Program for Undergraduate
Research Experiences (PURE)

2024

BOOK OF ABSTRACTS

UNIVERSITY OF
CALGARY

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INTRODUCTION

It is my pleasure to introduce the inspiring work of 157 students who completed a PURE undergraduate studentship in Spring/Summer 2024. This is the largest cohort of awardees since 2015. I am pleased to announce that this number will increase in 2025, thanks to funding from Cenovus Energy and The Students' Union Quality Money initiative, which will allow us to support fifty additional undergraduate researchers from equity-deserving groups in the 2024/2025 PURE cycle.

The work of these undergraduate researchers was made possible thanks to the support of 146 faculty members from 11 academic units, who generously shared their time and knowledge during the Spring and Summer terms. As a PURE supervisor, I believe I express the sentiment of many of my colleagues when I say that I treasure the opportunity to accompany undergraduate researchers during this time of personal, academic, and professional growth.

This is a special year for PURE as we approach a 20-year milestone. Over the last ten years, there has been a 155 percent increase in the number of applicants, positioning the PURE program at UCalgary as one of the largest in Canada. We are also fortunate to have the support of a team of academic and non-academic staff who help promote and facilitate the review and adjudication processes.

It is heartening to see the transformative impact that PURE studentships have had on undergraduate researchers. The mini stories included in this book are a testament to how undergraduate research is experiential learning that leads to deep, meaningful personal growth. The undergraduate researchers' stories reveal students learning about their cultural backgrounds, collaborating with communities, and gaining a deeper understanding of their academic fields.

I hope the undergraduate research projects showcased in this guide inspire more students to engage in research. I also hope that the diversity and richness of the work presented in these pages persuade every student that research is for them. Though challenging, research can be life changing.

Maria Victoria Guglietti, PhD
Academic Lead, Undergraduate Research

CUMMING SCHOOL OF MEDICINE

Dreden Gianetto

Cumming School of Medicine

Supervised by Sarah Childs

Characterizing the role of Tbx18 in pericyte differentiation to stabilize brain blood vessels

Ischemic stroke is a leading cause of death and disability, with limited treatment options. Recent research suggests that pericytes, specialized cells located on blood vessel walls, play a critical role in stroke pathology and are essential throughout life, from embryo to adult. Pericytes support brain microvessels and regulate blood flow, and reduced pericyte coverage can compromise vessel integrity in the brain. We hypothesized that the tbx18 gene, expressed in pericyte precursors, plays a crucial role in maintaining pericyte morphology, and that a loss of function in this gene may impair cerebrovascular integrity. To test this, we crossed heterozygous tbx18 mutant zebrafish expressing transgenes marking endothelial cells and pericytes. Confocal microscopy was used to visualize pericytes and endothelial cells in the brain, followed by embryo genotyping. We analyzed pericyte numbers and morphology, including soma size and process length. While no significant differences in pericyte numbers were observed between wild-type and homozygous zebrafish, mutant pericytes displayed smaller, less rounded somas and reduced process length and density. These results suggest that tbx18 mutations impact pericyte morphology, potentially impairing their function. This study highlights the importance of pericyte function in cerebrovascular health and suggests potential therapeutic targets for stroke intervention.

Hannah Kim

Cumming School of Medicine

Supervised by Jongbok Lee

Characterizing DNT-AML cell interactions on conventional T cell biology

Acute Myeloid Leukemia (AML) is a blood cancer arising from abnormal myeloid cells in the bone marrow. Unfortunately, there are limited treatment options for AML patients with refractory or relapsed disease, resulting in poor patient outcomes. Hence, there is an urgent need for novel therapies for this patient population. CD3+CD4-CD8- double-negative T cells (DNTs) are a mature T cell subset with demonstrated efficacy and safety in targeting AML cells in an allogeneic setting in preclinical models and a phase I clinical trial. The purpose of my study is to investigate DNT and CD8+ T cell interactions, and to elucidate the mechanisms involved in the anti-leukemic activity of CD8+ T cells induced by DNTs. Research findings will address the research question of how DNTs can be utilized as an effective immunotherapy for pediatric AML patients undergoing allo-HSCT. Our recent preliminary data suggest that, in addition to directing CD8+ cell cytotoxicity, DNTs synergize with peripheral blood mononuclear cells (PBMCs) to mediate superior anti-leukemic activity. However, the exact mechanisms are unknown. My research has demonstrated that CD8+ T cells cultured with AML in the presence of DNTs mediated superior anti-leukemic activity than those cultured with AML cells in the absence of DNTs, determined by flow cytometry-based assays. Next, the mechanisms of how DNT activated CD8+ cells show enhanced killing by using concanamycin A (CMA), an inhibitor of the perforin-granzyme-mediated killing pathway of CD8+ cells, will be investigated. These research findings will extend current knowledge in DNT cell biology, particularly on how they interact with other immune cells. A better understanding of DNT biology will enable the effective utilization of DNTs as a therapy for relapsed and refractory AML patients.

Akila Kularatne

Cumming School of Medicine

Supervised by Anthony Schryvers

Prevalence/Distribution of Transferrin Receptor-Expressing Bacteria in Mammals

Iron is crucial for both humans and certain bacteria, particularly those in the upper respiratory tract (URT). Gram-negative bacteria in the URT, including Neisseriaceae, Pasteurellaceae, and Moraxelleaceae, express transferrin receptors (TfRs) to sequester iron from hosts, contributing to diseases like meningitis and otitis media, especially affecting young children. Despite available treatments, these diseases persist, necessitating novel therapeutic approaches. This study explores TfR-expressing bacteria distribution in mammals, starting with cattle. Bovine URT samples were cultured on transferrin-supplemented agar, yielding translucent colonies after prolonged incubation. Colony PCR with enterobacterial repetitive intergenic consensus (ERIC) and random amplified polymorphic DNA (RAPD) primers revealed distinct banding patterns in some samples, with 16S PCR being used to identify the bacteria genomically. ERIC primers showed clearer banding patterns than RAPD, suggesting their potential for typing TfR-expressing bacteria. However, when determining the actual strain of the bacteria, 16S proved to be effective in most samples tested with only a few bacterial colonies showing difficulty achieving a 30 ng/µL minimum concentration of DNA amplification. Based on pervious knowledge of the bacteria identified from the bovine samples, there were 5/15 bacterial species that could potentially be expressing transferrin receptors with further analysis being required to confirm this.

