroplast envelope-targeting proteins. However, the HD of HyPRPs can have a hydrophobicity similar to that of a solely ER-targeting protein while localizing to both the ER and the chloroplasts.

Presentation time: 4:30 - 5:15 p.m.
Poster number: 54

**Abstract: 1103**

**Title: Video Mitigation Project at The Legal Aid Society**

**Presenter(s): Isabel Intrater ’26**

As part of plea negotiation, the defense has the opportunity to present mitigating factors to the court. Traditionally, the presenting of a client's story is in a written or spoken form, however the Video Mitigation Project is attempting to bring these stories to the courtroom in a video form, which has historically been very successful for the clients. Access to the resources, time and money to make mitigation videos has often been a barrier to Legal Aid clients having access to this effective resource in the courtroom, however the work I was doing over the summer was trying to create a process to make these videos that is less expensive and less time consuming.

This experience was funded by: The Carl and Ruth Weiner Fund for Social Justice Internships

Presentation time: 4:30 - 5:15 p.m.
Poster number: 55

**Abstract: 1104**

**Title: The Complexity of Criminal Justice**

**Presenter(s): Sam Isaacman ’24**

This Summer I worked at the Hennepin County Public Defender's Office, working alongside public defenders in order to complete a range of legal tasks corresponding to cases they were working on. I was assigned primarily to 2nd degree murder cases. (Side-note), I will be late to this meeting as I have soccer practice prior to the time slot

This experience was funded by: Pommerenke Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 44
Abstract: 1105

Title: Understanding the Athamanians

Presenter(s): Emery John ’24, Nahome Lantyderu ’26, Charlie Solomon ’25

Supervisor(s) and affiliation or institution: Cynthia Damon (Professor of Classical Studies, Emerita, University of Pennsylvania) and Jake Morton (Assistant Professor of Classics, Carleton College)

The Athamanians lived in in the Southern Pindus mountains between Epirus and Thessaly, Greece. They appear in the historical record under the Epirote King Pyrrhus in the early 3rd century BC and achieve their greatest political importance in the first half of the 2nd century BC, during the wars between the Romans and Macedonians. This poster shows our initial work researching the first comprehensive historical study of the Athamanians. Based on textual references and limited scholarly publications, we explored the regions, including the key mountain passes, mountain landscape, known forts and towns, Ottoman routes, and comparative land use through time. Furthermore, the Athamanians were a part of long tradition of transhumant mountain shepherding which continues in the region to this day. Understanding the topography of the region and how it affected people of other eras – including our own – helps us understand their reality during antiquity.

This experience was funded by: Humanities Center

Presentation time: 4:30 - 5:15 p.m.
Poster number: 56

Abstract: 1106

Title: Exploring Steric Considerations for Cobalt-Silylene Catalysis

Presenter(s): Marshall Johnson ’25, Quan Nguyen ’25

Other Authors/Contributors: Dani Kohen (Professor of Chemistry, Carleton College)
Supervisor(s) and affiliation or institution: Matthew T. Whited (Professor of Chemistry, Carleton College)

Transition-metal catalysis is a powerful tool for preparing organic compounds used in a variety of applications, from pharmaceuticals to agrochemicals to household products. Our group seeks to expand the paradigm of reactions occurring at a single metal center, by developing new catalysts that utilize a transition metal in cooperation with a nonmetal such as silicon. We have previously used a cobalt/silicon catalyst for the conversion of alkyl azides to isocyanates, but with limited substrate scope. In this poster, we explore a wider variety of azides to shed light on limitations of this catalytic approach and inform future changes to our family of catalysts.

This experience was funded by: NSF grant #2244969

Presentation time: 5:45 - 6:30 p.m.
Poster number: 45

Abstract: 1107

Title: Sport Medicine Integration at St. Croix Soccer Club
Presenter(s): Trevor Jones ’24

My experience this summer involved experiencing and understanding one very unique form of healthcare through sport medicine for a private soccer club. St. Croix Soccer Club operates out of Stillwater, Minnesota, and has soccer teams ranging from young children to an adult pre-professional team competing in the fourth division of American soccer. Local athletic trainers are contracted to serve athletes and families through St. Croix Soccer Club and serve as the point of contact for access to sport medicine for families. I spent time observing this dynamic during the summer while also seeking to better understand how modern soft-tissue injury treatment differs from older techniques and promotes more rapid and sustained recovery for patients.

This experience was funded by: Trustee Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 46

Abstract: 1108

Title: Stable Tamari Order

Presenter(s): Nzingha Joseph ’25

Other Authors/Contributors: Anna Hugo (Davidson College ’25
Supervisor(s) and affiliation or institution: Anna Pun (Assistant Professor of Mathematics, Baruch College, CUNY)

The classical Tamari order is a poset of Catalan objects that is useful across algebraic combinatorics. Recent work in this area has been motivated by Mark Haiman's study of trivariate diagonal harmonics using the Tamari lattice. Early generalizations of the classical Tamari order include the r-Tamari order developed by Francois Bergeron, a poset of r-Dyck paths represented by their area sequences. Motivated by the construction of the r-Tamari order, we present a new generalization of the classical Tamari order, the stable Tamari order, a generalization of the classical Tamari order to all non-negative integer sequences. We draw connections between the algebraic and combinatorial properties of the stable Tamari order, showing possible links to graph theory with a preliminary result. We also present discoveries and conjectures about the relative sizes of lower order ideals and maximal chains between sequences in our poset. This poster is based on work conducted at the NYC Discrete Math REU at Baruch College (CUNY), in Summer 2023. This work was mentored by Professor Anna Pun (Baruch College), and conducted in collaboration with Anna Hugo (Davidson College).

This experience was funded by: Partially funded by the Carleton Summer Science Fellowship

Presentation time: 5:45 - 6:30 p.m.
Poster number: 47

Abstract: 1109

Title: Simple Charity Internship: Fostering Community Engagement and Impact

Presenter(s): Chrinovic Kabelu ’26

The simple Charity internship is a 10 week Christian summer program that cultivates a deeper understanding of charitable organisations amongst students while growing in faith and solidarity. The
An internship focuses on practicing and learning about effective giving. The internship is based on the fact that a significant portion of donations made by generous donors around the world does not directly benefit the intended recipients. Therefore, Simply Charity prioritizes actions and donations that have a measurable and positive impact on the intended beneficiaries. It emphasizes outcomes and seeks to achieve meaningful, tangible results.

This experience was funded by: Nini’s Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 48

Abstract: 1110

Title: Simulating Ecological Speciation in Soft-Body Robots

Presenter(s): Max Keller

Supervisor(s) and affiliation or institution: Claus Aranha (Professor of Computer Science, University of Tsukuba)

This research seeks to simulate and analyze the natural process of speciation in soft-bodied robots. Speciation is a phenomenon that can be seen throughout nature, and plays an important role in evolution and ecology, however this process is usually not visible in the short-term, making its study difficult.

By using an artificially generated group of robots and niche environments, this research seeks to document and analyze speciation within a computer program. While data is still being collected, it argues that the robots do indeed go through the process of speciation over the course of the simulation, exhibiting traits that signify multiple different species.

This experience was funded by: Kolenkow-Reitz Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 49

Abstract: 1111

Title: The Queen of Hadrian’s Wall? Exploring Identities in Roman Britain Using Epigraphical Evidence

Presenter(s): Zaria Kelly ’25

What kind of cultural evolution did provincial people undergo following the world-shifting event of Roman expansion? Examining an epitaph from 2nd century CE Roman Britain reveals themes of migration (both local and empire-wide), slavery, language acquisition, marriage, and the military that point to the complexity of this new interconnectedness of places far and wide, all bound together following the Roman conquest. Ralph Haussler and Elizabeth Webster (2020) proposed the Creolage theory as a framework for attempting to explain how different cultures may have combined, taking into consideration the equal contribution and significance of each culture involved and the individual choices that led to the expression of this new culture. Applying the Creolage theory, I illustrate that this inscription showcases the many cultures and identities involved and the individual agency taken by its creator to include these specific cultural details in something as monumental and public as a tombstone.
Abstract: 1112

Title: Risk Factors and Infection Prevention Guidelines for Candida auris at a Large Academic Medical Center

Presenter(s): Amanda Khouw ’24

Candida auris is an emerging fungus that poses a severe health threat and has gained the attention of the CDC and other healthcare facilities. However, Candida auris is a Multidrug-Resistant Organism and can be challenging to identify with standard healthcare equipment. Upon these findings, an important question arises: "How can healthcare facilities prevent and control Candida auris?". To solve this issue, patient data was collected and analyzed to find trends within positively-tested patients. Once the trends were identified, a screening method was developed and is now undergoing a paper draft for publication.

Abstract: 1113

Title: Balloon Altitude Analysis of Cosmic Ray Flux Experiment

Presenter(s): Klara Kjome Fischer ’26

As part of the Edge of Space Academy, I worked in a team of four students for two and a half weeks to design, build, and integrate instrumentation on a weather balloon platform to measure cosmic ray flux. The project was student-driven and designed to simulate work in a NASA mission.

Abstract: 1114

Title: Few-shot NER and Thai NER

Presenter(s): Palmy Klangsathorn ’26

Named Entities Recognition, or NER, is one of the crucial tasks in natural language processing. This assignment is to identify and categorize identified entities stated in unstructured text into pre-defined groups, such as person names, organizations, locations, events, time, quantities, dates, percentages, etc. In addition to learning how to complete the NER job in English, this NER research with VISTEC examines how to do it in Thai and other Southeast Asian languages with limited resources (less commonly used and have fewer resources compared to the English language). Given the limited resources available, my mentor proposed adopting the Few-shot technique, a machine learning framework that enables a pre-trained model to generalize over new categories of data—data that the model had not encountered.
during training—using just a small number of labeled samples per class. This strategy fits within the meta-learning paradigm.

This experience was funded by: Robert E. Will '50 Endowed Internship Fund in Social Entrepreneurship

Presentation time: 5:45 - 6:30 p.m.
Poster number: 51

**Abstract: 1115**

**Title: Qualitative Impacts of Community Based Cancer Outreach in Milwaukee’s SE Asian Population**

**Presenter(s):** Ellis Kondrashov ’25

I worked with the Milwaukee Consortium for Hmong Health to create an Impact Report reviewing the work that they have been doing, and looking to the future to continue to grow and improve their non-profit in SE Wisconsin.

This experience was funded by: Project ’60 Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 52

**Abstract: 1116**

**Title: Immigration in America through the Immigrant Law Center of Minnesota**

**Presenter(s):** Fatima Koroma ’26, Nayi Abdi ’25

This summer, we interned with the Immigrant Law Center of Minnesota, a non-profit organization providing legal services and advocating for Minnesota's immigrant and refugee population. It was an insightful experience to understand more about the immigration system noncitizens must navigate as we witnessed first-hand the challenges and disappointments that clients undergo. Splitting our time between the Pro Bono and Intake teams, we saw clients' journeys with ILCM, from making their first intake call to their assignment to our pro bono attorneys. We shared many experiences with the clients we worked with as African immigrants. It has been a challenge to navigate our journeys, but we have been grateful for the opportunity to assist these people through theirs. Seeing how many people come together to help in a pro bono setting was rewarding.

This experience was funded by: Social Justice Internships Funds - Office of the Chaplain

Presentation time: 5:45 - 6:30 p.m.
Poster number: 53

**Abstract: 1117**

**Title: State-Level Welfare Policy Responses to COVID-19: The Case Study of Illinois**

**Presenter(s):** Manoka Kozaki ’26
U.S. state governments took various welfare policy responses during the COVID-19 pandemic. For instance, many states took income support and financial obligation relief policies. Using the data collected by the Oxford COVID-19 Government Response Tracker (OxCGRT), our research examined the welfare policies taken by each 50 states and the District of Columbia. The result indicated that there was an overall relationship between state-level policy response and state political ideology. However, there were some exceptions to this trend, which included Illinois. Using Illinois as a case study, this research examined state-level policy response and state politics/economy.

This experience was funded by: Humanities Center Summer Research Group

Presentation time: 4:30 - 5:15 p.m.
Poster number: 118

Abstract: 1118

Title: Concussion Alliance Summer Science Writing Intern

Presenter(s): Kat Kresse ‘26

This summer, I had the opportunity to work as a Science Writer intern for Concussion Alliance over the course of 8 weeks. I wrote multiple newsletters briefly summarizing different scientific papers, created a page on the Concussion Alliance website on concussions and individuals with pre-existing disabilities, and had the chance to hear from different expert guest speakers on up-to-date concussion research.

This experience was funded by: Robert E. Will ’50 Endowed Internship Fund in Social Entrepreneurship

Presentation time: 5:45 - 6:30 p.m.
Poster number: 54

Abstract: 1119

Title: Borehole Breakouts in Cemented Granular Rock Analogues

Presenter(s): Amberly Kroha ’25

Borehole breakouts are a critical tool for characterizing crustal stress directions and make up a significant fraction of the World Stress Map data set. Wells with breakouts are commonly located in sedimentary rocks and span a critical depth interval between surficial measurements and earthquake focal depths. To interpret stress directions from breakouts, workers typically assume that rocks are homogeneous and isotropic, such that breakout directions form perpendicular to the maximum horizontal stress direction. However, some rock physics experiments, well logs, and numerical models
indicate that rock anisotropy may affect the direction of breakouts, making the inference of stress directions more complicated.

Here we present preliminary experimental results on borehole breakouts in cemented granular rock analogues. To create an experimental material that is cohesive and can deform, we mix quartz sand with gelatine. The experimental material is cut into blocks, which are shortened in one direction by 5%. To simulate the borehole, we core each deformed sample with an aluminum tube. The sample rests for 30 minutes allowing breakouts to form after which we fill the void with molten wax to create a cast of the borehole. To investigate the impact of anisotropy, akin to the layering of sedimentary rocks, we create cm-scale layers in the experimental model material. We vary the layer orientation, testing horizontal layers as well as dipping layers that are parallel, perpendicular, and oblique to the maximum horizontal stress direction. Breakouts appear as a gentle warping of the hole sidewalls and independent of layer orientation. Our results have implications for the interpretation of borehole breakouts, and therefore the stress directions, in natural systems.

This experience was funded by: NSF, PRF Grants

Presentation time: 4:30 - 5:15 p.m.
Poster number: 59

Abstract: 1120

Title: "The Best Interests of the Child:" Parental Claims in Nebraska Child Custody Cases, 1877-1924

Presenter(s): Esme Krohn ‘24

Other Authors/Contributors: Professor Katrina Jagodinsky (Susan J. Rosowski Associate Professor of History, University of Nebraska-Lincoln), Professor William G. Thomas III (Professor of History, University of Nebraska-Lincoln)

How did mothers' and fathers' roles differ in child custody cases in Gilded Age and Progressive Era Nebraska? Data from 121 Lancaster and Douglas county habeas corpus cases reveals that while fathers petitioned for custody of their children more frequently than mothers, they were somewhat less successful in regaining custody of their children. This finding counters studies of the history of child custody, which suggest that fathers almost never succeeded in gaining custody in this period. This project also sheds light on the importance of extended family and the prominence of kidnapping in these disputes.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 55

Abstract: 1121

Title: Cell Biomechanics Lab: Microneedle Array Project

Presenter(s): Ezra Kucur ’25

Other Authors/Contributors: Nathan Sniadecki (Professor of Mechanical Engineering, University of Washington), Trevor Mollot (University of Washington)

According to the CDC over 697,000 Americans are diagnosed with heart disease last year. Currently, treatment for heart disease is limited to drugs or invasive surgical procedures.. One of these
possibilities, the single needle injection, offers the opportunity for the introduction of healthy cardiomyocytes into the diseased heart. But the SNI has some drawbacks; low cell retention, tissue damage, and low area of effect. For these reasons, the microneedle array was developed to hopefully increase retention, reduce injury to the tissues, and increase the area of affect.

In support of this project, my aim for the summer was to generate a positive control for the ongoing tissue trials by using fixed cells injected into agarose gel to allow for optimal imaging and 100% retention rate.