Kaleigh Major

Cumming School of Medicine

Supervised by Jason Werle

Comparing Alberta Hip and Knee Arthroplasty Revision Rates to the Canadian Joint Replacement Registry (CJRR)

Comparing provincial trends to national trends can help optimize surgical results by adjusting factors affecting success, benefiting the medical system with lower revision rates, reduced wait times, decreased costs, fewer emergency room visits, and improved patient experiences. Research question: How does the revision rate following primary hip and knee joint replacement performed in Alberta compare to the rates published in the Canadian Joint Replacement Registry (CJRR) over a ten-year time horizon? This retrospective cohort study uses patient data from the Alberta Bone and Joint Health Institute and compares it with public data from the Canadian Joint Replacement Registry. Several statistical tests were performed to compare and analyze the datasets. The analysis shows comparable revision total knee arthroplasty (TKA) rates between the two groups over a ten-year period. However, it reveals that Alberta experiences higher-than-anticipated early revision total hip arthroplasty (THA) rates within the first three years post-operatively compared to the Canadian CJRR data, with these rates stabilizing after the third year. While infection as a cause for revision in hip and knee arthroplasty is statistically significantly lower in the Alberta data, there is a higher-than-expected incidence of periprosthetic fractures following THA as a reason for revision. Additionally, there is a higher rate of TKA revision due to arthritis in the unresurfaced compartment and patellar maltracking. This study provides a detailed comparison of hip and knee arthroplasty datasets from Alberta and Canada, offering important insights into regional outcomes and trends.

Riley Ngo

Cumming School of Medicine

Supervised by Jan Storek

Toward Optimizing ATG Dosing: Search for Ideal ATG Exposure

Hematopoietic cell transplantation (HCT) is curative for leukemia; however, graft-versus-host-disease (GVHD) remains a major complication. Anti-thymocyte globulin (ATG), a polyclonal IgG, is used for GVHD prophylaxis. Unfortunately, ATG has not been shown to improve overall survival despite its efficacy in reducing GVHD incidence and its neutral effect on disease relapse. This is likely because ATG pharmacokinetics are highly variable; excess ATG exposure may lead to increased viral infections and insufficient ATG exposure may hinder GVHD reduction. This study aims to identify an optimal ATG AUC (area under the concentration-time curve, measure of exposure) maximizing HCT survival outcomes. A flow cytometry-based assay was used to measure the concentration of ATG in patient sera at different timepoints. Using this concentration-time data, AUCs were calculated for 171 patients. The association between five quintile groups of ATG AUCs and outcomes of interest (overall-, relapse-free-, and chronic GVHD/relapse-free survival, relapse, GVHD, viral infection) was investigated using multivariate (Cox proportional hazards/competing risks) analysis. Quintile 2 (containing the second-lowest AUCs) was determined as the ideal AUC. Eventually, this ideal AUC will be targeted by an individualized ATG dosing formula using a multi- compartmental population pharmacokinetic model, ultimately resulting in improved HCT outcomes.

My summer research project taught me that research isn't linear—it involves trial, error, and continuous learning.

Stefanie Rivera

Cumming School of Medicine

Supervised by Martina Ann Kelly

Silence in the Clinic, a Scoping Review

The objective of this review is to map, describe, and conceptualize how silence is addressed in the literature on physician-patient interactions in clinical settings and within communication skills curricula. This review follows the methodological framework of Arksey & O'Malley, adapted by Levac et al and Joanna Briggs Institute. Empirical studies including quantitative, qualitative, mixed methods, observational studies and reviews were included. Commentaries, editorials, and grey literature were also examined. The databases MEDLINE, Cumulative Index to Nursing and Allied Health Literature, PsycINFO, Scopus and Web of Science were searched. A two-part study selection strategy was applied. First, reviewers followed inclusion and exclusion criteria based on 'Population-Concept-Context' framework to screen titles and abstracts independently. Next, full texts were screened. Data will be extracted, collated, and charted to summarize methods, outcomes and key findings from the articles included. This abstract focuses on study search and selection, followed by a thematic analysis of narrative reports included. From an initial 1,992 studies identified in the search, 297 were selected for full-text review, which was then narrowed down to a final 96 studies for data extraction. Among these 96 studies, 21 were identified as narrative essays. The narrative essays highlighted how silence in medical contexts can facilitate deep connections and reflection, providing a valuable complement to verbal communication. Silence was shown to enhance empathy, support, and presence but can also be misinterpreted if not used thoughtfully. Integrating training on the nuanced use of silence into medical education can improve communication and patient care.

My summer research project has taught me that research is not just laboratory work, but also involves spending a lot of time planning, analyzing, and interpreting results.

Delaney Robinson-Wong

Cumming School of Medicine

Supervised by Katharina Lahl

The Impact of Rotavirus Infection on Intrinsically Derived IgA Responses in the Neonatal Intestine

Immediately following birth, infants are exposed to numerous environmental and microbial antigens. During this vulnerable period, breast milk-derived factors, such as antibodies, are crucial for providing infants with immune protection, and facilitating early-life immune development. The major mucosal antibody, Immunoglobulin A (IgA), is both provided through breast milk and intrinsically produced by the neonate. IgA plays n important role in protecting the neonate against mucosal infections and regulating intestinal microbiota during immune development. Identifying changes in intrinsic IgA induction over time can shed light on how early-life events impact immune maturation. Under steady-state conditions, the frequency of small- and large intestinal IgA producing plasma cells (IgA+ PCs) in neonates is low, but increases over time around weaning age. Given the prevalence of early childhood infection, we investigated IgA production in the context of rotavirus infection (RV) to determine how infection affects long-term immune maturation. Pups neonatally infected with RV exhibited an earlier onset and long-lasting increase in the frequency of IgA+ PCs compared to uninfected pups. Using an allotype-specific tracking method to investigate pup-intrinsic IgA(a) production independently from maternally derived IgA(b), we began interrogating how this increase impacts non-RV-specific IgA coating of commensals over time. This study highlights a potential correlation between early-life immune perturbation and long-term immune development seen by broad increases in IgA production, such as towards microbiota, even with decreasing frequencies of pathogen-specific IgA. Further investigations are needed to uncover the impact of early-life induced increases in intrinsic IgA production on immune development and long-term immune health.

Nidhin Sunil

Cumming School of Medicine

Supervised by Maryam Badv

Modifying Bacterial Nanocellulose Scaffolds to Enhance Mesenchymal Stromal Cell (MSC) Attachment

Bacterial Nanocellulose (BNC), a naturally synthesized polymer by Komagataeibacter Hansenii, has emerged as a prominent biomaterial for in-vivo biomedical applications due to its high biocompatibility, water retention capacity, as well as cost-effective production. However, a limitation of this naturally produced polymer is that it lacks sufficient biofunctional features necessary to promote effective cell attachment. In this study we explored a sequence of experiments that focused on modifying the surface properties of the BNC scaffolds to better facilitate the attachment of Mesenchymal Stromal cells (MSCs).BNC harvested from K. Hansenii cultures was used to create two types of scaffolds. Where one contained homogenized freeze-dried BNC (fdBNC) and the other contained regular non-freeze-dried BNC (ndBNC). MSCs were seeded onto each of these scaffolds and imaged using fluorescence microscopy with syto24 staining on day 1 and 4 of incubation. The preceding results prompted us to test ndBNC soaked in either FBS or gelatin. Another round of imaging indicating limited MSC attachment insisted further modification of the scaffold. Therefore, four concentrations of glutaraldehyde were tested for crosslinking the gelatin on ndBNC scaffold. It was determined from our first experiment that ndBNC scaffolds facilitated limited MSC attachment. Glutaraldehyde crosslinking of the gelatin in ndBNC showed better MSC attachment relative to fdBNC scaffolds. However, neither modification showed the extent of MSC attachment seen in the control wells. Further exploration, such as FTIR analysis and protein absorption assay of the glutaraldehyde crosslinked gelatin/ndBNC scaffolds would benefit our understanding for optimizing this protocol for cell attachment studies for future in-vivo applications.

Sabah Virk

Cumming School of Medicine

Supervised by Shalina S. Ousman

Characterization of Uninjured Peripheral Nerves Across the Lifespan of Male and Female Mice

Regeneration of peripheral nervous system (PNS) axons following nerve stretch, crush, or degenerative damage in humans is often incomplete, which results in motor and sensory deficits such as neuropathic pain and incoordination. Moreover, these deficiencies are exacerbated in older individuals. The overall purpose of this project was to elucidate the mechanisms underlying motor and sensory incapacitation with aging. Evidence suggests that poor PNS nerve regeneration is not due to an inability of older axons to regrow (Kang & Lichtman, 2013; Painter et al., 2014; Scheib and Höke 2016a), but rather it is related to defective function of other cell types in the nerve such as old macrophages and Schwann cells (SCs). Given that males disproportionately sustain PNS injuries, it is unknown if a sex difference exists in the presence and properties of SCs and macrophages in the older uninjured and injured PNS. I specifically explored if there was a sex difference in SCs and macrophages in the naïve PNS across the lifespan. To this end, sciatic nerve segments from 1-, 3-, 6-, 12, and 18-month-old uninjured female and male 129SVE mice were frozen and ten microns thick sections were immunohistochemically stained for and quantified for the number of myelinating [anti-myelin basic protein (MBP)] and non-myelinating (S100beta+glial fibrillary acidic protein (GFAP)+] SCs. Thus far, results depict the number of myelinating SCs to be reduced in 12-month-old male and female mice compared to 1-month-old male and female mice. Further analysis will include immunohistochemically-staining for inflammatory (Iba+CD16/32+) and immunosuppressive (Iba1+CD206+) macrophages. Altogether we will obtain a detailed analysis of the effect of aging on uninjured peripheral nerves of male and female mice.