This experience was funded by: Kolenkow-Reitz Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 60

Abstract: 1122

Title: Digging Up Dinner: Carleton Food Practices During the 20th Century

Presenter(s): Emmett Forster ’24, Ezra Kucur ’25, Evan Orjala ’24, Cat Reed ’26, Ellie Simon ’25

Supervisor(s) and affiliation or institution: Sarah Kennedy (Assistant Professor of Archaeology and Latin American Studies, Carleton College)

We use animal food remains to investigate diet and food procurement at Carleton during the 20th century
  ● We examine how food waste was deposited from dining halls and local farms
  ● We hypothesize that there was a difference between a typical student diet and that of a farming family

This experience was funded by: Towsley Endowment for the Sciences

Presentation time: 5:45 - 6:30 p.m.
Poster number: 56

Abstract: 1123

Title: Working at Department of Commerce’s Economic Development Administration

Presenter(s): Leo Kugel ’26

My summer in the U.S. Department of Commerce spanned eight weeks at the D.C. headquarters doing a variety of work for the Economic Development Administration – a subdivision of Commerce. My tasks ranged from charging cord reorganization to the compiling of weekly updates for senior staff and the Office of the Secretary. Every day involved reporting to numerous different bosses, mostly in the office of public affairs. I learned a great deal from this summer, despite the work being far different from what I had expected.

This experience was funded by: Dolores D. Oswald ’46 and Hanan D. Wedlan Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 57
Abstract: 1124

Title: Concussion Alliance: Working Administratively as a Science Writing Mentor

Presenter(s): Kira Kunzman ’24

Concussion Alliance is a non-profit organization dedicated to educating and providing free resources to patients navigating their recovery from concussions and to healthcare providers striving to stay up-to-date on the most current information regarding concussions. My position as Science Writing Mentor was a newly adapted position, as I was the first intern to come back for a second summer. With my previous experience as an intern, my supervisor and I changed the structure of this role and at the end of the internship, decided this position was a necessity for future years. During the internship, I taught first-year interns how to write for the weekly newsletter, providing feedback, editing, and revisions for their synopses; I helped create the curriculum and managed the scheduling of the program; I facilitated weekly group discussions; and I mentored, organized, and provided feedback/sources for multiple groups of interns as they worked on their projects.

This experience was funded by: Jean Phillips Memorial Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 61

Abstract: 1125

Title: Food Access Intern/Interim Program Assistant at the CAC

Presenter(s): Emily Lanegraff ’24

I spent eleven weeks this summer interning with the Food Access team at the Community Action Center of Faribault. The organization offers a wide range of services for those who cannot afford such services, such as housing and job assistance, but my team focused specifically on the food shelf and food access realm.

This experience was funded by: Project ’60 Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 58

Abstract: 1126

Title: Gravitational-Wave Data Quality: Veto Algorithms

Presenter(s): Alex Lattal ’26

Other Authors/Contributors: Nelson Christensen (George H. and Marjorie F. Dixon Professor of Physics, Emeritus & Research Fellow in Physics, Carleton College), Bianca Lott ’26.

Supervisor(s) and affiliation or institution: Jay Tasson (Associate Professor of Physics, Carleton College)

In this work we implemented a data-quality algorithm, the updated Used Percentage Veto, on data from the Laser Interferometer Gravitational-Wave Observatory (LIGO). Our continuing work includes adjustments to the algorithm as well as curation and interpretation of the results. We have found that
running the algorithm on weeks of data rather than days provides more useful results and have found that the algorithm is useful for vetoing glitches such as those caused by earthquakes.

This experience was funded by: NSF Grant PHY1806990

Presentation time: 4:30 - 5:15 p.m.
Poster number: 62

Abstract: 1127

Title: Investigating the role of long-range Ret signaling in regulating Adar2a A-to-I editing in zebrafish posterior lateral line neurons

Presenter(s): Nick Lattal ’24

Although it is understood that neurotrophic signaling is essential for the development of a properly functioning nervous system, the mechanisms by which neural circuits are formed are not fully understood. The neurotrophic factor receptor Ret is expressed at the axon terminals of pioneer neurons in the developing zebrafish mechanosensory system, the posterior lateral line (pLL). When bound by its ligand, Ret is internalized and retrogradely transported to the soma, initiating a transcriptional response. Adar2a is an adenosine to inosine (A-to-I) RNA editor that is downregulated in ret-/- pLL neurons. Adar2a editing targets include the AMPA receptor and other genes that influence calcium dynamics. Disruption of Ret signaling in pLL neurons modulates Ca2+ dynamics and editing by Adar2a might be the link. This summer, I conducted multiple experiments to establish the connection between retrograde Ret signaling and A-to-I editing by Adar2a in pLL neuron development.

This experience was funded by: M. Leith Shackel Internship Endowment Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 59

Abstract: 1128

Title: ATLAS Detector Collisions in Virtual Reality

Presenter(s): Tosh Le ’24

Supervisor(s) and affiliation or institution: Daniel Hayden (Professor of Physics, Michigan State University)

The ATLAS (A Toroidal LHC Apparatus) Detector at the Large Hadron Collider (LHC) in Switzerland records 1 kHz worth of events, and the processing of all of this information is challenging and time-intensive. I designed a method of visualizing the events in three dimensions (rather than the standard two dimensions), which allows for smoother and more intuitive data analysis. Using Unreal Engine, I created a virtual reality world and populated it with the different layers of the detector. I then worked to create a modeling system where the viewer can simulate collision events using data directly from the ATLAS Detector. I was ultimately able to create a system that clearly displays subatomic particles, their trajectories, and relative energy quantities. The program could also be used to identify particle reconstruction errors or even particles that leave unconventional signatures in the detector.

This experience was funded by: NSF Grant
Abstract: 1129

Title: Exploration of Deep-Sea Hydrothermal Vent Food Webs

Presenter(s): Caroline Lee ’24

Supervisor(s) and affiliation or institution: Rika Anderson (Associate Professor of Biology, Carleton College)

The trophic interactions among protists, bacteria, archaea, and viruses at hydrothermal vents play an important role in carbon cycling in the deep sea. In order to construct a model for these food webs, fluid samples were previously collected at diffuse flow vent sites and the plumes above the Von Damm and Piccard vent fields in the Mid-Cayman Rise in the Caribbean. This summer, metagenomic analyses were conducted on viral and microbial sequences from these samples in order to explore how different viruses infect different bacteria and archaea, how microbial community composition varies between different vents, and how viruses can modulate host behavior through auxiliary metabolic genes (AMGs).

Abstract: 1130

Title: Computational Exploration of the Role of Sterics in Silicon-Metal Cooperative Chemistry

Presenter(s): Claire Lee-Zacheis ’26, Aidan Khan ’25

Other Authors/Contributors: Ellie Vandel, Emma Watson, Will DeSnoo
Supervisor(s) and affiliation or institution: Daniela Kohen (Professor of Chemistry, Carleton College) and Matt Whited (Professor of Chemistry, Carleton College)

A novel organometallic catalyst developed by our experimental lab utilizes a polarized Si-Co bond to facilitate the transformation of an azide into an organic isocyanate. Our computational lab uses DFT/Gaussian 16 to examine the energetic space of this catalytic cycle. This summer, we were particularly interested in understanding the role of steric on the complex’s ability to act as a catalyst. We found that employing a bulkier substituent, tert-butyl, on the complex affected the energetic profile of the catalytic reaction and changed the rate limiting step. This change could give us better control of the reaction, which would allow us to alter the catalyst to make it more efficient.

This experience was funded by: NSF Grant

Abstract: 1131

Title: Uncovering Life Stories of Tibetan Women Through Text and Spatial Analysis

Presenter(s): Cynthia Leng ’25
This project employs text analysis tools to explore the life narratives of around 100 Tibetan women, resulting in a catalogue of biographies, analysis, and visualizations. Utilizing Python, Java, Gale, and Voyant, the project involves extracting relevant passages from a corpus of 115 textual records, counting word frequencies, generating word clouds, and conducting sentiment analysis. The primary focus is on how Tibetan Buddhism shapes the process by which Tibetan refugees navigate the challenges of migration and establish their identities while living in exile.

This experience was funded by: Class of 1963 Fellowship

Presentation time: 4:30 - 5:15 p.m.
Poster number: 65

Abstract: 1132

Title: Exploring the Effects of Leuprolide on Sprague Dawley Rats and Implications for Gender-Affirming Healthcare

Presenter(s): Sophie Lenzer ‘25

Other Authors/Contributors: Dr. Anthony Auger, PhD (Professor of Psychology at UW Madison), Gabriela Oliveira (PhD Candidate at UW Madison), Thomas Niepsuj (Master's Student at UW Madison), Charlotte Cheong ’23, Arushi Gupta ’24, Amber Nguyen ’25, Eden Lev ’25, Leisha Chopra ‘25, Sa

In recent years, the topic of transgender health has stimulated much conversation and controversy, especially in the United States. Transgender youth have markedly higher rates of mental illness, such as depression and anxiety; but studies have shown that gender-affirming care can improve their mental wellbeing. One method of gender-affirming care comes in the form of GnRH (gonadotropin releasing hormone) agonists such as leuprolide, which lower Testosterone levels and slow the development of secondary sex characteristics. The presence of puberty blockers like leuprolide as a means of gender-affirming treatment have called into question the long-term biological effects on adolescent brains, bodies, and behavior. We explored the effects of leuprolide on social and anxiety-like behavior in relation to hormonal and physical development in pubertal Sprague Dawley rats.

This experience was funded by: Waterbury Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 66

Abstract: 1133

Title: Soil Seed Banks in Tropical Dry Forest

Presenter(s): Rebecca Lerdau ‘25

I spent the summer working at a field station in Horizontes Experimental Forest (EEFH) in Guanacaste, Costa Rica. I was working as a field assistant for Viviana Londono-Lemos, a graduate student in the Powers Lab at the University of Minnesota. The research I was assisting with focused on seed ecology and the soil seed bank in tropical dry forests. Most of the work I did was related to Londono-Lemos’ dissertation research, but I also assisted with some long-term experiments that the Powers Lab has at Horizontes.

This experience was funded by: Class of 1963 50th Reunion Fund for Internships
Abstract: 1134
Title: SayKid: The Importance of Conversational Design in Youth Education

Presenter(s): AJ LeSure ’24

For my internship at SayKid, I worked on developing educational and mentally stimulating voice-based games for use on SayKid’s main product: ToyBot, a plushie that’s compatible with Amazon smart speakers and provides an audio-based interface for kids to learn.

This experience was funded by: Nini’s Endowed Internship Fund

Abstract: 1135
Title: Orbital Angular Momentum Mode Sorting in Free-Space Optical Communication Links

Presenter(s): Oliver Licht ’25

Supervisor(s) and affiliation or institution: Krishna Rupavatharam (Director of Spectrum Labs, Montana State University)

We explore the effects of turbulence on different mode sorting systems for Orbital Angular Momentum (OAM) encoded Laguerre-Gaussian (LG) beams. We introduce and explore the effects of turbulence on free-space optical (FSO) links, particularly in 3 mode sorting receiving (Rx) systems: astigmatic transformations, log-polar coordinate transformations, and Archimedes spiral coordinate transformations. Through a series of experimental tests using phase screens generated with the Modified Von-Kármán method for turbulence simulation, we show that astigmatic transformations are incredibly robust under high turbulence, though only capable of OAM shift-keying. For multiplexing systems, we find that log-polar and Archimedes spiral coordinate transformation systems both deteriorate under high turbulence, but Archimedes spiral transformations have better overall resolution. Finally, we discuss the implications of these findings in the context of the FSO communication quantum network being developed at Montana State University.

Abstract: 1136
Title: Anthropology, History, and Politics: How National Identity is Reflected in Taiwanese Cuisine

Presenter(s): Ammy Lin ’24

Taiwanese cuisine, shaped by a long history of immigration and colonization, has become increasingly prominent on the global stage due to factors such as the government’s gastrodiplomacy campaign and the rise of soft power. This summer, I had the opportunity to attend a language program in Taipei,
Taiwan, while conducting research about the relationship between Taiwanese cuisine and national identity. I spoke to shop owners and locals, visited museums and a scallion farm, and dined in a variety of places to gain a better understanding of the unique aspects of Taiwanese cuisine and its relationship to perceptions of authenticity and national identity.

This experience was funded by: Center for Global and Regional Studies Junior Research Fellowship, Professor Qiguang Zhao Fellowship

Presentation time: 4:30 - 5:15 p.m.
Poster number: 67

Abstract: 1137

Title: Charting Precision: Navigating Quality Assurance in Speech Recognition Technology

Presenter(s): Yuxin Lin ’24

Over six enriching weeks at AI Speech Co., Ltd in Suzhou, China, I transitioned from viewing my testing engineer internship as mundane to appreciating its significance in product development. My sincere thanks to the Carleton College Career Center and the Chang-Lan Endowed Fund for enabling this journey. Daily, I meticulously designed and executed test cases, unraveling bugs to ensure our speech recognition technology's seamless functionality. Key skills honed include discerning value in repetitive tasks, gracefully receiving constructive criticism, and exercising patience during complex problem-solving scenarios. Interaction with teammates and engaging in company-organized badminton games enriched my experience, fostering a harmonious work-life balance even amidst the demanding tech industry. The exposure to a project aiding visually impaired individuals ignited an aspiration to meld technology with social impact in my future endeavors. This internship was an invaluable confluence of personal and professional growth, setting a robust foundation for my ventures in technology. This experience was funded by: Chang-Lan Endowed Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 68

Abstract: 1138

Title: Should Generative AI Own What It Makes and Can We Plagiarize It?

Presenter(s): Harald Lundberg ’24

Other Authors/Contributors: Daniel Groll (Chair of Philosophy, Professor of Philosophy, Carleton College), Jason Decker (Associate Professor of Philosophy and Cognitive Science)

Exploratory research within the field of philosophy with a specific focus on contemporary philosophical discourse concerning creative and generative Artificial Intelligence (AI) and its implications for ethical considerations surrounding plagiarism and intellectual property rights. A deep dive into the current landscape of generative AI and its implications for the traditional boundaries of creativity, authorship, and plagiarism. Source material included philosophy articles, psychology studies, and legal proceedings. The research culminated in a comprehensive understanding of the ethical issues posed by AI-generated content in creative spaces and a broadened perspective on the need for nuanced philosophical and ethical frameworks to navigate the evolving terrain of generative AI.

This experience was funded by: The Dale ’60 and Elizabeth Hanson Fellowship in Ethics
Abstract: 1139

Title: Hopeless Resistance

Presenter(s): Kunwu Lyu ’25

Other Authors/Contributors: Daniel Groll (Professor of Philosophy, Carleton College), Anna Moltchanova (Professor of Philosophy, Carleton College), Micah Day-O’Connell ’25, Ryan Cechini ’25, Harald Lundberg ’24, Alex Wang ’26

When speaking of protests, people often associate it with the idea of an assembly gathering for social change. But what if there is never hope for change? Do people still protest? China’s recent protest on COVID policies is considered one of the largest protests in the last two decades. While the movement has brought together a diverse group of people, its legacy is little to non-existent, due to the violent oppression from the government. However, people still protest, in an existential sense—even though protests may not lead to action or media coverage. I want to study the dynamics behind this unusual form of protesting, an existential act of resistance that is valuable in and of itself.

This experience was funded by: Chang-Lan Fellowship

Abstract: 1140

Title: Formulation and transfer of stimuli-responsive polymer capsules

Presenter(s): Casey MacVeagh ’24

Capsules for biomolecules are becoming more important as advances are being made in the fields of biotechnology and drug delivery. These capsules, however, must protect their fragile contents from changes to their environment. To do so, a number of encapsulation techniques have been used. Our capsules use interfacial complexation of polymer materials at a water/oil interface to form polymer shell walls. This procedure is completed using water-in-oil emulsions as a template with oppositely charged polymers solubilized in each phase. Electrostatic interactions between the two species formed the shell of the capsule. However, the weakness of the bonds forming the shell of the capsule complicates extraction of the capsules from oil into an aqueous solution, a necessary transfer for the biological use of the capsules. In this internship, we investigated the emulsions of various oil phases and surfactants with PLL-g-PNIPAM to determine which were successfully able to form capsules. Further, we investigated the feasibility of the extraction of the capsules formed into an aqueous solution. For this transfer, we based our technique on the cushion method, which coats capsules with biocompatible small molecules to disperse the capsules from the inverse emulsions in which they are prepared, with a high recovery rate.

This experience was funded by: Abeona Endowed Fund for International Internships

Presentation time: 4:30 - 5:15 p.m.
Poster number: 119
Abstract: 1141

Title: Hidden Currents: A Novel Flow Sensor For Measuring Water Velocities within Biological Assemblages

Presenter(s): Christopher Maring ’25

Supervisor(s) and affiliation or institution: Mike Nishizaki (Assistant Professor of Biology, Carleton College)

In aquatic systems, water motion is an important driver of biological processes such as respiration, photosynthesis, calcification, feeding, and fertilization. Indeed, changes in water flow can have dramatic effects on mixing processes that affect the mass transfer of important gases, food particles/nutrients, and gametes between organisms and their fluid environment. However, measuring flow inside the complex shapes associated with mussel aggregations has proven difficult as many techniques require a clear line of sight, while others are inappropriate for use in the small interstitial spaces between mussels. Presently, there is need to accurately quantify flows within aggregations of benthic marine organisms.

Here, we present results from our testing of a field-deployable flow sensor based on 3D-printed mussels fitted with pressure sensors. Lab testing demonstrated that the sensors are accurate over a range of ecologically-relevant velocities. We also deployed sensors in the field to characterize the natural flows present inside mussel beds. These results set the stage for more explicit investigations into the ecophysiology of aggregations associated with foundational benthic organisms (e.g., mussel beds, oyster beds, and coral reefs).

Presentation time: 5:45 - 6:30 p.m.
Poster number: 65

Abstract: 1142

Title: Applications of a Disease Dynamics Model to Crime Spread in California

Presenter(s): Aydn Math ’24

Other Authors/Contributors: Pengrui Han ’25
Supervisor(s) and affiliation or institution: Joseph Johnson (Assistant Professor of Mathematics, Carleton College).

In the paper "Modeling the Underlying Dynamics of the Spread of Crime," McMillon, Simon, and Morenoff explore SIR-based models of crime, determining equilibria and stability constraints on the systems. In this work, we applied these models to recorded violent crime data in Oakland, California and determined theoretical incarceration constants for distinct police areas in the city from 2016 through 2020 in search of statistically significant differences in policing patterns. We fit the model to the data using the built-in nonlinear regression function in Mathematica, recovering the incarceration and crime rates that best match the crime data.

This experience was funded by: The Towsley Endowment for the Sciences and the Elaine Tatham ’58 Endowed Fund for Mathematics and Statistics

Presentation time: 5:45 - 6:30 p.m.
Poster number: 66
Abstract: 1143

Title: Solidarity Organizing with CTUL

Presenter(s): Alex Mazur ’24, Eliza Lox ’25

Other Authors/Contributors: Myles Fisher ’25

Eliza and I worked with Tre Tellor, the solidarity coordinator with CTUL, doing work on community outreach, social media, event organizing, fundraising, and organizational networking during our internship. We created fliers and social media posts to share physically and on the internet with allies and community members. We also organized internal fundraising events and inter-organizational events.

This experience was funded by: John ’55 and Bonnie Raines Endowed Internship Fund and the Fred D. Andersen Foundation - The Visiting Professor of American Studies

Presentation time: 4:30 - 5:15 p.m.
Poster number: 69

Abstract: 1144

Title: Preliminary Study: Effects of Pb Exposure on Memory and Neuroinflammation in Young Mice

Presenter(s): Sage McCann ’26, Martha Chan ’25, Nithin Poreddy ’25, Natalie Sanchez ’24

Other Authors/Contributors: Fiona Liberge ’25
Supervisor(s) and affiliation or institution: Gisel Flores-Montoya (Assistant Professor of Psychology, Carleton College)

Chronic exposure to low levels of lead (Pb) has been shown to affect memory and cognition in children. The mechanisms by which Pb produces these deficits are not well understood, thus our study aimed to examine the neuroimmune response in lead-exposed young mice. To test these effects, an odor habituation/dishabituation test assessed olfactory memory in mice. Enzyme-linked immunosorbent assay (ELISA) was used to compare concentrations of pro-inflammatory cytokines in the hippocampi of the mice. Immunohistochemistry (IHC) for meninges was conducted to stain Iba-1 cells (macrophages). We found that exposure to lead increases some pro-inflammatory cytokine levels in the hippocampus, but there could be pro-inflammatory and anti-inflammatory mechanisms activated in chronic low-level lead exposed mice. In the future, effects of low-level lead exposure will be evaluated using these behavioral and biological methods. With further research, a possible intervention could be tested to reverse the cognitive deficits observed in young mice.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 67

Abstract: 1145

Title: Spleen Development Research

Presenter(s): Alice McClain ’24
I worked as a research assistant in Dr. Licia Selleri's lab at UCSF. My team studied spleen development in a mouse colony in order to identify the genetic mutations that cause congenital asplenia, a rare genetic birth defect where there is no spleen or the spleen is non-functioning. Findings will eventually help us develop a diagnostic tool to detect the spleen in the prenatal period and open the door to new therapeutic interventions.

This experience was funded by: Trustee Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 70

**Abstract: 1146**

**Title: Reviewing the Cognitive Benefits of Dance and Video games In Older Adults**

**Presenter(s): Chris Melo Mejia ’25**

Life expectancy worldwide has steadily increased each year since the 1960s (Medina 2020). The population of adults 65 years or older is expected to increase to 2.1 billion by 2050 (World Health Organization 2021). With the rise of older adults there is also an increase of cognition-related problems like Alzheimer’s disease (Manly 2022). In order to prevent cognitive decline in older people, research has focused on the effects of physical exercise and cognitive training on cognition. This review gathers peer-reviewed scientific articles from PubMed, Google Scholar, and Psycinfo databases that studied the effects of dance and video games, respectively, on cognitive function in older adults. Results will be useful for developing interventions, developing tailored activities to individual preferences, and improving quality of life of older adults.

This experience was funded by: Dolores D. Oswald ’46 and Hanan D. Wedlan Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 68

**Abstract: 1147**

**Title: Manipulating DNA Polymers With Magnetic Tweezers: A Computational Overview**

**Presenter(s): Luis Miranda ’24**

Other Authors/Contributors: Dr. Abhijit Sarkar (Professor of Physics, The Catholic University of America), Dr. Santosh Gaire (Postdoctoral researcher, The Catholic University of America), Luis Miranda Almanzar ’24

Magnetic force spectroscopy is a single molecule micromanipulation technique that has made significant progress in bridging the realms of physics and biology. The remarkable advancements made since the invention of magnetic tweezers have not only amplified its strengths but also mitigated its limitations. These developments have played a pivotal role in the emergence of magnetic tweezer-based force spectroscopy, providing new types of data on DNA elasticity and DNA-protein interactions. My project involved doing preliminary research on defining the software and architectures for integrating real-time data processing methods into the horizontal magnetic tweezers developed here at the Vitreous State Laboratory. Based on a literature review and study of the relevant technical literature, we decided to study the feasibility of using an existing single molecule data analysis tool, Micro-Manager 2.0, to enable
real-time tracking of beads connected to DNA polymers. I will report on the various aspects of the project and the initial feasibility studies on Micro-manager 2.0.

This experience was funded by: NSF grant PHY-1852006

Presentation time: 5:45 - 6:30 p.m.
Poster number: 69

Abstract: 1148

Title: Summer Internship at the Rice County Historical Society

Presenter(s): Marjorie Mitalski '24

During the summer of 2023, I participated in an internship at the Rice County Historical Society. I gained experience in the various aspects of museum operations including collections care, exhibit design, historical research, non-profit administration, and more. I learned about museum and historical ethics, legal standards within the museum profession, and the general best practices in the field. I was able to sample many aspects, allowing experience and insight into all museum functions and roles.

This experience was funded by: Jean Phillips Memorial Internship Fund
Presentation time: 4:30 - 5:15 p.m.
Poster number: 71

Abstract: 1149

Title: Global Middle Ages Summer Research

Presenter(s): Griffin Momsen-Hudson ’25

Other Authors/Contributors: Alex Wilson ’24, Nicholas Spezia-Shwiff ’24, Evan Orjala ’24, Abdullah Ansar ’25, Hope Yu ’26
Supervisor(s) and affiliation or institution: Victoria Morse (Professor of History, Carleton College)

The Global Middle Ages Research Project was composed of myself and five others students being supervised by Professor Victoria Morse to create a course focused on the Global Middle Ages, with an aim to de-center Europe in the topics studied. Each student researched a specific historical element in a specific region, with a special eye to connections between different parts of the world.

This experience was funded by: Humanities Center

Presentation time: 5:45 - 6:30 p.m.
Poster number: 122

Abstract: 1150

Title: Examining the pH Dependence of Hydroxynitrile Lyase

Presenter(s): Alice Mongane ’25

Other Authors/Contributors: Dr. Romas Kazlauskas (Researcher at the University of Minnesota)
Hydroxynitrile lyase and esterase are related but catalyze different reactions. Hydroxynitrile lyases catalyze the synthesis of cyanohydrins, while esterases catalyze the hydrolysis of esters. Exchanging the catalytic functions between these enzymes can help understand how the new catalytic activity evolves. Previous engineering of hydroxynitrile lyase created HNL3V, which has poor esterase activity. The new variant HNL3VN104A, substituting asparagine 104 with alanine, is a significantly better esterase. We hypothesized that this substitution improves catalytic activity by changing the pH optimum of the enzyme.

To test this hypothesis, we will measure the pH optimum of HNL3V and HNL3VN104A. These enzymes are overexpressed in bacteria purified, and their catalytic activity is measured at differing solution pH.

The catalytic activity toward hydrolysis of p-nitrophenyl acetate was measured at one pH, and measurements at additional pH values are ongoing. The graph shows the expected experimental results. In conclusion, the hypothesis has not yet been tested since experiments are incomplete.

Abstract: 1151

Title: Concussion Research and Science Writing with Concussion Alliance
Presenter(s): Keya Mookencherry ’25

Other Authors/Contributors: Conor Gormally, Malayka Gormally, Zach Napora

The internship consisted of several moving parts. Daily activities consisted of reading concussion research articles, meeting in groups for discussion, reading the book “Shaken Brain,” completing a Stanford science writing course, writing weekly newsletter synopses, and ultimately creating a larger final project for the Concussion Alliance website.

This experience was funded by: Robert E. Will ’50 Endowed Internship Fund in Social Entrepreneurship

Presentation time: 4:30 - 5:15 p.m.
Poster number: 72

Abstract: 1152

Title: A Recipe for Growth: My Summer with the Northfield Community Action Center Food Shelf

Presenter(s): Ben More ’24

I spent the summer as Food Access Intern at the Northfield Community Action Center Food Shelf. I oversaw the daily operations of two food shelf locations, including checking guests in and out, managing inventory, and communicating effectively in both English and Spanish.

This experience was funded by: Sam ’75 and Meg Woodside Endowed Fund for Career Exploration

Presentation time: 5:45 - 6:30 p.m.
Poster number: 70
Abstract: 1153

Title: Loving Eyes Foundation Internship Summer 2023

Presenter(s): Henry Moshfeghi ’25

Other Authors/Contributors: Henry P. Moshfeghi ’25, Dr. Frank Brodie ’05

This past summer I worked at the Loving Eyes Foundation (LEF) with Carleton Alumnus Dr. Frank Brodie ’05. LEF is a nonprofit organization co-founded by Dr. Brodie and is based out of the University of California San Francisco Medical School. The goal of LEF is to provide custom, cost-effective, glasses to children with facial abnormalities. I worked on several projects at LEF, including an internal review examining the time each step of the scanning and manufacturing process took and looking for areas where LEF could improve its turnaround time. I also worked with a team to finance and fund the upcoming year of operations.

This experience was funded by: Sam ’75 and Meg Woodside Endowed Fund for Career Exploration

Presentation time: 4:30 - 5:15 p.m.
Poster number: 74

Abstract: 1154

Title: A radioactivity‐free assay for aminoacylation by alanyl‐tRNA synthetase

Presenter(s): Katie Munro ’24, Lizzet Solache Salgado ’25

Supervisor(s) and affiliation or institution: Joe Chihade (Professor of Chemistry, Carleton College)

Aminoacyl‐tRNA synthetases are enzymes that catalyze the attachment of an amino acid to its corresponding tRNA, an essential step of protein synthesis. The most commonly used assay for monitoring alanyl‐tRNA aminoacylation utilizes radioactive alanine which allows for direct measurement of product formation, but is costly and time consuming. We are interested in developing an assay for alanyl‐tRNA synthetase that would eliminate the need for radioactive alanine. We are attempting to couple the reduction of NAD+ to NADH with the aminoacylation reaction. This would allow us to monitor the reaction by measuring NADH production with UV-Vis spectroscopy. To amplify the spectroscopic signal, we are attempting to include a way to regenerate the substrates and keep the assay running continuously.

This experience was funded by: Elliott Uhlenhopp Endowed Fund for Student & Faculty Research in Chemistry

Presentation time: 5:45 - 6:30 p.m.
Poster number: 71

Abstract: 1155

Title: Optogenetic Activation of Aggression-Promoting Neurons in Drosophila melanogaster

Presenter(s): Navya Murahari ’25, Nick Moore ’24
Aggression is a highly conserved social behavior crucial for survival and reproduction, serving essential functions such as securing and defending territories, mating partners, and essential resources. Genetics, sensory cues, past experiences, and internal biological states are crucial modulators of aggression, but the neural mechanisms that integrate these influences and produce aggression are poorly understood. Previous work in Drosophila melanogaster identified 19 transgenic lines which target neurons which promote intermale aggression following thermogenetic activation. In this study, we used (light-based) optogenetics to investigate the relationship between activation of unique neuronal populations and aggression phenotypes in 13 of these transgenic lines. We show that optogenetic stimulation recapitulated the increased aggression in 11 of the 13 lines tested. Interestingly, optogenetic stimulation also induced courtship behavior in 9 lines, comprising 6 additional courtship lines when compared to thermogenetic activation. Lastly, in order to investigate how neuronal activation affects other aggressive behaviors, we developed an automated classifier for tussling behavior. These results suggest that optogenetic activation reliably reproduces and may augment aggression and courtship behaviors observed in previous thermogenetic screens.

This experience was funded by: Towsley Endowment for the Sciences

Abstract: 1156

Title: Designing an In Vitro Stimulation Protocol to Test Immune Cell Activation by Gut Microbiome of Inflammation-Prone Mice

Presenter(s): Wanying Na ’24

The field of cancer immunotherapy has advanced at a rapid speed. In particular, immune checkpoint blockade (ICB) therapy work by unleashing the power of the patient’s own immune system to fight against cancer. However, around 50% of patients receiving ICB experience ≥1 immune-related adverse events (irAEs), including grade 3-4 colitis. Previous research has shown the host microbiome-immune homeostasis might predispose or contribute to ICB-driven irAEs. To explore the microbiome-immune interaction, I worked on developing an in vitro system to stimulate immune cell cultures with whole fecal bacterial samples from an inflammation-prone mouse model. We found that the distinct microbiome of inflammation-prone mice leads to increased levels of co-stimulatory marker expression by antigen presenting cells. We also found that the secreted factors in fecal supernatant induce a greater inflammatory immune response compared to purified bacteria.

This experience was funded by: Class of 1970 Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 75
Abstract: 1157

Title: Diet, Exercise and the Gut Microbiome in Cancer

Presenter(s): Shreya Nair '24

Supervisor(s) and affiliation or institution: Neelendu Dey (Assistant Professor, Department of Medicine, Fred Hutchinson Cancer Center, University of Washington)

Resistant starch (RS) has purported anti-inflammatory and anticarcinogenic benefits that are attributed to gut microbial metabolism. We conducted a pilot study to assess RS effects on potential biomarkers in individuals recently diagnosed with colorectal cancer (CRC). Isobutyric acid is a branched short chain fatty acid that is implicated in CRC metastasis. In this small trial, we observed reduction in isobutyric acid in the RS cohort only. Concentrations of butyrate, acetic acid, and other quantified short chain fatty acids (SCFAs) did not significantly change over the course of the trial. These findings demonstrate the potential for diet-by-microbiome effects on fecal metabolomic biomarkers in the setting of CRC. Additionally, we explored the effects of diet and exercise in the gut microbiome and health of Breast Cancer survivors and found an increase in potentially healthy SCFAs and microbes.