Hannah Cohen

Cumming School of Medicine & Faculty of Arts

Supervised by Tiffany Boulton

It's About the Impacts: Interventions and Remedies for Coercive Control

Coercive control is a pattern of abusive behaviour used to harm, manipulate and alienate victims from their support networks. It is prevalent in contexts of domestic violence, cults and sex trafficking, but can be seen in any abusive relationship or organization. Coercive control is not yet recognized as a criminal offence within Canada, and this impacts current policies and front-line responses to domestic violence, which are most frequently focused on discrete acts of physical violence against victims. Interconnected aspects of domestic violence are treated as distinct issues by service providers, creating "siloed" responses to the complex needs of survivors that are informed more so by the actions of abusive perpetrators than the lived experiences of those impacted by domestic violence. This study, led by Andrea Silverstone in partnership with Sagesse and the University of Calgary, examines universal and cross-contextual experiences of the psychological impacts of coercive control. It follows a mixed methods research design, including a systematized review approach, an empirical qualitative approach (including surveys, interviews and/or focus groups) to gain insight into and reflect individuals' lived experiences of coercive control, as well as a quantitative analysis approach to explore the frequency of cross contextual experiences of coercive control(using surveys and examining existing data). Previous literature has examined the damaging mental health effects of coercive control, as well as how it is employed in different contexts. This research focuses on the experiences shared by different individuals impacted by coercive control, as well as the experiences of service providers who have worked with those affected. By arguing for changes and innovations within practice and policy to better reflect survivors' needs, this study lays the groundwork for more comprehensive remedies and interventions.
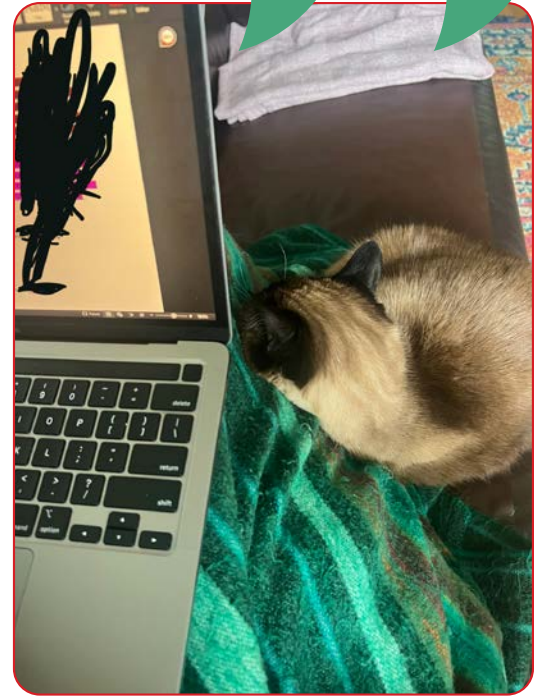
FACULTY OF ARTS

Damase Anderson-Camacho

Faculty of Arts

Supervised by Petra Dolata

The Visual Construction of Weimar Lesbian Identities

In 1924, Radszuweit Verlag published Die Freundin, a magazine aimed at the lesbian and queer female population of Germany. It was the first of its kind, its existence permitted by a brief collapse in the enforcement of censorship laws in the newly-established Weimar Republic. In order to attract readers, this and subsequent lesbian periodicals utilized images f nude and topless women on their covers, often sourced from photobooks and unaffiliated studios. Employing a process of comparison to women's fashion magazines and modern art photography, this project attempts to discern what was unique about the images selected for lesbian periodicals Die Freundin and Frauenliebe, focusing on the images printed between 1927-1929. Certain aspects of an early "queer aesthetic," can be discerned. These visuals were a powerful source of comfort and community for queer people, allowing them to feel seen in images that if not paired with explicitly homosexual text they might not have felt seen in. Simultaneously, the selection of these images was driven by a strong desire for conformity. Compared to the images in fashion magazines, those in lesbian periodicals largely seem dated and performative. Because of their need to appeal to the broadest readership possible while evading censorship, these magazines tended to utilize the images that could most easily be defended as art, meaning relying on older, less modern aesthetics.

Imandi Attanayake

Faculty of Arts

Supervised by Gavin Cameron

What role does international cooperation play in the success of naval 'Projection Operations,' and how can collaboration between different naval forces be optimized for maximum impact in the context of this operation?

This research examines the essential role of international cooperation in enhancing the effectiveness of the Canadian Navy's 'Operation Projection,' with a specific focus on joint operations in the Indo-Pacific region involving key allies such as the United States, Australia, and Japan. As a vital component of Canada's maritime strategy, 'Operation Projection' supports global maritime security and upholds the rules-based international order. This study reveals how international collaboration strengthens Canadian naval capabilities and diplomatic influence. This research is conducted through a mixed-methods approach, including interviews with Navy personnel and defence experts and an analysis of official documents. The findings underscore the importance of strategic partnerships in optimizing naval operations and provide actionable recommendations to enhance Canada's future maritime posture and contribute to global stability.

In their own words

For my PURE Award research, I explored the relationship between the Canadian Navy and international co-operations. Essentially, I wanted to explore whether these relationships improve operations achievement between different countries or improve the function of the Canadian Navy as a whole. Coming from a family of medical doctors, these topics and methodologies were completely new to me, and I did not know what to expect from myself or the project. My research methods were literature review/document analysis, plus interviews with Canadian scholars, Navy and Military experts.

I had to quickly learn how to adapt when something didn't go my way.

Searching for answers in primary sources was harder than I expected. Since the Navy is unlikely to publish the information that I am looking for online, I had to go through sources like government reports, which tend to be vague. Preparing research interviews was learning curve as well, as I had to apply for ethics certification for the first time and design an interview protocol with a tone that was informational, yet conversational. This was quite hard – even scary – at times, but I learned to trust the research process and to trust in myself, as cliché as this may sound. As a first-year student who primarily thought of research as only happening in labs, I have a new appreciation that research can happen in any field, and that a researcher is someone with questions and curiosities about the world.

I had so many invaluable experiences throughout my summer of research that have left feeling me confident in both my research skills and my people skills; I had the opportunity to meet and work with so many wonderful, kind, and generous people, all of whom I will never forget—I cannot wait to continue to apply these skills gained during my PURE research experience!

Gabby Barber

Faculty of Arts

Supervised by Sabrina Perić

Queer Life in Contemporary Rural Alberta

Queer Life in Contemporary Rural Alberta is a project that calls attention to an underrepresented community in contemporary social science scholarship: rural 2SLGBTQIA+ people. This PURE project seeks to: 1) understand the experiences of queer people in rural Alberta; 2) dispel reductive stereotypes about rural areas; and 3) give voice to underrepresented rural residents. This summer, I conducted eleven life history interviews to better understand growing up queer in rural areas, how people create community in small towns, and what differences they perceive between rural queer experiences and urban ones. I also conducted participant observation at 4 rural pride events to document important social and support networks for queer communities, observe participation and attendance, and understand how pride organizations presented queer experiences to the broader public. This project found that queer people in rural areas: 1) have very diverse experiences growing up, and their experiences are not easily categorized; 2) enjoy living in rural areas and do not feel well represented by the predominantly urban-based pride organizations/2SLGBTQIA+ advocacy groups; 3) do not feel well-represented by their elected politicians; and 4) are fearful of possible future increases in anti-2SLGBTQIA+ vitriol and violence in rural Alberta.