This experience was funded by: Trustee Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 73

Abstract: 1158

Title: Leveraging Machine Learning in the Design of Novel Ionic Liquids

Presenter(s): Mays Neiroukh '25

Supervisor(s) and affiliation or institution: Subha Kumpaty (Adjunct Professor of Mechanical Engineering, Milwaukee School of Engineering), Pawan Panwar (Fluid Power Research Associate, Milwaukee School of Engineering)

Ionic Liquids (ILs), recognized for their versatile applications across various domains, have stirred considerable interest. However, the traditional experimental approach to discover unique ILs is resource intensive and time consuming. To address this, our study introduces a contemporary method for generating unique ILs, leveraging machine learning to target desired chemical properties and novelty in the resulting ILs. While many neural network architectures have attempted to tackle similar problems related to chemical generation, our research uniquely employs the Generative Chemical Transformer (GCT) model for IL generation. Integrating the proven Transformer and Conditional Variational Autoencoder (CVAE) architectures, the GCT model can generate novel ILs with specified properties. We utilized the National Institute of Standards and Technology database to obtain properties of 450 ILs at varied temperatures and atmospheric pressure, amassing 3315 data points. Each data point was tailored to include the IL depicted as a standard SMILES string, alongside the recorded temperature, pressure, and IL properties such as density, viscosity, and electrical conductivity. The GCT model, trained on this data, generated 30000 ILs for model testing. By facilitating the creation of valid and innovative ILs with predefined attributes, our research streamlines and expedites generation of efficacious ILs.

Keywords: Ionic Liquids, Machine Learning, Generative Chemical Transformer.

This experience was funded by: Elizabeth K. Ester '79 and Michael T. Brody Endowed Internship Fund
Abstract: 1159

Title: Understanding Heritage: Exploring Hong Kong Culture Through Hong Kong Cinema

Presenter(s): Kate Ng ’24

Hong Kong has significantly changed in the past century, including making the transition from a British colony to a special administrative region of China. Many in Hong Kong feel as though Hong Kong has manufactured its own culture—a complex blend of eastern and western influences—during its time away from its motherland. Hong Kong cinema is an illuminating, important, and accessible part of Hong Kong culture. Therefore, I seek to utilize Hong Kong films ranging from the 1950s to the present day, along with visiting cultural sites featured in the film, to explore the creation and evolution of Hong Kong culture.

This experience was funded by: Chang-Lan Fellowship

Abstract: 1160

Title: Trust Based Relational Intervention: A Nonprofits’ Approach

Presenter(s): Tin Nguyen ’24

Summer of 2023, I was an Educational Game Facilitator for United Playaz and West Bay in San Francisco, working with k-8 students from all over the city. During my time, I learned more about the program framework and methods for working with students who have experienced trauma, whether that is violence at home or in the city or the jarring experience of moving to a new country. This framework is called Trust Based Relational Intervention.

This experience was funded by: Class of 1963 Student Research Fellowship

Abstract: 1161

Title: Impact of Distance Reiki Among Patients with Multiple Myeloma

Presenter(s): Tiffany Nyamao ’25

Other Authors/Contributors: Joselle Cook, M.B.B.S., Rahma Warsame, M.D., Katharine Dooley, M.P.H., Martha Q. Lacy, M.D.

Patients with Multiple Myeloma (MM) undergo significant distress when dealing with the disease that often impacts their quality of life (QOL). As a result, many patients are turning to Complementary and Alternative Medicine (CAM), like Reiki Therapy, to help elicit a healing response. We created this pilot
study to determine if there is a meaningful impact on the QOL and immune repertoires of patients with MM when using Reiki therapy. We enrolled and randomized thirty outpatients with MM to different arms and conducted Reiki over Zoom® for four weeks. Patients took QOL surveys like the PROMIS-29®, LASA, and the “Was it Worth it” (WIWI) questionnaire, and we assessed their blood for changes in the immune repertoires. We found that patients from the “Was it Worth it” (WIWI) questionnaire were satisfied with the intervention. However, there were no significant improvements in their QOL from the other questionnaires. Although this was not significant, this pilot study demonstrated the acceptability and feasibility of Distance Reiki among multiple myeloma (MM) outpatients. We plan to conduct more research to improve this study and build on these results.

This experience was funded by: Multicultural Alumni Network (MCAN) Fellows Program

Presentation time: 5:45 - 6:30 p.m.
Poster number: 74

Abstract: 1162

Title: An Online Tool to Search for False Gravitational Wave Signals

Presenter(s): Daniel Nykamp ’26

Other Authors/Contributors: Luke Bisio ’26, Nelson Christenson
Supervisor(s) and affiliation or institution: Jay Tasson (Associate Professor of Physics, Carleton College)

We collected data from gravitational wave observatories that logged coherence of auxiliary channels, and we created a database that can be queried from a website.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 75

Abstract: 1163

Title: Effects of Phthalate on the Upper Limit of Detection of Ion-Selective Electrodes

Presenter(s): Katie O'Leary ’25

Supervisor(s) and affiliation or institution: Philippe Buhlmann (Professor of Chemistry, University of Minnesota), Madeline Honig (PhD Candidate in Chemistry, University of Minnesota)

Ion-selective electrodes (ISEs) are powerful chemical sensors that allow for the detection of given target ions in solution. Phthalate is an ion present in commercially-available pH buffer solutions that is known to interfere with the working range of ISEs. Prevention of phthalate interference is thus a key objective in industrial and research settings that utilize ISEs, but until recently, the mechanism of phthalate interference has not been well understood. In this study, quantitative theoretical models for the upper detection limit of ISEs as well as nuclear magnetic resonance (NMR) spectroscopy were employed with conventional proton-selective ISEs to better understand the nature of phthalate interference.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 76
Abstract: 1164

Title: Washburn Center for Children - Family Focused Classroom Internship

Presenter(s): Lindsay Okindo ’24

This summer I had the opportunity to intern at Washburn Center for Children. Based in Minneapolis, MN, Washburn is a nonprofit organization that provides mental health services for children and families. I worked in Washburn’s Family Focused Afternoon Group. The Family-Focused program provides therapeutic services for young children, ages 3-5, who are at risk for abuse or neglect due to high levels of family stress. As an intern, I assisted clinicians with providing classroom treatment to a small group of children in the program.

This experience was funded by: Multicultural Alumni Network (MCAN) Fellows Program

Presentation time: 4:30 - 5:15 p.m.
Poster number: 79

Abstract: 1165

Title: Preserving Performance at the Franklin Furnace Archive

Presenter(s): Brett Olson ’24

The Franklin Furnace Archive is dedicated to serving artists by providing both physical and virtual venues for the presentation of time-based art, including but not limited to artists’ books and periodicals, installation art, and performance art. As an intern during the summer of 2023, I was largely tasked with managing and digitizing all archival material from performances, events, and readings from the organizations founding in 1976 up to the present. This material was to be made accessible online for scholars, researchers, and the greater public. Additionally, the opportunity arose to work on grant writing, fundraising, and assisting in a panel for juried artist grant applications.

This experience was funded by: Wiebolt Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 77

Abstract: 1166

Title: Chickens accelerate the increase in soil organic carbon and microbial activity in regenerative agricultural systems.

Presenter(s): Karl Olson ’25

Other Authors/Contributors: Maya Hofmann ’23, Misaki Taniguchi ’26
Supervisor(s) and affiliation or institution: Daniel Hernandez (Professor of Biology, Carleton College)

Regenerative agriculture seeks to produce food using land management practices that improve soil quality and ecosystem health. Documenting these ecological benefits in diverse agricultural systems is important for understanding the efficacy of these practices. We worked with three local regenerative poultry farms of different ages (2, 6 and 11 years) to determine the ways in which the addition of free-
range chickens to a perennial hazlenut system affected soil carbon storage and carbon dioxide emissions. At each farm, we sampled within chicken paddocks and compared these to similar areas where chickens were not present. The presence of chickens increased soil organic carbon and this increase was greater on older farms. Carbon dioxide emissions increased under the presence of chickens long term but in younger farms was not as evident.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 78

Abstract: 1167

Title: Identifying and Classifying Misinformation About Cryptocurrencies on Twitter

Presenter(s): Jamal Omosun '26

Supervisor(s) and affiliation or institution: R. Micheal Alvarez (Professer of Political Science, California Institute of Technology)

Misinformation on Twitter, especially around cryptocurrency, has long been a topic of conversation on the platform. There has been a long history in the crypto community on Twitter of bot accounts, spam, scams, and misinformation. Recently there have been incidents where misinformation has affected and actively influenced crypto trading and market prices such as in the case of the currency Ripple. The goal of this project is to train models that can accurately identify misinformation involving cryptocurrencies and classify them. We gathered a large dataset of thousands of tweets and then tested them against a preselected selection of misinformation key phrases and other such identifiers. The results of this analysis give us an idea of how likely any given tweet is to be misinformation, a scam, or a bot account. The results of this project also give us an idea of how to proceed with further research in this field.

This experience was funded by: Trustee Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 80

Abstract: 1168

Title: Examining the Use of Research Evidence in Local Policymaking During COVID-19

Presenter(s): Arthur Onwumere ’24

Other Authors/Contributors: Dr. Denise Payan - UC Irvine Public Health Department

This research paper examines the use of research evidence in local policymaking during the COVID-19 pandemic, focusing on three California counties: Orange, Merced, and Riverside. The study builds upon existing literature, which highlights the gap between research evidence and policy decisions in various areas, such as restaurant nutrition label policies and pandemic-related research. The primary objective of the comprehensive study is to analyze the types of arguments and research evidence used to support policy decisions at the county level, with a special emphasis on building equitable and accessible knowledge bases. The research questions explore the types of arguments mentioned in county policy discussions, the policies proposed and adopted, and the demographic profiles of the three counties.

This experience was funded by: Multicultural Alumni Network (MCAN) Fellows Program
Abstract: 1169

Title: The Global Middle Ages

Presenter(s): Evan Orjala ’24

Other Authors/Contributors: Abdullah Ansar ’25, Griffin Momsen-Hudson ’25, Nicholas Spezia-Shwiff ’24, Alex Wilson ’24, Hope Yu ’26

Supervisor(s) and affiliation or institution: Victoria Morse (Professor of History, Carleton College)

The purpose of this five-week project was to design the syllabus for HIST 126, a 100-level history course scheduled for Spring 2024. The course will explore the Middle Ages from a global perspective, welcoming the methods and frameworks of interdisciplinary scholars, and addressing the reality that the traditional Middle Ages has upheld a Eurocentric and colonialist view of the non-Eurasian world. Students will explore a range of primary and secondary sources from around the globe. It is our goal they will see the world between 500 and 1500 C.E. as interconnected and multicultural, and that they will consider the frameworks and modes of periodization that helped or hindered them in gaining that perspective.

This experience was funded by: Humanities Center

Abstract: 1170

Title: Quantitative analysis of behavior during virtual navigation using DeepLabCut and Python

Presenter(s): Joseph Park ’25

Investigating relationships in the activity of cell types to a broad repertoire of behaviors, can reveal novel insights into more complex coding properties of neurons in the hippocampus. Additionally, utilizing behavioral data is a valuable way to quantitatively demonstrate motor learning in mice as they learn to navigate a new environment. This summer, I compared naive and experienced mice as they navigated a virtual reality linear maze to demonstrate motor learning using DeepLabCut and Python. We also found that whisking activity is highly correlated with other active behaviors like running which is naturally necessary for exploratory behaviors. Finally, pupil data generated using DeepLabCut was analyzed with relation to the task and electrophysiology recordings which revealed that pupil diameter directly correlates with fluctuations in brain state (small pupil diameter = higher power theta oscillations).

This experience was funded by: Eric '85 and Sue Munis '86 Nord Internship Fund

Abstract: 1171

Title: Cytokine Profile of LRP1 Wild Type T Cells vs. LRP1 Knockout T Cells
**Abstract: 1172**

**Title: A Test of EP Violations on Cooper Pairs**

**Presenter(s): Ian Paulson ’24**

I played a primary role in the upgrading and improvement of an ultra-low vibration cryostat for the detection of equivalence principle violations on superconducting niobium and cooper pairs. This included extensive spectral power density analysis. I did some additional work on LIGO calibration apparatus, and a test of the short range Newtonian inverse square law.

This experience was funded by: Kolenkow-Reitz Fund

**Presentation time: 5:45 - 6:30 p.m.**
**Poster number: 81**

**Abstract: 1173**

**Title: Clash Detection Algorithm for Revit**

**Presenter(s): Doug Pham ’24**

This was a self proposed project I worked on for about 2 weeks a the end of my internship. I first came up with this idea from some reasearch I previously conducted about the BIM industry as a whole and one area that I that was particularly interesting was about clashes in BIM design. I thought it would be helpful to create an add-in within Revit that could be used to help automate finding clashes and saving time for designers. I first had to develop an algorithm that I would use to be able to find which elements would be considered a clash and utilizing Revit APIs I was able to create this program.

This experience was funded by: Robert E. Will '50 Endowed Internship Fund in Social Entrepreneurship
Abstract: 1174

Title: Synthesis of 3,4-disubstituted Pyrroles by Michael Addition Ring Closure

Presenter(s): David Pille ’24

Other Authors/Contributors: David Pille ’24

Nitrogen heterocycles make up a significant portion of FDA approved small-molecule prescription drugs in the United States. Pyrrole, a five-membered aromatic ring containing one nitrogen atom and 4 carbon atoms is one such heterocycle. Pyrroles with the 3,4-disubstitution pattern can be synthesized using a base-catalyzed Michael reaction between a TMS-protected alkyne containing an electron-withdrawing ketone and a β-keto sulfonamide forming a tertiary alcohol, followed by reduction with boron trifluoride diethyl etherate. The reactions were monitored by nuclear magnetic resonance spectroscopy (NMR) and thin layer chromatography (TLC). We found that the success of the Michael addition was dependent on the EWG attached to the alkyne. NMR confirmed that the sulfonamide and alkyne starting materials were present, so the Michael reaction step was the barrier. Aromatic substituents prevented the reaction from completing entirely, while aliphatic substituents produced variable yields.

Abstract: 1175

Title: Claiming Inspiration and The Oma People of Laos

Presenter(s): Eila Planinc ’26

In 2019, an international fashion brand misappropriated traditional designs of the Oma people, an ethnic group in Laos. The Oma were left with little recourse. My work with the Traditional Arts and Ethnology Centre was to create the digital aspect of their new exhibition on this issue. "Claiming Inspiration: Artisans, Culture, Commercialisation" chronicles how the Oma, with the help of the TAEC and other organizations, fought back against the IP Theft and provided a framework for other communities to protect their traditional knowledge and designs.

This experience was funded by: Donald A. Camp ’70 and Elizabeth Hart Camp Endowed Internship Fund

Abstract: 1176

Title: Fire-Induced Mass Flowering Allows Rattlesnake Master (Eryngium Yuccifolium) to Escape Pre-Dispersal Seed Predation by Larvae of the Moth Coleotechnites Eryngiella

Presenter(s): Will Puzella ’25, Josey MacDonald ’25
Mass synchronous flowering (masting) could offer an escape from seed predation due to predator satiation. The prairie forb rattlesnake master (Eryngium yuccifolium) frequently is attacked by larvae of the moth Coleotechnites eryngiella, a specialist pre-dispersal seed predator. To test whether fire-induced masting allows E. yuccifolium to satiate seed predators, we compared a burned and an unburned prairie in the Carleton Arboretum. Flowering of E. yuccifolium was much greater in the burned plot. Seed predation was quantified by a visual assay, since externally visible brown flowers reliably indicate internal C. eryngiella damage. There was 3X more damage by seed predators in the unburned plot. Heads from the unburned plot averaged >75% of flowers damaged per head, while in the burned plot heads averaged between 25% and 50% of flowers damaged per head. Decreased predation rates in mass-flowering burned plots supports masting as a strategy to reduce seed predation.

This experience was funded by: William Muir Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 84

Abstract: 1177

Title: Retinopathy of Prematurity Telemedicine Screening: Biweekly Screening After 40 Weeks Postmenstrual Age

Presenter(s): Daanyal Raja ’25
Other Authors/Contributors: I worked with Dr. Darius Moshfeghi of Stanford Medicine.
Supervisor(s) and affiliation or institution: Darius Moshfeghi (Professor of Ophthalmology, Stanford University) and Charles DeBoer (Clinical Instructor, Ophthalmology, Stanford University)

Retinopathy of Prematurity (ROP) significantly affects the visual development of preterm infants. This study analyzes a novel ROP examination approach, involving weekly exams until infants reach a PMA (Postmenstrual Age) of 40 weeks, followed by bi-weekly exams, with variations based on case severity. A retrospective analysis of 111 patient records aimed to adapt this new examination frequency. Patient data was transferred from a TeleROP database to a REDCAP database, with identifiers removed during analysis.

On average, each patient had 8.94 exams, with 1.74 occurring at 2-week intervals. The average PMAs indicate reduced ROP risk in preterm infants over time. All cases where a patient developed ROP during the exam period saw regressions; no patient developed ROP, which is encouraging. While this new testing frequency is promising, further research is necessary to fully grasp all long term impacts on the visual outcomes of each patient.

This experience was funded by: Eugster Endowed Student Research and Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 83

Abstract: 1178

Title: The Bing Crosby House Museum
Presenters: Sophie Rast ’24

I worked on an interpretive plan and remodeling suggestions for the Bing Crosby House Museum located on Gonzaga’s campus.

This experience was funded by: Jean Phillips Memorial Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 84

Abstract: 1179

Title: Start a Riot: Thinking the Possibility of a Politics of Excess

Presenters: Natalia Ron-Lopez ’25

Excess, defined as the part of a social field whose exclusion acts as the constituting condition for the field as such, is essential as a central concept for thinking through political change; excess opens up various emancipatory possibilities. To think from the point of view of excess is to think from that point of a social field which has the possibility of disrupting the field. My work draws on Alain Badiou’s theory of change, articulated most fervently in Logics of Worlds (2012) and Sylvia Wynter’s critical (post)humanism which is articulated in the article “The Ceremony Must be Found” (1984) and “The Ceremony Found” (2015). Both thinkers attempt to think through the end of a whole mode/genre of subjugation as well as the possible limits/shortcomings of their respective discourses. Wynter’s critique of the symbolic replicator of life/death and Badiou’s notion of the inexistent provide a critical architecture for understanding the way in which every system is constituted based upon an exclusion.

This experience was funded by: Mellon Mays Undergraduate Fellowship

Presentation time: 5:45 - 6:30 p.m.
Poster number: 85

Abstract: 1180

Title: Multicultural Planning and Migrant Acculturation

Presenters: Ayanna Rose ’25

Supervisors and affiliation or institution: Cherlon Ussery (Professor of Linguistics, Carleton College)
Daniel Groll (Professor of Philosophy, Carleton College)

Historically, urban planning has been used to alienate marginalized communities through racist planning initiatives like redlining. In order to rectify the past, cities have sought to incorporate social planning planning projects that consider the social and cultural needs of the community, to be critical of its discriminatory past while encouraging a socially cohesive future. My research identifies how social planning has impacted migrant communities’ ability to acculturate within cities. Using Ruth Fincher’s case studies in, “Planning in the Multicultural City: Celebrating Diversity or Reinforcing Difference”, I selected two cities, Sydney and Amsterdam, to be the focus of my research. I highlight two different approaches: the multicultural and melting pot approaches. The multicultural approach designates the duty to integrate as responsibility of the dominant society, so planning programs have a sociocultural perspective. In comparison, the Melting Pot approach assigns the duty to integrate to the migrant community. Planning policy in the melting pot approach is centered around the needs and wants of the
dominant society and can be alienating to those looking to integrate. Aside from the case studies I also interpreted my own experience interning at Northfield city hall where I observed the different roles behind the policy implementation and acculturation process.

This experience was funded by: Multicultural Alumni Network (MCAN) Fellows Program

Presentation time: 4:30 - 5:15 p.m.
Poster number: 85

Abstract: 1181

Title: The Past and Future of Detecting the Smallest Particle in the Universe: A Livingston-Style Historical Literature Review of Neutrino Detectors

Presenter(s): Adam Rothman ’25

Other Authors/Contributors: Adam Lister (Research Associate, University of Wisconsin-Madison)
Supervisor(s) and affiliation or institution: Ben Messerly (Postdoctoral Associate, University of Minnesota)

Since their discovery in 1956, neutrinos have been a growing field of study, and today they offer some of the most promising inroads to new physics. Neutrinos are extremely elusive particles and can only be detected in specially built detectors. The history and future of neutrino detectors is an exciting story for particle physicists designing and improving these detectors. In this study, we pursued two quantities characteristic of all neutrino detectors: position resolution and detector mass. Experiments did not always prioritize knowing or documenting these quantities. Thus, we developed several sophisticated estimation methods – spanning engineering, chemistry, and particle physics – to determine them, complement direct quotations, and cross-check publications. Our preliminary results show changes in position resolution and detector mass are dependent on the type of detector and the physics goals associated with that technology. Spanning back 70 years to the first neutrino observation, position resolution and detector mass tell a tale of technological growth, scientific priorities, and specialization.

Presentation time: 4:30 - 5:15 p.m.
Poster number: 86

Abstract: 1182

Title: My Communications Internship at the Office of Governor Walz and Lieutenant Governor Flanagan

Presenter(s): Adam Rothman ’25

For this internship, I supported the communications team in many ways, such as drafting press releases, social media posts, and general research. Through this internship, I got a taste of the political communications world, preparing me for a career in this type of public service.

This experience was funded by: Jean Phillips Memorial Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 87
Abstract: 1183

Title: Juneau Icefield Research Program

Presenter(s): Lia Salomon ’25

The Juneau Icefield Research Program (JIRP) has been conducting glacier research since 1946. A group of 30 students, staff, and rotating faculty complete a 75 mile ski traverse from Juneau, AK to Atlin, BC while living on the glacier in four permanent camps. Dozens of research projects take place, such as gravimetry, drone surveys, ground penetrating radar surveys, and many more. The three main projects I was involved in were mass balance pit sampling across the Lemon Creek and Taku Glaciers, lapse rate data collection on the Mathes Glacier, and a GPS elevation survey on the Llewellyn Glacier.

This experience was funded by: Eugster Endowed Student Research and Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 86

Abstract: 1184

Title: Negative Correlation Between Copepod Age and Vulnerability to S. Solidus Infection

Presenter(s): Josh Sampson ’26

Other Authors/Contributors: Josh Sampson ’26
Supervisor(s) and affiliation or institution: John Berini (Postdoctoral Fellow in Ecology and Evolution, Carleton College), Amanda Hund (Visiting Research Assistant Professor of Biology, Carleton College),

The majority of research focusing on the interaction between Schistocephalus solidus tapeworms and its hosts has focused on its parasitization of its second intermediate host, threespine stickleback. To better understand how S. solidus impact their first intermediate host, a cycloid copepod (Acanthocyclops robustus), our group sought to determine the relationship between A. robustus age at exposure to S. solidus and parasite load later in A. robustus development.

This experience was funded by: Kolenkow-Reitz Fellowship

Presentation time: 4:30 - 5:15 p.m.
Poster number: 88

Abstract: 1185

Title: Serving at the Ethiopian Community Support and Advocacy Center (ECSAC) Engaging Community Needs and Establishing Integrative Initiatives

Presenter(s): Hermela Samuel ’26

This summer, I was an assistant program manager at the Ethiopian Community Support and Advocacy Center (ECSAC) in Alexandria, Virginia. ECSAC is a non-profit which provides Ethiopian immigrants, and first-generation individuals with the resources to succeed in the Washington, DC area. ECSAC aims to bridge the inequity through culturally aware support in health, education, and housing. I supported this mission with resources especially for uninsured or Medicaid individuals.
Abstract: 1186

Title: Modeling Planet Forming Disk HD 163296 with Differential Evolution

Presenter(s): Jake Schaefer ’26

Other Authors/Contributors: Gabe Driscoll ’24
Supervisor(s) and affiliation or institution: Evan Rich (Assistant Professor of Practice, University of Nebraska)

Planet forming disks like HD 163296 are essential to discovering how small dust grains grow to become planets. Observational data is complicated and difficult to interpret, so we use Monte Carlo radiative transfer simulations to generate models. Finding the best fit model by hand is extremely time consuming, so we coded a differential evolution program to find the best fit model efficiently and quickly. It took only 300 model runs, where by hand it would take 3000.

Presentation time: 4:30 - 5:15 p.m.
Poster number: 89

Abstract: 1187

Title: Interning at the Washington Observer

Presenter(s): Luna Schindler-Payne ’26

Other Authors/Contributors: Paul Queary

During my internship at the Washington Observer, I took a deep dive into Washington State politics, covering news stories and conducting investigative journalism. Over the course of my experience I wrote articles on a variety of issues: from a revealing audit release on the Seattle Police, to the considerable finances from the National Realtors Association donated in municipal primaries in Spokane. My long-term project of investigating Robert Ferguson’s campaign finances also proved to be a success – and resulted in revisions of the campaign’s financial disclosure and the transferring of $86,000 in donations to the appropriate account. Overall I learned a considerable amount about politics in Washington and about what it means to be a journalist in practice and in purpose.

This experience was funded by: Neil Isaacs and Frank Wright ’50 Fellowship in Investigative Journalism

Presentation time: 5:45 - 6:30 p.m.
Poster number: 87

Abstract: 1188

Title: Youth Reconciliation Abroad: Art and Conversation in Northern Ireland
Presenter(s): Ian Scott ’24

Other Authors/Contributors: Marynel Van Zee (Director of Student Fellowships and Lecturer in History)

I traveled to Northern Ireland to study a suite of conversational and artistic strategies to engage people in meaningful conversations around challenges faced in their communities. Over the last 70 years, Northern Ireland has practiced youth-focused reconciliation strategies spanning multiple creative disciplines to catalyze healing from divisive sectarian conflict. I learned how to participate in individual and community reconciliation with an emphasis on art as an invitation to explore belonging and sense of place. If my generation is going to dismantle generational separation and antagonism, we need to learn from reconciliation initiatives in other contexts.

This experience was funded by: Larson International Fellowship

Presentation time: 5:45 - 6:30 p.m.
Poster number: 88

Abstract: 1189

Title: Small Cycladic Islands Project 2023

Presenter(s): Victoria Semmelhack ’25, Emmett Forster ’24, Bianca Lott ’26

Other Authors/Contributors: Emmett Forster ’24, Bianca Lott ’26, Victoria Semmelhack ’25

Supervisor(s) and affiliation or institution: Alex Knodell (Associate Professor of Classics, Carleton College)

The Small Cycladic Islands Project is an archeological project in Greece that seeks to identify a history of occupancy and patterns of use in the smallest Greek islands in the Aegean Sea. This year, the project focused on the islands around Andros, Tinos, and Amorgos. We collected material remains in the field and analyzed them in the lab. We found evidence of pottery, stone tools, and human-built structures. Along with local interviews and historical records, we developed a better understanding of how this island was occupied throughout history, and could ascertain the long-term role these islands played within the Greek Cyclades.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 89

Abstract: 1190

Title: Psychophysiology and Social Experiences

Presenter(s): Sonia Shah ’24

This summer I worked at the UCSF Emotion, Health, and Psychophysiology Lab. I worked on two sleep and social experiences studies where I was running participants through tasks and recording psychophysiological data according to the protocol. The other studies I worked on included a Personal History study and a Couple Transcutaneous Vagal Nerve Stimulation study. These studies were newer, so I provided suggestions regarding questionnaires and protocols and also worked to run participants and record physiological data. We collected blood pressure, heart rate (ECG sensors), impedance (thoracic cavity blood flow), salivary cortisol, finger skin temperature, and finger blood flow. The study tasks included dyadic interactions that were real (couple study) or simulated online (sleep study 1) or in person (sleep study 2 and personal history study). I also had the opportunity to connect with postdocs, study coordinators, and learn more about the field of health psychology by attending various tutorials.
that included topics about autonomic nervous system, psychoneuroimmunology, and intersectional models of health.

This experience was funded by: Ratner Fund for Aging and Geriatrics Internships and the Trustee Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 90

**Abstract: 1191**

**Title:** Effect of DREADD-induced VMN Silencing On Paced Mating Behavior in Female Rat

**Presenter(s):** Ted Shao ’25, Claudia d’Auria ’24

Other Authors/Contributors: Claudia d’Auria ’24, Gabrielle Reynaga ’23

Supervisor(s) and affiliation or institution: Sarah Meerts (Professor of Neuroscience and Psychology, Carleton College)

Paced mating behavior observed in female rats is modulated by multiple brain areas. Previous studies have shown that the ventromedial nucleus of the hypothalamus (VMN) plays a critical role in facilitating lordosis during mating. However, it remains unknown whether the VMN affects certain aspects of paced mating behavior, such as contact return latency. The present study was conducted to examine the effect of DREADD-induced temporary silencing of VMN on paced mating behavior and whether that effect varies between sexually naive female rats and sexually experienced female rats. Ovariectomized, Long-Evans female rats were randomly assigned to four groups: naive injected with water, naive injected with CNO, experienced injected with water, experienced injected with CNO. All subjects were primed with estradiol benzoate (EB) 48 hours and progesterone (P) 4 hours prior to paced mating. Either water or Clozapine-N-oxide (CNO) was injected intraperitoneally 30 minutes before each mating session. Four paced mating sessions were conducted. Although results were not statistically significant, sexually experienced female rats injected with CNO showed longer contact return latency to intromissions and ejaculations. They also exhibited fewer preceptive behaviors and spent less time with the male in comparison to sexually experienced female rats injected with water. As expected, sexually naive female rats that were injected with water exhibited significantly lower contact return latencies to intromissions on test day 4 in comparison to test day 1. However, no effect of silencing the VMN is noticed in sexually naive female rats infused with CNO.

This experience was funded by: NIH

Presentation time: 4:30 - 5:15 p.m.
Poster number: 91

**Abstract: 1192**

**Title:** Summer Assistant at Curbside Compost Co-op

**Presenter(s):** Zack Shawn ’26

Over this summer, I worked as a summer assistant at Curbside Compost Co-op, a compost collection company based in Northfield. I worked on a variety of projects for the company, including compost collection, research, and maintenance of a chicken farm owned by the company. This experience
allowed me to learn more about a range of topics, such as environmental sustainability, food waste, and alternative business models.

This experience was funded by: Karen Grove Feldt ’61 and William A. Feldt ’61 Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 91

Abstract: 1193

Title: Smooth Muscle and Inflammatory Markers are Increased in Obliterans Bronchiolitis Lungs

Presenter(s): Frank Sheffield ’24

Supervisor(s) and affiliation or institution: Rodney Britt (Principle Investigator, REaCH-LABS Nationwide Children's Hospital)

Bronchinitis Obliterans (Popcorn Lung) is a bronchial disorder that primarily disrupts airflow obstruction, and causes inflammation of small-airway epithelial cells and subepithelial structures. It presents as excessive fibroproliferation and has been associated with transplants, inhalational injury, and multisystem autoimmune diseases. Methods such as western blots, and Meso Scale Discovery U-Plex Assay, were used to discover more about the pathophysiology, specifically identifying the structural and immune makers in patients with Bronchinitis Obliterans.

This experience was funded by: Dolores D. Oswald ’46 and Hanan D. Wedlan Endowed Internship Fund and REaCH-LABS Nationwide Children's Hospital
Presentation time: 5:45 - 6:30 p.m.
Poster number: 92

Abstract: 1194

Title: Examining structure-based mutants in the exocyst complex for gain of function activity

Presenter(s): Sarah Shi ’26

Supervisor(s) and affiliation or institution: Patrick Brennwald (Professor, UNC Chapel Hill School of Medicine Cell Biology & Physiology), Gabrielle Puller (BBSP program graduate student, UNC Chapel Hill)

Yeast (Saccharomyces cerevisiae) contains a protein known as the exocyst which is involved in vesicle tethering to the plasma membrane; previous research shows that there are two discrete tethering pathways via the two subcomplexes Exo70 and Exo84. To further understand the protein interface interactions within the exocyst, we created single residue, heat-sensitive, gain-of-function (GOF) yeast mutants with mutations located in Sec10 and Sec5, which are subcomplexes that border Exo70 and Exo84. GOF yeast mutants will tell us which amino acids are the most important to exocyst vesicle tethering function.

This experience was funded by: Kolenkow-Reitz Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 93
Abstract: 1195

Title: Urban Dynamics in Hellenistic Greece

Presenter(s): Ellie Simon ’26

This summer, I worked as an archaeological intern at the Pella Urban Dynamics Project. This five-year archaeological project focuses on ancient Pella in Northern Greece as a hub of rapid cultural expansion and development in the Hellenistic period. The project employs geophysical and field surveys, the excavation of a non-elite household, and a stratigraphic trench to examine the lives of the city’s inhabitants from the fifth to first centuries BCE. Building on previous research that discovered the exceptionally large agora, public baths, elite households, and sanctuaries of the city, this iteration of the project focused on the presence of the non-elite in the ancient city. Additionally, the project seeks to contextualize the individual household in the city by developing a better understanding of the city's grid layout. Finalization and publication of the finds will occur in 2025.