In their own words
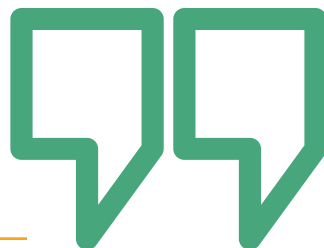
Little about my research went as planned, but I learned change can be positive! Before PURE, I was in Italy on a group study program. My PURE Award Supervisor, Sabrina Perić, and I were well-prepared before my departure for my research working with Pride YMM, Fort McMurray's pride organization. Suddenly, I saw headlines about forest fires in Fort MacMurray - I was in a different country and my project was going up in flames!

Dr. Perić said, "Take a breath. This experience will help you in academia. Your research will never take the shape you think it will."

When I returned, we shifted our focus to life histories of queer people in rural Alberta. We attended the Ponoka Stampede together to practice participant observation, and we planned to conduct my first two interviews together. However, the day before, Dr. Perić texted me, "I think you should try this by yourself". I was pushed out of the nest! I was so anxious, but both interviews went so well. The first was the person who created Lacombe Pride, and they were very supportive of my project. The second was a Lacombe resident. We met in a park, and she was so open with me. This success continued in my other interviews, and I realized I could become a real anthropologist. By the end of the summer, I had collected so much data that Dr. Perić said it could be the basis of a master's thesis. I am still deciding what my next steps are, but no matter what, I know it will be something that gives voice to people who are underrepresented.

To learn more about my research, see **quiraproject.ca**

My summer research project taught me the value of collaboration and how important interdisciplinary integration is for true innovation!

Lindsay Bayer

Faculty of Arts

Supervised by Tonya Callaghan

Proof of Plurisexuality: Experiences of Stigma in 2SLGBTQIA+ Individuals

Heterosexism remains an oppressive and discriminatory force within the Two-Spirit, Lesbian, Gay, Bisexual, Transgender, Queer, Intersex, and Asexual (2SLGBTQIA+) community; however, plurisexual individuals face a unique form of discrimination against their attraction to multiple genders, known as monosexism. The dominant explanation for this trend lies in the societally imposed heterosexual/homosexual binary, one that plurisexual-identifying people lie outside of. Monosexual identities that fall within this binary, such as gay and straight, are both aligned in their single-gender attraction basis, whereas plurisexual identities such as bisexual and pansexual are outliers, facing discrimination from both heterosexual and homosexual individuals alike. Previous research has primarily relied on single-gender cisgender samples with aggregation of all plurisexual identities under a single umbrella, thereby invalidating the unique lived experiences of different plurisexual identities. This project utilizes data collected from a myriad of empirical sources such as literature reviews, semi-structured interviews, and online surveys. These were scrutinized in order to understand the impacts of monosexist discrimination on plurisexual individuals in the contexts of mental and physical health. Monosexism produces a variety of adverse effects on plurisexual individuals, including but not limited to pressure to prove identity, accusations of 'faking' their identities, and assumptions of romantic/sexual greed. Our findings suggest that monosexism is harmful to plurisexual individuals and their identities, thereby invalidating a vital component of their sense of self. These findings indicate a necessity for increased research into the mental/physical health impacts of monosexism on plurisexual individuals, both short and long term.

In their own words

Back when I was volunteering at the Q Centre, I heard about discrimination of plurisexual individuals happening both within and outside the 2SLGBTQ+ community. Even within this community, there are binaries. Because both heterosexuality and homosexuality are aligned in being monosexual identities, plurisexuality lies as its own outlier within a community that is already ostracized. These stories stayed with me, and I wondered why such discrimination would happen both within and outside the 2SLGBTQ+ community. To thoughfully explore this question, I wanted to take an interdisciplinary approach. I connected with Dr. Collaghan (Werklund School of Education) to incorporate gender and sexuality research with my learning in psychology. It's been a journey. People's social assumptions can also inform their academic assumptions. Consequentially, people who don't identify in this subset of the 2SLGBTQ+ community can have a hard time understanding why this is worth researching.

What's kept me going has been walking meetings with my supervisor. Her support has been invaluable. We've talked a lot about how important it is for people within the 2SLGBTQ+ community to be the ones researching their community.

As this topic is so new, we still don't know its cause and what the long-term impacts are. Yet, innovation doesn't happen without someone having the courage to express an idea, even when the idea isn't well received. This idea is my space to be who I am, both personally and academically, and to connect with and support others with similar lived experience.

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Genevieve Bradford

Faculty of Arts

Supervised by Jenny Godley

A Comparison of Ethical Regulations in Social Science Research Across Five Countries

Effective ethical oversight is a critical component of conducting responsible research. However, despite increasing global awareness of the need for ethical oversight, development of research ethics standards has grown asymmetrically and focused largely on health and biological research, disregarding the dangers of unregulated social science research. In this project we examine social science research regulations in Canada, The United Kingdom, Kenya, India, and Thailand, to explore if and how countries across the world are addressing ethical concerns in social science research. We first conducted a scoping review of the academic literature produced over the past ten years related to social science research ethics in each country using a SCOPUS search. Our initial search returned 777 titles, which we then narrowed to 440 titles, which fell within the scope of our research. We reviewed the abstracts for each article, and coded each article by theme. We then analyzed the frequency and overall themes of the research articles for each country separately to gain a comprehensive understanding of the current state of social science research ethics in each country. We then further researched the guidelines, laws, and systems mentioned in our literature review to gain a further understanding of how regulations are implemented. We found a large disparity in both the strength and origins of regulations across countries, with varying ethical focuses but often similar methods of implementation. From these findings we can begin to develop a sense of how effective ethical regulations may be implemented in countries that lack formal guidelines as well as the trends in the development of and concerns surrounding social science research ethics globally.