This experience was funded by: Multicultural Alumni Network (MCAN) Fellows Program

Presentation time: 4:30 - 5:15 p.m.
Poster number: 92

Abstract: 1196

Title: Plasmid Design in Engineered Genetic Incompatibility of Drosophila suzukii

Presenter(s): Phoebe Sinner ’24

Drosophila suzukii, or the spotted wing drussel fly, are invasive and wreak havoc on Minnesota crops. NovoClade is working to engineer a transgenic line of flies with CRISPR DNA editing. When engineered flies are crossed with the wild population, they are unable to produce viable offspring. Population modeling has shown that this method can create local population knockout.

This experience was funded by: Class of 1963 50th Reunion Fund for Internships

Presentation time: 4:30 - 5:15 p.m.
Poster number: 93

Abstract: 1197

Title: Educating Kids with Voice Interactive Games

Presenter(s): Muno Siyakurima ’24

Other Authors/Contributors: Leo Moran ’25, AJ Lesure ’24, Brandon Szeto ’25, Ntense Obono ’25, Barry Nwike ’25, Gideon Antwi ’26

During my summer internship with SayKid, I focused on the development of voice interactive educational games for children. The primary objective of this internship was to explore innovative and engaging ways to facilitate learning through voice technology. One of the key projects I worked on was the creation of a "Guess the State" game, designed to help children learn about U.S. states by providing them with clues and hints to identify the state in question. Additionally, I contributed to the development of a "Choose Your Own Adventure" game that encouraged decision-making and problem-
solving skills in young learners. This internship allowed me to gain valuable experience in designing interactive educational content, leveraging voice technology to make learning more enjoyable and effective for children.

This experience was funded by: Robert E. Will '50 Endowed Internship Fund in Social Entrepreneurship

Presentation time: 4:30 - 5:15 p.m.
Poster number: 94

Abstract: 1198

Title: Conflict and Control: Dispute Resolution and Community Stature on English Wikipedia

Presenter(s): Dylan Smith '24, Kyra Helbold '24, Henry Burkhardt '26

Supervisor(s) and affiliation or institution: Sneha Narayan (Assistant Professor of Computer Science, Carleton College)

Wikipedia exemplifies the power of large scale collaboration to produce important shared resources. On English Wikipedia, the thorniest disputes are adjudicated by a group of volunteers known as the Arbitration Committee (ArbCom), with input from other editors. We assembled a dataset of 1,483 arbitration cases that occurred between 2004 and 2023 to understand how a Wikipedian’s stature within the editing community impacts their dispute resolution process.

Our initial findings show that Wikipedians who participate in ArbCom deliberations are dramatically more experienced than an average editor. Additionally, the stature of an editor filing a case with ArbCom appears to be strongly associated with the likelihood of ArbCom accepting their case; however, we do not find a similar association between an editor’s stature and the likelihood of them facing a remedy from ArbCom. Further analyses will focus on the dynamics of retention and turnover among editors participating in such dispute resolution processes.

This experience was funded by: Towsley Endowment for the Sciences, New World Endowment Fund, and the Department of Computer Science

Presentation time: 5:45 - 6:30 p.m.
Poster number: 94

Abstract: 1199

Title: The Global Middle Ages

Presenter(s): Nicholas Spezia-Shwiff ’24

Other Authors/Contributors: Alex Wilson ’24, Evan Orjala ’24, Griffin Momsen-Hudson ’25, Abdullah Ansar ’25, Hope Yu ’26

Supervisor(s) and affiliation or institution: Victoria Morse (Professor of History, Carleton College)

Our team, led by Professor Victoria Morse and consisting of six Student Research Partners (Alex Wilson ’24, Evan Orjala ’24, Nicholas Spezia-Shwiff ’24, Abdullah Ansar ’25, Griffin Momsen-Hudson ’25, and Hope Yu ’26) worked during our five week assignment to help construct a new Carleton course: “Global Middle Ages.” We engaged with newly-developed frameworks that involve highlighting global themes of trade, climate, and exploration and centering Europe in the medieval period. Each student research
partner put together units that could be used in the upcoming course to teach enrolled students about various different cultures and interactions around the world. In using a combination of physical and digital research tools and resources, we gained insight into how undergraduate-level courses are designed and learned new research skills and practices we can put back into our own work.

Presentation time: 4:30 - 5:15 p.m.
Poster number: 121

https://storymaps.arcgis.com/stories/430947dbdeda42139f35cf5cf64d830d

Abstract: 1200

Title: Mutual Aid Myanmar International Aid and Grant Writing

Presenter(s): Brayden Stark '24

Other Authors/Contributors: Nate Bauer ’24, Tun Myint (Professor of Political Science, Carleton College Supervisor(s) and affiliation or institution: Courtney T. Wittekind

I interned with Mutual Aid Myanmar (MAM) this summer, working on various projects and research. MAM is a non-profit international aid organization dedicated to helping the people of Myanmar who are suffering under a military regime that overthrew the democratic government in February 2021. MAM offers vital financial assistance for food, water, and shelter to those most impacted by the effects of the military government and recent natural disasters that have hit Myanmar. Myanmar’s public workers and government officials began the Civil Disobedience Movement (CDM) because they refused to work for the military government. Since the start of CDM, MAM has helped support those who refused to work on behalf of the undemocratic government. My specific responsibilities this summer for MAM were mainly policy research-based. I researched various avenues for grant funding from the US government to support MAM’s aid to the people of Myanmar. I help write numerous policy briefs and summaries on bills in Congress regarding Myanmar, as well as Department of Defense documents detailing the situation on the ground and ways in which aid organizations and the US can help. The policy briefs I constructed were used internally to determine the most optimal ways to pursue grants issued by the federal government.

This experience was funded by: Initiative for Service Internships in International Development

Presentation time: 4:30 - 5:15 p.m.
Poster number: 95

Abstract: 1201

Title: Examining State-Level Social Assistance

Presenter(s): Brayden Stark ’24

Supervisor(s) and affiliation or institution: Juan Diego Prieto (Oden Postdoctoral Fellow in Political Science and International Relations, Carleton College)

I researched and analyzed the Oxford COVID-19 Government Response Tracker for the US. This included an in-depth analysis of the CARES ACT and the US-state responses to the outbreak of the COVID-19 pandemic. Specifically, this research project focused on the level of social assistance and welfare provided by states during the pandemic. The investigation sought to determine differences in state-level
responses to the pandemic and measurable differences between Republican and Democrat-run states. I conducted a case study on Utah and the differences between income support and obligation relief to the residents of Utah throughout the pandemic.

This experience was funded by: Humanities Center

Presentation time: 5:45 - 6:30 p.m.
Poster number: 95

**Abstract: 1202**

**Title: The LA Media Intern Experience**

**Presenter(s): Marko Stojanovic ’24**

During my time in LA, I’ve worked as a post-production intern at Mandalay Sports Media. MSM is a production company specializing in sports films and TV shows. Responsibilities included doing research for developing projects and potential IPs, creating pitch decks and related materials for pitches/meetings/deliverables, completing script coverage, handling administrative tasks around the office, completing script coverage, assisting on documentary sets, and completing special projects for Executives as needed. Aside from those, interns were also given the opportunity to pitch project ideas to company executives and to receive feedback at their Pitchfest. For this presentation, I pitched my short film COMPS project.

This experience was funded by: Solhem Business Fellowship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 96

**Abstract: 1203**

**Title: Immune Response to Temperature and Light-Induced Bleaching in the Model Anemone Exaiptasia diaphana**

**Presenter(s): Micah Jay (MJ) Strike ’24**

Coral reefs are among the most biodiverse ecosystems in the world. One of the biggest threats facing coral reefs is bleaching, or the breakdown of symbiosis between the coral and their algal symbionts. As marine heat waves increase in severity and frequency, it is crucial to understand how environmentally driven changes in this symbiotic relationship affect the coral immune system. Here we leverage the model anemone Exaiptasia diaphana to study the relationships between environmental stress, bleaching, and disease. Anemones from two genetically distinct clonal lines were exposed to a heat ramp coupled with increased light exposure to induce bleaching. Symbiont density and constitutive immunity were tracked throughout the experiment to determine how dynamic changes in symbiont density affect immune activity. The results from this experiment will provide insight into how anemones and corals respond to multiple stressors and will help inform conservation and restoration efforts on coral reefs.

This experience was funded by: Class of 1963 50th Reunion Fund for Internships

Presentation time: 5:45 - 6:30 p.m.
Poster number: 96
Abstract: 1204

Title: Researching Extremism with the World Jewish Congress (WJC)

Presenter(s): Mia Strubel Iram ’25

This summer I was based in Brussels, Belgium working hybrid for the World Jewish Congress (WJC) in their Intel Unit. I researched various forms of extremism, including but not limited to, antisemitism. My research focused on close readings of current and recent news articles or other online reliable sources that document extremism. After reviewing the material, I categorized the extremism reported and further filtered the information to indicate whether it represented a specific person, event or organization. When the article was thoroughly categorized, I summarized the content. The goal of my research was to identify and understand the origins of each incident of hatred, extremism, and/or antisemitism. The research, which is not yet accessible to the public, is meant to educate members of targeted communities as well as their allies about the rise in extremism and antisemitism and to raise awareness about emerging trends and patterns.

This experience was funded by: Abeona Endowed Fund for International Internships

Presentation time: 4:30 - 5:15 p.m.
Poster number: 97

Abstract: 1205

Title: Social Mobility Beliefs in Children: Findings from SMG3

Presenter(s): Daphne Suh ’24

Previous literature indicates that children have a complex understanding of socioeconomic status, wealth inequality, and money that changes and develops as they age. Social Mobility Game (SMG) investigates how children’s social mobility beliefs develop over time and differ from adults’ social mobility beliefs. SMG3 follows up on SMG1 and SMG2, which determined that children believe in social mobility and require less evidence to shift their social mobility beliefs than adults. This study contrasted low-evidence and no-evidence conditions of social mobility to see whether any amount of evidence can change children’s beliefs on social mobility. 96 participants from ages 5-10 from the surrounding area contributed. Preliminary linear regression models found significant interactions between age and gender. Future studies could examine first-person perspectives of social mobility to explore how children view their own social mobility as they age.

Keywords: Social Mobility, Children, Bias, Social Cognition

Presentation time: 4:30 - 5:15 p.m.
Poster number: 98

Abstract: 1206

Title: UBP10 Effect on Gross Chromosomal Rearrangement in Sacharomyces Cerevisiae

Presenter(s): Ben Szeto ’26
De novo telomere addition occurs when telomerase mistakes telomere-like sequences (Sites of Repair-associated Telomere Addition or SiRTAs), exposed in the middle of the chromosome, for the end of a telomere, creating a new telomere in the middle of the chromosome. Initial studies of two SiRTA’s at their endogenous locations, showed that the deletion of UBP10, which encodes a deubiquitinating enzyme, does not affect the frequency of GCR events but increases the frequency of translocations and decreases the frequency of de-novo telomere addition.

To test the effect of UBP10 in cases where there is more homology and to limit confounding variables, we tested strains in which a 300 bp region surrounding each SiRTA is integrated at an ectopic location on chromosome VII. Initial results have shown that the deletion of UBP10 does not alter the frequency of GCR events. We are continuing to classify these events as translocations and de novo telomere addition. This work will help clarify the mechanism through which Ubp10 influences the type of repair at a SiRTA.

This experience was funded by: Eugster Endowed Student Research and Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 99

Abstract: 1207

Title: ToyBot Basketball and Football

Presenter(s): Brandon Szeto ’25

During my internship this summer, I was tasked with working on two projects. ToyBot basketball and ToyBot football. Using voice flow, my team and I produced a fully functioning screen-less football game. Furthermore, my team and I were all located in different places around the country so we were working remotely. ToyBot football was not the only game I created. As a solo project, I was tasked to create a fully functioning screen-less basketball game, which I finished during the internship!

This experience was funded by: Robert E. Will ’50 Endowed Internship Fund in Social Entrepreneurship

Presentation time: 4:30 - 5:15 p.m.
Poster number: 100

Abstract: 1208

Title: Bison Wallows Increase the Heterogeneity of Soil Microbial Processes in Prairies

Presenter(s): Misaki Taniguchi ’26

Bison (Bos bison) commonly roll around on the ground, creating depressions known as wallows. Wallows have lasting effects on vegetation, increasing habitat heterogeneity. However, their effect on soil microbial activity is unknown. We measured soil CO2 emissions from wallows in restored prairies of Spring Lake Park Reserve (Dakota County, Minnesota) where bison were recently reintroduced.
Sampling was done in two paddocks that each had bison present for around a month. We measured CO2 emissions at the center, inner edge, and outer edge of five wallows in each paddock, 2, 3, 5, and 10 weeks after bison were removed. Preliminary results suggest CO2 emission levels are higher at outer edges, and lower at centers of wallows compared to controls. Microbial activity was higher at outer edges likely because of differences in conditions such as vegetation and soil density. Thus, bison wallows affect soil microbial activity, and increase heterogeneity in microbial processes.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 97

Abstract: 1209

Title: How the Compounds Potassium Permanganate and Potassium Ferrate Eliminate Water Pollution

Presenter(s): Maeva Tchouaffe ’25

Everyday we use disinfectant products, especially during the COVID-19 pandemic, when the use of disinfectant products increased significantly, as they were essential in stopping the spread of the virus. Quaternary ammonium compounds (QACs), are listed as active ingredients in over 200 disinfectant products. They are usually discharged through waterways, and end up going through wastewater treatment plants. As a result, that is where 75% of QACs settle. QACs can be found in wastewater treatment plants on a global scale. The goal of a wastewater treatment plant is to produce effluent water that can be safely returned to the environment. Unfortunately, QACs make this process challenging, as they upset the nitrification process. The goal of this project was to run experiments with each respective oxidant and C12-BAC, a type of QAC, to assess if they could successfully decrease C12-BAC concentrations. Based on the results, potassium permanganate and/or potassium ferrate, could be incorporated in the wastewater treatment process (before nitrification and after primary clarification), and in turn, decrease levels of QACs in released into the environment.

Presentation time: 4:30 - 5:15 p.m.
Poster number: 101

Abstract: 1210

Title: Doing Good with WalkGood: Community Health and Wellness in Los Angeles

Presenter(s): Nia Terry ’26

This summer I interned with WalkGood LA, a Black and Brown-led community health and wellness organization based in Los Angeles. WalkGood LA emerged out of the racial justice movement in 2020, beginning as a weekly protest before transitioning into a health and wellness organization. Now they offer a variety of donation-based programming, including community yoga classes, guided meditations and breath work, hikes, and run clubs.

As an intern, I regularly attended events and assisted with set up, break down, check in of attendees, and sale of merchandise. I also worked with the WalkGood LA team on several projects. I documented and filed financial records, edited event photographs for campaigns and social media, and designed a thank you card for sponsors and partners. For our three year anniversary event, I created two large chalk art murals in a community garden.

This experience was funded by: Trace McCreary '89 and Alissa Reiner Endowed Internship Fund
Abstract: 1211

Title: Judicial Summer Internship

Presenter(s): Brian Thevenot ’26

Other Authors/Contributors: Judge Bruce Manning, Luke Klefstad, Ryan Cechini ’25, Maitaz Hoz ’25

During the internship I assisted in writing court orders, which are summaries of each court hearing. The orders would include who was present (or not present) during the hearing, what each individual said, and when the next hearing would be. The language used for the court orders had to be in past tense and very formal, however the judge took very good notes and would share them with us, and he offered feedback after we wrote each order on how to improve it next time. I improved on a multitude of skills during the course of the internship, however I believe the skill that I strengthened the most were knowing the correct questions to ask. I say I improved my questioning skills because to get the most out of the internship, you have to know what type of questions to ask that you believe will help you the most, either in regards to the internship itself or questions about life after Carleton.

This experience was funded by: M. Leith Shackel Internship Endowment Fund

Abstract: 1212

Title: Improved Cause-Specific Mortality Estimation Via Modular and Local Calibration of Verbal Autopsy(VA) Data

Presenter(s): Bella Thomas ’25

Accurate national health data is crucial for effective government responses to illnesses and health epidemics. However, 65% of the world’s population lacks complete and reliable cause of death (COD) data. Verbal autopsy (VA) is a useful method for determining COD in low and middle-income countries, but standardizing VA data is challenging. Computer-coded VA software offers standardized interpretation, but it relies on additional data not available in all countries, leading to unreliable cause-specific mortality fractions (CSMFs) due to misclassification bias from the algorithm.

This study aimed to retest VA calibration methods using the InSilicoVA algorithm and Population Health Metrics Research Consortium (PHMRC) data from four countries. The results after calibration confirms the software’s efficacy in obtaining reliable CSMF estimates based on precalculated VA misclassification matrices. The updated VA calibration software is modular and has the potential for widespread use, allowing countries to obtain reliable CSMF statistics from VA data alone.

This experience was funded by: Multicultural Alumni Network (MCAN) Fellows Program
**Abstract: 1213**

**Title:** *Summer of Sweat and Skill-building at WWCD92.9 FM*

**Presenter(s):** Stella Thompson ’26

As a promotions intern for an independent, local radio station in Columbus, Ohio, I worked at events promoting the station, interacted with community members, worked on marketing campaigns, and developed my social media skills.

This experience was funded by: Neil Isaacs and Frank Wright ’50 Fellowship in Investigative Journalism

Presentation time: 4:30 - 5:15 p.m.
Poster number: 103

**Abstract: 1214**

**Title:** *Heavy Metal Contamination of Philadelphia Play Area Soil*

**Presenter(s):** Blake Tran ’24

Other Authors/Contributors: Dr. Kabindra Shakya (Department of Geography and the Environment, Villanova University)

Heavy metal contamination in urban environments is a concern to public health, especially in areas frequented by children such as parks and playgrounds. This concern may be particularly troubling to minority and poorer neighborhoods who disproportionately live in proximity to historic industrial sites, deteriorating structures composed of hazardous paint, and heavily trafficked areas, all possible sources of heavy metal contamination. While Philadelphia is a racially and socioeconomically diverse city, no studies have investigated heavy metal soil contamination of play areas with respect to these social factors in Philadelphia. This study investigates trace metal levels in soil samples (n=108) of 18 Philadelphia-area parks and playgrounds in neighborhoods of varying wealth and racial backgrounds. Soil samples were analyzed for various metals and metalloids (Co, Mn, Zn, Ni, Cr, As, Pb, Cr, Hg, and Cu) using an X-ray fluorescence (XRF) spectrometer and inductively coupled plasma-mass spectrometry (ICP-MS). Lead concentrations ranged from 20 to 774 ppm. Three parks had lead concentrations exceeding 400 ppm, the EPA’s standard. Elevated lead levels could pose significant health and developmental risks for children and other vulnerable groups. Long-term exposure to these contaminants has been associated with cognitive impairments, developmental delays, and adverse health effects, which can disproportionately impact communities already facing socioeconomic challenges.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 100

**Abstract: 1215**

**Title:** *Facilitating Visual Comparison of Clonal Trees*

**Presenter(s):** Thea Traw ’25

Other Authors/Contributors: Quoc Nguyen ’23, Eric Alexander (Assistant Professor of Computer Science, Carleton College), and Layla Oesper (Associate Professor of Computer Science, Carleton College).
The evolutionary history of a tumor is often represented as a clonal tree: a rooted tree where vertices represent tumor cell clones and edges represent ancestral relationships between them. Specialized distance measures allowing pairwise comparison of clonal trees have recently been developed. However, such methods reduce dissimilarity between trees to a single number, making interpretation difficult.

To address these issues, we have developed a visualization tool (implemented using d3.js) that allows researchers to compare two clonal trees. Specifically, our tool visualizes how differences in the two trees contribute to a variety of different distance measures. Each of the three visuals we provide gives a different level of granularity to understanding how the distance measure is computed. Our node-link diagrams share a clone-level breakdown of contributions, while our tripartite graph and heatmap afford mutation-level insight.

In future iterations, we plan to both integrate multi-tree comparison and support new distance measures.

This experience was funded by: NSF Grant

Presentation time: 5:45 - 6:30 p.m.
Poster number: 101

Abstract: 1216

Title: Solar Parameters and Their Role in the Deep Underground Neutrino Experiment (DUNE)

Presenter(s): Josiah Tusler
Supervisor(s) and affiliation or institution: Chris Marshall (Professor of Physics, University of Rochester)

Currently, the Deep Underground Neutrino Experiment’s (DUNE) simulations use the world-average values of the solar parameters of neutrino oscillation which were measured by other neutrino experiments. We investigated the role of the solar parameters within DUNE by varying their simulated values and analyzing the impact on electron neutrino detections as well as the resolutions of the solar parameters and other oscillation parameter measurements. We found that the solar parameters had little to no impact within DUNE overall, with a subtle but negligible effect on lower energies of electron neutrinos, an incapability of DUNE to measure the solar parameters, and virtually no effect on resolution of the other oscillation parameters. This project was supported in part by NSF award PHY-2149332.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 102

Abstract: 1217

Title: Investigating TFRC Prevalence in Small Cell Lung Cancer

Presenter(s): Kate Ulrich ’25

The Lampe Lab at Fred Hutchinson Cancer Research Center in Seattle, Washington is dedicated to identifying cancer-specific biomarkers that can be utilized in the early detection of small cell lung cancer (SCLC). This summer, I was involved in investigating the detection of TFRC protein within various cell lines using a variety of candidate antibodies. The eventual goal of this project is to determine a cancer-specific TFRC antibody for use in cancer screenings and drug therapies.
Abstract: 1218

Title: Studying the Eruptive Processes of the Submarine Stratovolcano, Bogoslof

Presenter(s): Evan Umbreit ’26

Bogoslof is a submarine stratovolcano in the Alaskan Aleutian Islands that erupted from December 2016 to August 2017. Our study focused on 16 mafic samples collected from Bogoslof after these eruptions, studying the pre- and syn-eruptive process by measuring the porosity, viscosity and estimating crystallinity via heat capacity. Secondary to equipment failures, viscosity data was unreliable. The total porosity was relatively high but isolated porosity was close to zero for all samples, indicating a smaller-scale eruption. The log viscosity of the only fully tested sample was 12.43 Pa-s at 1020°C. Since the eruption had a max eruption temperature of 1050°C, this data indicates it was closer to 1050°C than previously thought.

This experience was funded by: Trace McCreary ’89 and Alissa Reiner Endowed Internship Fund

Abstract: 1219

Title: Developing a highly efficient, multiplexable, photosensitized proximity labeling technology

Presenter(s): Vasilii Vaganov ’24

Supervisor(s) and affiliation or institution: Xiao Wang (Assistant Professor of Chemistry, MIT), Chanan Sessler (Graduate Student in Chemistry, MIT)

Proximity labeling (PL) is a technique used to analyze protein interactions in bulk samples. It can identify the proteins that bind to or associate with a specific target protein. However, current techniques are limited in their ability to address complex networks of interactions within the same cell or between cells. To overcome this limitation, we are introducing a new PL technique based on genetically targetable photosensitizers that produce singlet oxygen species. This chemistry allows for high spatial and temporal resolution, and does not require the PL molecule to enter the active site of an enzyme. With this technique, we can track how the interactome of a target changes over time. We validate this technique by applying it to the trafficking of proteins between different subcellular locations. In the future, this technique can help answer important biological questions, such as how stress-responsive proteins change in response to cellular stressors.

This experience was funded by: Eugster Endowed Student Research and Internship Fund
Abstract: 1220
Title: Amor and Autism: Latine Parents Values of

Presenter(s): Marycruz Valdivia Acosta ’24

The concept of multicultural autism is not new to sociology, especially as it pertains to the Latine experiences of raising an autistic child. However, little research has focused on the caregiving aspect of these Latine parenting experiences, especially in relation to how parents show affection to their children. My research brings together the concepts of autism, the Latine culture, and role of caregiving within family dynamics to examine how these aspects intersect in the narratives and lives of the Latina mothers I interviewed. My ongoing analysis of these interviews suggests that the concept of love and care is utilized as a tool, as a resource, and as a method to navigate the triumphs and challenges of the autistic Latine upbringing experience.

This experience was funded by: Mellon Mayes Undergraduate Fellowship

Presentation time: 5:45 - 6:30 p.m.
Poster number: 105

Abstract: 1221
Title: The Role of Art in Medicine

Presenter(s): Isabella Vazquez ’24

Healing runs much deeper than providing medications or performing procedures. I was able to witness this first-hand during my summer internship at Hennepin County Medical Center in the Inspire Arts Program. When I began at HCMC I knew that I had two strong—and distinct—interests: medicine and art. For much of my education I never believed that these two fields could interact or inform each other. However, HCMC recognized the positive effects that non-medical interactions can have on outcomes, and the Inspire Arts Program was designed to provide patients and families with creative artistic outlets through artists-in-residence and musical therapists. Acknowledging the role that art can play in medical healing has changed my perspective of healthcare—I have learned time and again that patients are people, and their souls require just as much treatment as their bodies. Five minutes of connection can change health outcomes just as much as a prescription.

This experience was funded by: Rob White '85 Endowed Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 105

Abstract: 1222
Title: Mammalian CHMP3 effects on a S. cerevisiae model of retrotransposition

Presenter(s): Aniketh Vipparla ’24

Other Authors/Contributors: Steve Cho, Nels C. Elde ’95
The ESCRT pathway is a membrane remodeling pathway that plays a key role in many cell functions but is also hijacked by viruses for budding. RetroCHMP3, is a newly discovered protein in New World monkeys and mice that has been shown to selectively inhibit this viral budding while maintaining host ESCRT processes. One of the functions of the ESCRT pathway is retrotransposition (RT) however, retroCHMP3 has been found to inhibit RT in cell lines. It is still unknown the extent of the evolutionary impact inhibition of RT has on the fitness of retroCHMP3. In this study, we hypothesize that when tested in Saccharomyces cerevisiae, the results will show that retroCHMP3 inhibits RT induced by the Zorro3 LINE-1 RT element. If this is the case, this study will allow us to look into whether RT is really an evolutionary advantage or not and why it may happen.

This experience was funded by: Eugster Endowed Student Research and Internship Fund and the Office of the Provost

Presentation time: 4:30 - 5:15 p.m.
Poster number: 106

Abstract: 1223

Title: What does “the Commons” mean?

Presenter(s): Grace Wallace-Jackson ’24

Supervisor(s) and affiliation or institution: Palmar Álvarez-Blanco (Professor of Spanish, Carleton College)

I applied for an SRP with Palmar Álvarez-Blanco after I took her course Culture, Capitalism and the Commons and became passionate about the ways that sustainability, human rights, civic engagement, and climate justice converge in history and present-day. I consider our research project to be a continuation, and in-depth exploration, of materials presented to me in that class. We constructed interviews with individuals who work as farmers, lawyers and politicians in northern Spain, who in one way or another, advocate for the preservation of the commons. We recorded conversations that discussed the reality of self-managed communities, conflict resolution, and the economic/political/social organization of communal land. Afterwards, we transcribed, edited and translated our interviews into Spanish and English to upload to the Constellation of the Commons– which is an audiovisual archive, created by Professor Álvarez-Blanco, of “communities of practice” that are working to transform their communities against the capitalist system and into a position that prioritizes the welfare of beings and the earth.

This experience was funded by: Humanities Center

Presentation time: 4:30 - 5:15 p.m.
Poster number: 107

Abstract: 1224

Title: “Hallelujah, Socialism!”: An Attempt to Explain Jonestown

Presenter(s): Alex Wang ’26

Supervisor(s) and affiliation or institution: Sonja Anderson (Assistant Professor of Religion, Carleton College)
On November 18, 1978, all 909 members of The Peoples Temple killed themselves in “Jonestown,” a remote settlement in the jungle of Guyana, South America. To the news media, the Temple, led by the Rev. Jim Jones, was a “destructive cult,” and the mass suicide, a result of brainwashing. This research reviews past publications on the Peoples Temple by prominent religious studies scholars like David Chidester. The members’ “self-destruction” was an act of revolution against evil, a path to a fully human death with dignity, and a way to transcend human mortality. Approaching their suicide from the Temple’s own worldview not only makes the final day intelligible but also makes the Temple less a demonized “cult” and more a human enterprise.

This experience was funded by: the Dale ’60 and Elizabeth Hanson Fellowship in Ethics

Presentation time: 5:45 - 6:30 p.m.
Poster number: 123

Abstract: 1225

Title: epilepsy research in Boston Children's Hospital

Presenter(s): Emerald Wang ’25

Other Authors/Contributors: Emerald Wang ’25

I completed a 8 weeks internship in Boston Children’s Hospital, Harvard Medical School, Loddenkemper Lab under the supervision of Dr Tobias Loddenkemper, MD. During the internship I worked on developing seizure monitoring and predicting systems by using different devices (miku camera, Empatica E4 wristband and Epitel wireless EEG) to prevent, predict, detect, and treat every seizure and status epilepticus in children before it occurs.

During the internship, I selected, summarized, reviewed, and presented journal articles on emerging research topics weekly in lab meetings; collected, inputted, cleaned, and organized data using statistical software (Redcap, Powerchart, Excel, Google Sheets); analyzed data variables (demographics, seizure frequency, home medication and MRI result) and created graphs using Python for future conference presentations; assisted in all phases of the research process, including preparation and submission of IRB proposals, events and study pre-registrations; and interviewed and trained junior interns in research methodologies.

This experience was funded by: Sam ’75 and Meg Woodside Endowed Fund for Career Exploration

Presentation time: 5:45 - 6:30 p.m.
Poster number: 106

Abstract: 1226

Title: Summer on the Masumoto Family Farm

Presenter(s): Noel Wang ’25

This summer, I worked on the Masumoto Family Farm, a small, fourth-generation family-operated farm in Fresno County that cultivates organic peaches, nectarines, apricots, and grapes. I aimed to investigate the process of organic farming, experience rural life in Central California, and observe the practices of a small business in the food industry. I mainly worked in the packing shed to organize boxes, assist the workers in packing fruit, and support other general farm tasks. Some highlights of my experience include
learning how to make jam, visiting nearby towns, and conversing with supervisors and fellow workers. After my internship, I was deeply impressed by the commitment, dedication, and resilience it takes to be a farmer or farm worker, and I gained a broader perspective of the agricultural industry in Central California. In the future, I hope to further study applications of physics to agriculture and earth science.

This experience was funded by: Raymond Plank Chair in Incentive Economics Funding for Internships

Presentation time: 4:30 - 5:15 p.m.
Poster number: 108

Abstract: 1227

Title: The dilemma: in the midst of development and preservation

Presenter(s): Xi Wang ’26

The Chinese poverty alleviation policy, along with its complementary education policy, has heralded the total eradication of absolute poverty. Notably, the Liangshan area stands as a prominent example frequently cited by the media to support this assertion. This experiential study aims to explore how education alleviation policies influence the teachers’ and students’ circumstances in practice. I chose to investigate Y school’s educational system, which is located in a Tibetan autonomous county. Thus, I also paid attention to the practice of bilingual policy in the school and cultural setting.

This experience was funded by: Yueh-Townsend Asian Fellowship

Presentation time: 5:45 - 6:30 p.m.
Poster number: 107

Abstract: 1228

Title: Discovering Identity in Japan through Music

Presenter(s): Caleb Wataoka ’24

This summer, I traveled to Japan to survey the culture of and perspectives on Japanese music. Throughout my 77 day journey, I played taiko and shakuhachi with a farmer and his family, performed dance and djembe in the Awa Odori, went to jazz cafes and live music bars with Japanese college students, and jammed out to J-pop while hitchhiking to Hiroshima with a newly-wedded Japanese couple. Through these shared experiences of culture and music, I made many lifelong friends, many of whom told me that they thought of me as Japanese, not as a foreigner. One friend even told me that I should move to Japan. As a Japanese American, receiving acceptance from ‘true Japanese’ people allowed me to understand that being Japanese and American at the same time is not a contradiction, but rather something to be proud of.