Garima Chahal

Faculty of Arts

Supervised by Paul Stortz

Lived Experiences of Senior Citizen Muslim Refugees in Alberta: A Qualitative Study

This study explores the lived experiences of senior Muslim refugees resettled in Alberta, focusing on the challenges they face during integration into Canadian society. The research aims to provide insights that inform community support systems and policy interventions to improve the well-being and social inclusion of this demographic. A qualitative approach was employed, with semi-structured interviews conducted with 10 Muslim refugees aged 60 and above, who have lived in Alberta for at least five years. Participants were selected through purposive sampling and snowball recruiting to ensure diverse representation. Thematic analysis revealed key challenges related to language barriers, cultural adaptation, access to healthcare, and social isolation. Despite these difficulties, participants displayed resilience and adaptability, with faith, community networks, and intergenerational support playing vital roles in their adjustment process. However, many reported ongoing loneliness and challenges in accessing mental health services. The study concludes that culturally sensitive, targeted support services are essential to addressing the specific needs of senior Muslim refugees. It highlights the importance of programs that enhance community engagement, offer language and cultural training, and improve access to mental health resources. The research contributes to ongoing efforts to support the integration of senior refugees in Canada, advocating for tailored interventions that address their unique challenges.

Participating in a summer research project has left me with valuable insight and an appreciation for the rigorous and resilient process that research undergoes to provide quality knowledge that helps us understand the world better to foster social development.

Aressana Challand

Faculty of Arts

Supervised by Maria Victoria Guglietti

'A Lawless Wasteland': Neoliberal Governmental Discourse on Alberta's Supervised Consumption Sites

Canada's implementation of Supervised Consumption Sites remains controversial, despite a growing opioid overdose mortality crisis. In 2019, the Alberta United Conservative Government published in affiliation with Alberta Health, 'Impact: A Socio-Economic Review of Supervised Consumption Sites in Alberta'. The aftermath of the report's publication saw site funding freeze, Supervised Consumption Sites close, and the overdose crisis escalating. These events require analysis into how Supervised Consumption Sites and harm reduction is now communicated by the Alberta Government. This cross-sectional case study asks, 'What discourse is produced in the Alberta Government's 'Socio-Economic Review of Supervised Consumption Sites in Alberta?'' The methodology is informed by Van Dijk's Critical Discourse Analysis and Michel Foucault's concepts of knowledge and power. The two major themes identified, site inefficiency and a risk to society, evidence a neoliberal governmental discourse on health services. Findings indicate that neoliberalism silences the voices of site users and social issues to emphasize the impact of Supervised Consumption Sites on the community as negative. Neoliberal discourse challenges who is most embattled by the drug crisis; the community facing the reported socio-economic problems of Supervised Consumption Sites, or the site users experiencing the socio-economic determinants of addiction. This discourse erodes health and social services like harm reduction to rationalize the Alberta Government's newest addiction treatment proposal — the forced treatment model. At the crux of the drug toxicity debate is how Supervised Consumption Sites are perceived, as a solution to the problem or as the problem blocking a potential solution.

My summer research project taught me that having a strong support network during a research project makes all the difference, leading me to feel that research should never be done in isolation.

Lauren Clavelle

Faculty of Arts

Supervised by Adela Kincaid

Indigenous Politics in Political Science Curriculum

The Indigenization of Canadian Political Science has been slow to develop and materialize (Ladner, 2017). As the University of Calgary continues its parallel path towards reconciliation, this study asked: 1) How have Indigenous voices, perspectives, and analytical frameworks been included within undergraduate courses offered by the University of Calgary's Department of Political Science? and 2) how can they be further represented and included? Inspired by previous PURE winner Tapisa Kilabuk, this project used a qualitative document analysis (Kutsyuruba, 2023) to explore the presence of Indigenous content within courses offered between Winter 2018 to Winter 2023. The preliminary findings of this analysis indicated a gradual inclusion of Indigenous content within political science courses. There was an identified need for further inclusion of Indigenous content including a deeper analysis of course readings over the past five years.

Vidhi Desai

Faculty of Arts & Faculty of Science

Supervised by Gerald Giesbrecht

Microbiome on Fire: Wildfire-Associated Smoke Exposure is Associated with the Infant Gut Microbiome

Wildfires in Canada have been on the rise, prompting concerns about their potential impacts on public health. Exposure to wildfire smoke has been associated with inflammation, potentially leading to alterations in the gut microbiome, thereby influencing various metabolic and brain-related health outcomes. This study aimed to explore the effects of wildfire smoke exposure on infant gut microbiome development, a contributor to early health. We hypothesized that early-life exposure to wildfire smoke would lead to changes in alpha diversity—a measure of species richness and evenness. Data was collected as part of the Pregnancy During the Pandemic study. The stool microbiome was analyzed through metagenomic shotgun sequencing, with samples collected from infants at approximately 4 months of age. Infants were classified as exposed to forest fire smoke if they experienced at least one instance of monthly average air pollution (PM2.5 levels) exceeding 9 $\mu g/m^3$. 87 infants met this exposure threshold, whereas 224 participants comprised the control group. An ANCOVA was conducted, controlling for seasonality and regional differences across provinces, to assess the impact of smoke exposure on three measures of alpha diversity. Infants exposed to wildfire smoke had lower Shannon and Simpson diversity relative to the comparison group. No significant association was found between exposure to wildfire smoke and CHAO1 diversity. Ongoing work is identifying whether there are any individual gut microbes that are impacted by forest fire smoke.

In their own words

For my PURE Award, I studied the impact of wildfire smoke on the gut microbiomes of Canadian infants. Wildfire smoke releases particulate matter (PM), which can cause temporary inflammation and breathing difficulties. My project focused on PM2.5 and its effects on the infant gut microbiome—a community of bacteria influencing everything from brain function to immunology. My fascination with the microbiome began in university, and joining my supervisor's project allowed me to explore this interest while also pursuing my passion for helping children with developmental and mood disorders. Initially, I assumed every problem had a clear solution, which challenged my goal-oriented mindset. Our team was among the first to study PM2.5's impact on the developing gut microbiome, leading to many uncertainties, like defining "exposure" to wildfire smoke.

This project required me to merge creative and analytical skills, something I hadn't done before. Learning to ask for help was humbling, but my team showed me that failure is a natural part of research and that improvement is what truly matters. Reflecting on this experience, I've gained a deeper appreciation for the process over the outcome. Awards are not everything; what matters most is your passion and the drive to explore your ideas.

Evangeline Dorval

Faculty of Arts

Supervised by Ali Karimi

How to Go Viral: Testing a Communication Theory

How do you go viral on social media? One communication theory about online virality claims that morally and emotionally divisive content is favoured by social media algorithms, giving the content a wider outreach than more benign or morally neutral messages (Brady et. al,, 2017). The authors present their findings based on the diffusion of morally and politically polarizing posts on Twitter (now X). This study found that "the expression of moral emotion is key for the spread of moral and political ideas in online social networks" (Brady et al., 2017). In this study, I investigated specifically the extent to which this theory could be applied to the algorithms of the three dominant short-form video social media platforms TikTok, YouTube Shorts, and Instagram Reels. For my experiment, I created two short-form videos: one with a fact-based, unbiased theme and the other conveying a morally divisive and emotionally provocative message about genetically modified food. These videos were posted to Instagram Reels, TikTok and YouTube Shorts for a period of two weeks. Variables related to the name, 'following' count, video captions/ hashtags, and creation date of the accounts used for posting were kept consistent and controlled for accuracy. It was found that the short-form video content containing moral-emotional expression received a significantly greater amount of engagement (in the form of saves, likes, reposts and shares) on TikTok specifically, with the videos on Shorts and Reels receiving generally low levels of traction. These findings could be of use to content creators looking for methods to gain more exposure on short-form video platforms, and could increase TikTok users' awareness of the level of misleading, emotional and controversial videos they may be encountering while scrolling the app.
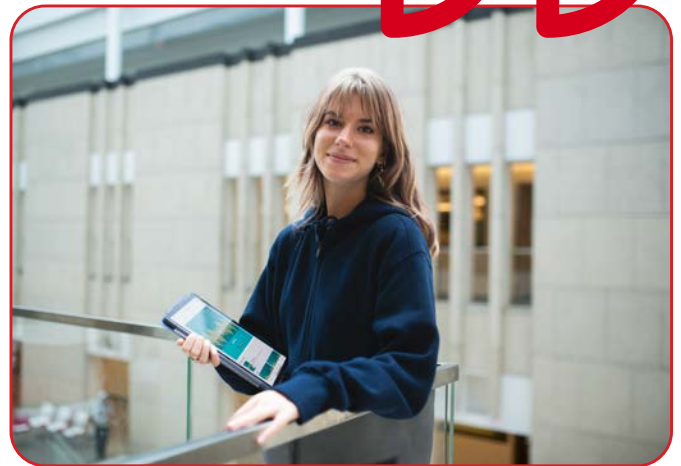
Eman Elkhaial

Faculty of Arts

Supervised by Allen Habib

Canadian Jurisprudence of Search and Seizure

For this research, I completed a legal memo. A legal memo is a formal document written by junior lawyers for senior lawyers and colleagues in a firm, where an in-depth analysis and explanation of the case at bar, the relevant statutes, and case law are provided. A legal memo is a useful document for a legal team to understand and build upon the legal issues involved in a case or continuing litigation. This legal memo addresses s. 8 of the Canadian Charter of Rights and Freedoms, which protects individuals against unreasonable search or seizure. The central question this paper seeks to answer is: What constitutes a search under s. 8 of the Charter? To answer the question, the paper analyzes various scenarios with different legal contexts and expectations of privacy. By analyzing how s. 8 has been applied in the bodily search of the person, vehicles, and homes, with particular emphasis on electronic records in the modern, digital world. An emphasis is placed on the application of the totality of circumstances test and what can be referred to as subjective or objective "reasonable expectations of privacy" on whether a search has been conducted in accordance with law. What follows is a deeper analysis supported by the leading case law in the form of decisions such as R. v. Cole and R. v. Morelli, to demonstrate how the courts have applied s. 8 in diverse contexts in the past. A detailed analysis of what constitutes a search within s. 8 is covered, including developing technologies and evolving notions of privacy in the context of electronic records.

Sophie Garcia

Faculty of Arts & Werklund School of Education

Supervised by Erin Sutherland

Indigenizing the Nickle: Curatorial Project

The overarching project, Indigenizing the Nickle, examines how integrating Indigenous arts and culture on campus can facilitate the implementation of the ii' taa'poh'to'p strategy at the University of Calgary. Through the form of an art exhibition, the project aims to advance the university's goals in executing the strategy, honouring the Truth and Reconciliation Commission, and deepening connections with Treaty 7 Indigenous communities through contemporary visual art. Historically, the Nickle Galleries has exhibited Indigenous art in a single space at a time. This initiative aims to transform the galleries by featuring Indigenous art across all three exhibition spaces simultaneously. The project's second phase, supported by the PURE Award and titled Indigenizing the Nickle Galleries: Curatorial Project: Curatorial Project, explores Indigenous curatorial practices and how they can uplift the larger project's goals. The research involved a two-phase approach: initially, conducting studio visits and building relationships with Indigenous artists, followed by curating a mock exhibition. The curation process focuses on selecting Indigenous artists and developing a thematic narrative that reflects celebrates and honours artists from Treaty 7. Findings reveal that successful curation of Indigenous art is inherently relational, prioritizing dialogue and mutual understanding. Key to a meaningful exhibition is the active participation, communication, and commitment of all involved stakeholders. This approach highlights the importance of relational practices in achieving the goals of the ii' taa'poh'to'p strategy and fostering a more inclusive and representative cultural environment on campus.