This experience was funded by: The Roy Grow Fellowship

Presentation time: 5:45 - 6:30 p.m.
Poster number: 108
Abstract: 1229

Title: Investigating the Legacy of Art as a Form of Resistance in the Wake of the Regime of Nicolae Ceausescu

Presenter(s): Amelia Watt ’25

During my time in Bucharest, I studied how art is used as a tool of political resistance in post-communist Romania. After so many years of censorship under the dictatorship of Nicolae Ceausescu, artists in Romania are now learning how to express themselves in a newly capitalist society. Highlights of my internship include speaking to esteemed Romanian artist Dan Perjovschi and asking him how Romanian politics affects his work, interviewing Bucharest-based street artist, Aeul, whose work critiques capitalist society in Romanian cities, and speaking to art history Caterina Preda from the University of Bucharest about her research on art during the communist regime in Romania.

This experience was funded by: Larson International Fellowship

Presentation time: 5:45 - 6:30 p.m.
Poster number: 109

Abstract: 1230

Title: Sustainability Internship at City of Northfield

Presenter(s): Liwei Weng ’25

Participated in municipal environmental policy research, drafting resources guide for local businesses, and setting up new recycle bins in the city-owned buildings

This experience was funded by: Rosenheim Environmental Internship Fund
Presentation time: 4:30 - 5:15 p.m.
Poster number: 109

Abstract: 1231

Title: Interning at the Immigrant Law Center of MN

Presenter(s): Grace Werner ’24

My internship at ILCM revolved around the Community Defense Team, which helps immigrants who are facing removal from the U.S. I helped in the completion of many tasks during my internship, including answering the phone on the detention line, drafting briefs and appeals, and creating a crime chart for attorneys throughout MN to use as a resource. Overall, I learned a lot about the immigration system and the legal profession, and I hope to incorporate the skills and values I learned in my future career.

This experience was funded by: Social Justice Internships Funds - Office of the Chaplain

Presentation time: 4:30 - 5:15 p.m.
Poster number: 110
**Abstract: 1232**

**Title: Software Design Internship- Tag Video Systems**

**Presenter(s): Luke Wharton ’25**

Summer internship for Tag Video Systems, a world leader in 100% software based integrated IP multi-viewing, probing and monitoring solutions for broadcasting and content distributors. Developed a Angular web app and corresponding API and PostgreSQL database to showcase streams and display stream information for testing purposes.

This experience was funded by: Abeona Endowed Fund for International Internships

Presentation time: 5:45 - 6:30 p.m.
Poster number: 110

**Abstract: 1233**

**Title: Analyzing Phenotypic Characteristics of Clostridioides difficile Mutants**

**Presenter(s): Ella Wiegman ’25**

Clostridioides difficile is a bacterium that causes diarrhea and colitis by colonizing the gut when the normal intestinal microbiota is disturbed. Highest risk factors include hospitalization and antibiotic usage, although research shows cases of Clostridioides difficile infection (CDI) are increasing in previously low-risk populations. The goal of my internship at the Université Paris Cité Faculty of Health was to identify the phenotypic characteristics of the mutant strains in order to ultimately develop antimicrobial agents targeting C. difficile. By learning many new microbiological laboratory techniques and working while immersed in the French language, I grew immensely and gained skills I plan to apply to my work at Carleton and beyond.

This experience was funded by: Abeona Endowed Fund for International Internships

Presentation time: 5:45 - 6:30 p.m.
Poster number: 111

**Abstract: 1234**

**Title: Sample Size Applet for SMARTs**

**Presenter(s): Augustus Williams ’24**

Supervisor(s) and affiliation or institution: Kelley Kidwell (Professor of Biostatistics, University of Michigan School of Public Health)

Rarely is it the case that medical experts can cure health deficiencies or behavioral issues of patients after an initial treatment. Thus calls the need for dynamic treatment regimens (DTRs), also known as adaptive interventions, in which practitioners change, augment, continue or discontinue treatment based upon individual response and characteristics. Given the usefulness of DTRs that guide treatment along the continuum of care, sequential multiple assignment randomized trials (SMARTs) have been used to aid in their creation. A SMART is a multi-stage trial where individuals may receive a sequence of
treatments and provides robust data to estimate and compare DTRs. To aid in the dissemination of these trials, we have enhanced a free, easy-to-use applet that allows researchers to predetermine the number of individuals they would need to answer a variety of aims under various SMART designs considering both binary and continuous outcomes.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 112

Abstract: 1235

Title: Learning about Learning: Reflecting on a Middle School Summer STEAM Internship

Presenter(s): Faith Williams ’26

This summer I interned at the Faribault Public Middle School in Rice County Minnesota. My fast paced days entirely surrounded the support I could provide the students. From bus monitoring in the mornings and afternoons to the facilitation of reading groups and camps, my weeks were very busy this summer. For the months of June and July I worked as a Summer STEAM Facilitator. The bulk of my job was a teacher’s aid in the mornings, as a camp facilitator in the afternoons, and a general child monitor throughout the day. Many of the skills I learned were targeted towards being an educator within the K-12 public school system, but I did learn teamwork and communication skills outside of my main tasks. Overall it was a truly informative experience and benefited from it greatly.

This experience was funded by: Jean Phillips Memorial Internship Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 111

Abstract: 1236

Title: Global Middle Ages

Presenter(s): Alex Wilson ’24

Supervisor(s) and affiliation or institution: Victoria Morse (Professor of History, Carleton College)

This summer, our research team sought to decenter Europe and work within new theoretical frameworks to create a Carleton class that will be taught in Spring 2024. Alongside Professor Victoria Morse, myself and five other research partners helped to create a wide array of different units to represent a truly diverse yet interconnected Middle Ages. I found the areas of material culture, folklore, and resilience particularly fascinating. These interests led me to specifically examine Viking-Thule interactions in the Arctic, the rise and fall of the Mississippian Moundbuilders, and trade through the harsh Saharan desert.

This experience was funded by: Humanities Center

Presentation time: 4:30 - 5:15 p.m.
Poster number: 122

https://storymaps.arcgis.com/stories/430947dbdeda4213f35cf5cf64d830d
**Abstract: 1237**

**Title:** Research on Addictive, Compulsive, and Impulsive Disorders

**Presenter(s):** Maya Wolff ’24

The research I did this summer covered topics related to psychiatric disorders of addictive, compulsive, or impulsive nature. The studies that were running while I was there for the summer included but were not limited to drug trials for borderline personality disorder, depression, obsessive compulsive disorder, and cocaine use disorder. I did a variety of tasks to help run participants and analyze data.

This experience was funded by: Class of 1970 Endowed Internship Fund

Presentation time: 5:45 - 6:30 p.m.
Poster number: 113

**Abstract: 1238**

**Title:** Investigating Two-Component Gas Adsorption in Zeolites

**Presenter(s):** Henry Wolters ’26, Nathan Wang ’26

Supervisor(s) and affiliation or institution: Daniela Kohen (Professor of Chemistry, Carleton College), Ilja Siepmann (Professor of Chemistry, University of Minnesota), Randall Snurr (Professor of Chemical Engineering, Northwestern University), Haoyuan Chen (Professor of Chemistry, University of

Zeolites are nanoporous materials that exhibit interesting properties when in contact with gases. This makes them good candidates for filtration, catalysis or purification applications. To better understand the chemistry behind the selectivity of different zeolites, we used ab-initio molecular dynamics to study a system of propylene and carbon dioxide gas loaded into the pores of the LTA zeolite in the presence of calcium extra-framework cations. This system was particularly interesting as it's properties weren’t accurately predictable with current adsorption selectivity theories. We used different analytical and statistical methods to quantify the CO2 & C3H6 to cation interaction, helping us develop a better understanding of how the two different gasses interact with the material.

Presentation time: 5:45 - 6:30 p.m.
Poster number: 114

**Abstract: 1239**

**Title:** Is First-Order Learning Separate From Mini-Grammars?

**Presenter(s):** Sofia Woodruff ’25

Supervisor(s) and affiliation or institution: Suyeon Hwang (PhD Candidate, University of Illinois at Urbana-Champaign), Cynthia Fisher (Professor of Psychology, University of Illinois at Urbana-Champaign)

Over the course of my internship at the Language Acquisition Lab at UIUC, I worked on multiple research projects related to language and syntax. However, I gained a primary interest in a research project conducted by Graduate teaching assistant and researcher Suyeon Hwang. Hwang's research is investigating the relationships between the mini grammar and 1st/2nd order phonotactic constraints.
Over the course of my presentation, I will be breaking down Hwang's 2022 paper she published on the topic as well as speaking about my experiences within the lab.

This experience was funded by: Multicultural Alumni Network (MCAN) Fellows Program

Presentation time: 5:45 - 6:30 p.m.
Poster number: 115

https://escholarship.org/uc/item/8nz8v9ps

Abstract: 1240

Title: DESIGNING BIN-PICKING ROBOT for HARDWARE STORE

Presenter(s): Yiming Xia ’24

Due to the extensive use of robots in both commercial and industrial environments, there is a rapidly increasing demand for research and development in the field of robot bin-picking. I had the opportunity to be actively engaged in the design and testing of several robot grippers capable of adapting to diverse scenarios. Notably, one of the grippers I developed is highly specialized for bin-picking in retail stores, and it is currently in the process of applying for an utility patent. Furthermore, I worked with computer vision software and robot control systems to coordinate between teams working on our robot’s vision system and the robot arm responsible for delivering the gripper.

This experience was funded by: Robert E. Will '50 Endowed Internship Fund in Social Entrepreneurship

Presentation time: 5:45 - 6:30 p.m.
Poster number: 116

Abstract: 1241

Title: State-level Social Assistance Responses to the COVID-19 Pandemic between 2020-2021

Presenter(s): Andy Yang ’24

Other Authors/Contributors: Brayden Stark ’24, Manoka Kozaki ’26, Elsa Snowbeck ‘25, Eric Yuan ‘25, Suwannee Conroy-Baarsch ’26
Supervisor(s) and affiliation or institution: Juan Diego Prieto (Oden Postdoctoral Fellow in Political Science and International Relations, Carleton College)

The research investigated data collected by the University of Oxford on state-level social assistance responses to the COVID-19 Pandemic between 2020-2021 in the United States. After examining and revising the original coding, patterns of seven states--Idaho, Montana, North Dakota, South Dakota, Oregon, and Wyoming--were presented. North Dakota was selected as the case study for its intriguing inconsistency between conservative political affiliation and robust, expansive social assistance programs.

This experience was funded by: The Humanities Center and Ethical Inquiry

Presentation time: 4:30 - 5:15 p.m.
Poster number: 123
Abstract: 1242

Title: The Global Middle Ages: Pacific Islands, Pirates, & Expansive Interconnection

Presenter(s): Hope Yu '26

Other Authors/Contributors: Nicholas Spezia-Shwiff '24, Alex Wilson '24, Evan Orjala '24, Griffin Momsen-Hudson '25, Abdullah Ansar '25

Supervisor(s) and affiliation or institution: Victoria Morse (Professor of History, Carleton College)

Our team, led by Professor Victoria Morse and consisting of six Student Research Partners (Alex Wilson '24, Evan Orjala '24, Nicholas Spezia-Shwiff '24, Abdullah Ansar '25, Griffin Momsen-Hudson '25, and Hope Yu '26) worked during our five week assignment to help construct a new Carleton course: “Global Middle Ages.” We engaged with newly-developed frameworks that involve highlighting global themes of trade, climate, and exploration and decentering Europe in the medieval period. Each student research partner put together units that could be used in the upcoming course to teach enrolled students about various different cultures and interactions around the world. In using a combination of physical and digital research tools and resources, we gained insight into how undergraduate-level courses are designed and learned new research skills and practices we can put back into our own work.

Presentation time: 4:30 - 5:15 p.m.
Poster number: 124

https://arcg.is/1zXeP5

Abstract: 1243

Title: Research Group on State-Level Emergency Welfare

Presenter(s): Eric Yuan '25

Other Authors/Contributors: Juan Diego Prieto (Postdoctoral fellow, Carleton College)

We examined the patterns of state-level social assistance responses to the COVID-19 pandemic between 2020 and 2021 in the United States, as a window into the current state and possible futures of global social protection.

This experience was funded by: Humanities Center and Ethical Inquiry

Presentation time: 4:30 - 5:15 p.m.
Poster number: 125

Abstract: 1244

Title: Optimal Constructions for DNA Self-Assembly of k-Regular Graphs

Presenter(s): Xingyi Zhang '24

Supervisor(s) and affiliation or institution: Leyda Almodóvar Velázque (Associate Professor of Mathematics, Stonehill College), Amanda Harsy (Associate Professor of Mathematics, Lewis University), Cory Johnson (Associate Professor of Mathematics, California State University, San Bernardino) and Jessi
Recent advances in nanotechnology and microbiology have spurred research on self-assembling complex structures, primarily using DNA for its complementary base-pairing. These complexes can be represented using graph theory, where edges are strands of DNA joined at junctions, represented by vertices. Branched DNA molecules, referred to as tiles, have flexible unpaired cohesive ends for bond-edges formation. We consider the minimum number of tiles and bond-edge types to construct a graph $G$, while avoiding the formation of smaller or non-isomorphic graphs of the same size.

We introduce the concept of (un)swappable graphs and establish lower bounds on bond-edge and tile types in the unswappable case. We also introduce a method of generating upper bounds using a vertex-cover model. We apply both of these methods to prove new bounds on a number of regular families, including crown graphs, prism graphs, Kneser graphs, Johnson graphs, Antiprism Graphs and Archimedean solid graphs.

Presentation time: 4:30 - 5:15 p.m.
Poster number: 112

Abstract: 1245

Title: Geriatric Depression Symptoms during COVID-19

Presenter(s): Yichen Zhang ’24

The outbreak of the COVID-19 pandemic has had wide-ranging and profound effects on the global elderly population. A literature review was conducted to identify emerging risk factors specific to the pandemic. Furthermore, both qualitative and quantitative data were collected in the form of semi-structured interviews and questionnaires for depression assessment.

This experience was funded by: Chang-Lan Endowed Fund

Presentation time: 4:30 - 5:15 p.m.
Poster number: 113

Abstract: 1246

Title: Establishing My Career in Data Science: Summer Internship at Slingwave

Presenter(s): Hank Zhao ’25

Other Authors/Contributors: Evan Christensen ’24

My internship at Slingwave as a Data Analyst Intern was a transformative experience that equipped me with essential skills, valuable lessons, and a deeper understanding of the evolving field of marketing analytics. Through multiple projects concerning the real needs of clients, I improved my knowledge of R and Python, as well as those technologies I didn’t learn in college, such as SQL, Google Analytics, and Looker Studio. In addition, I improved my critical thinking and problem-solving skills, and I am excited to apply these learnings to shape my future career. I would like to express my deepest gratitude to the donors of the Robert E. Will ’50 Endowed Internship Fund in Social Entrepreneurship, whose generous support made my internship experience possible.

This experience was funded by: Robert E. Will ’50 Endowed Internship Fund in Social Entrepreneurship
Abstract: 1247

Title: Computational Evaluation of Cell-to-Cell Interactions in Cancer Immunotherapy Data

Presenter(s): Eric Zhou '26

Immunotherapy is a cancer treatment which utilizes the patient’s immune system to fight tumor cells. While having great potential to be an effective cancer treatment, currently only 20% of patients receive clinical benefits. In immunotherapy, cell-cell communication between immune cells sets off a cascade of downstream events which either results in cancer cell proliferation or cancer cell apoptosis. Thus, studying how immune cells interact within and near a tumor environment can be an indicator of how effective immunotherapy treatment is for a particular patient. Two types of RNA-seq data were used to identify cell-cell interactions between immune cells: scRNA-seq data and stRNA-seq data. These data give a good representation of the proteomic activity in a particular region from which certain cell-cell interactions can be inferred. We found that granulocytes and cycling lymphoids are more active in the MHC-I pathway in high response immunotherapy patients than in low response immunotherapy patients.

Abstract: 1248

Title: Navigating New Horizons: Our Startup's Odyssey

Presenter(s): Tan Zhou '25, Kevin Bui '24

During the summer, our team Dou Read, dispersed across multiple time zones, grappled with various challenges. Contrary to popular belief, we found the Chinese market to be dynamic, fiercely competitive, and brimming with innovation. This led to a period of uncertainty and frustration. However, it also catalyzed our pivot from a startup focused on AI-powered educational solutions to a vibrant team committed to bridging educational disparities, gamifying education using technology and ensuring equitable access to quality learning irrespective of geographical location or familial background.

This experience was funded by: Solhem Business Fellowship Fund