Valeria Garcia Palma

Faculty of Arts

Supervised by Ruth Pogacar

The Evolution of Feminine and Masculine Brand Personalities Over Time

Brand names with linguistically feminine characteristics are perceived as warmer and are more often chosen than linguistically masculine names (Pogacar et al., 2021). Yet there is limited research on brand names that are either gender-neutral or combine both masculine and feminine traits, and the conditions under which these may be advantageous. To explore this gap, we asked over three hundred participants to evaluate Interbrand's 2023 Top 100 brands according to Grohman's (2009) brand personality dimensions. While participants in Grohman's (2009) research could readily identify brands with personalities that were masculine (e.g., Old Spice), feminine (e.g., Dove), and undifferentiated, i.e., neither (e.g., Benadryl), they were not able to list any androgynous brands that combined genders. Our pilot data suggest a notable shift: several top brands are now perceived as androgynous or undifferentiated. This shift may reflect changes in brand positioning or a transformation in consumer perceptions, or both. Understanding these evolving perceptions could offer valuable insights into how brands can strategically use genderneutral or mixed-gender identities to appeal to broader or more diverse consumer segments.

Josiah/Josie Grof

Faculty of Arts & Werklund School of Education

Supervised by Jack Lucas

Politics of Resentment and Place across the Rural-Urban Divide: An Analysis of Ontario Politician's Social Media Posts

The concept of the Urban-Rural divide highlights the differences in ideas, beliefs, and politics which has become an increasingly relevant topic in the discussion of Canadian politics and identity. These cleavages effect not only how people view others, but how they view themselves and how they vote. Electoral candidates who are aware of this may appeal to place-based identities in their communication with their ridings, highlighting characteristics which aim to prove political competency to their potential constituents. How politicians appeal to these identities through social media is a key piece to understanding how location-based identities are formed, reinforced, and changed through political action. This project compiles over 1300 social media posts made by electoral candidates in the 30 days leading up to the 2021 Ontario federal election. 15 politicians across 7 different ridings (3 rural, 2 suburban, 2 urban) were chosen based on competitiveness of the electoral race, with chosen ridings being decided with less than 5% margins. Each post was individually assessed for indicators of place and resentment, and then categorized by riding density and partisanship. Results showed higher amounts of resentment across suburban place types as well as an inclination by nearly all candidates to use place-based language appeals over the course of the campaign. This study adds to the growing literature around Canadian politics, identity, and behavior of actors who appeal to place-based identities.

Anastasia Grygoryeva

Faculty of Arts

Supervised by Chelsea Willness

Stakeholder reactions to Corporate Social Responsibility (CSR)

While CSR initiatives may enhance a company's image, these claims may also be received negatively and with skepticism. Understanding why this happens and how to better communicate or implement these initiatives can allow an organization to perform better ethically and professionally. To date, the majority of published research in the micro-CSR literature has been focused on stakeholders' positive responses to CSR communications and initiatives. There is growing indication that stakeholders are becoming more skeptical of organizations' social and environmental promises, yet comparatively little research has examined this phenomenon. The objective of this project was to conduct a systematic review of the literature on negative reactions to CSR, to develop an exhaustive and cohesive summary and analysis of what is known to date, and to identify pressing research questions for the future. Common negative reactions that were found included skepticism, lower purchasing intentions, general negative perceptions, and negative attitudes. The least common reactions included lower recommendation intentions, cyberloafing, boycotting and suspiciousness. These reactions were mostly studied in consumers, and thus we found a major gap in micro-CSR research as there is a lack of articles studying other stakeholder groups, such as employees, communities, and investors.

Danielle Greenberg

Faculty of Arts

Supervised by Peter Toohey

The Calendar for Uncertain and Gloomy Readers

With the rise of the study of emotions in recent years, there has been a profoundinterest in fear, both biologically/physiologically and societally/culturally. But what, exactly, is fear, and what does it encompass? Can we differentiate between variations of fear? And how does fear relate to other emotions? The illumination of our understanding and experience of different forms of fear was the aim of my research, as well as how these forms intersect both with other emotions and with each other. To do so, I began by conducting a literature review, across a wide variety of disciplines, which encompasses fear as a general concept as well as some of its most common variations: anxiety, horror, terror, fright, dread, panic, creepiness, and hate. In my work, I looked at each term individually, before considering how we can conceptualize the relationship between these terms as well as other emotions through visual models and spectrums. By looking at each fear term on its own and attempting to establish a definition for it, I was able to better understand our society and culture and what it truly means to experience these variations of fear. The final product of my research is a diagram which I created to illustrate these relationships. What my research revealed is that fear is a complex, multi-layered emotion, which encompasses many distinct feelings and overlaps significantly with other 'basic' emotions, such as disgust and anger.

In their own words

At the end of my PURE Award, I feel like I am at the start of a lifetime of research possibilities, and I hope other humanities students will feel inspired to explore their interests, too. For my PURE Award, I worked on my supervisor, Dr. Peter Toohey's project creating an "almanac of emotions"; a calendar of typical occurrences of moods and emotions throughout the year, ranging from depression to optimism. Early on, Dr. Toohey and I observed that several emotions interacted with fear, so I proposed to look at fear specifically, and to write up my findings in an appendix to his project. I consulted diverse sources, from ancient and modern literature to etymology and scientific journals, resulting in a five-circle Venn diagram to map how different fear varieties interact with other emotions. These sources also gave me several tools to deconstruct feelings of fear and anxiety.
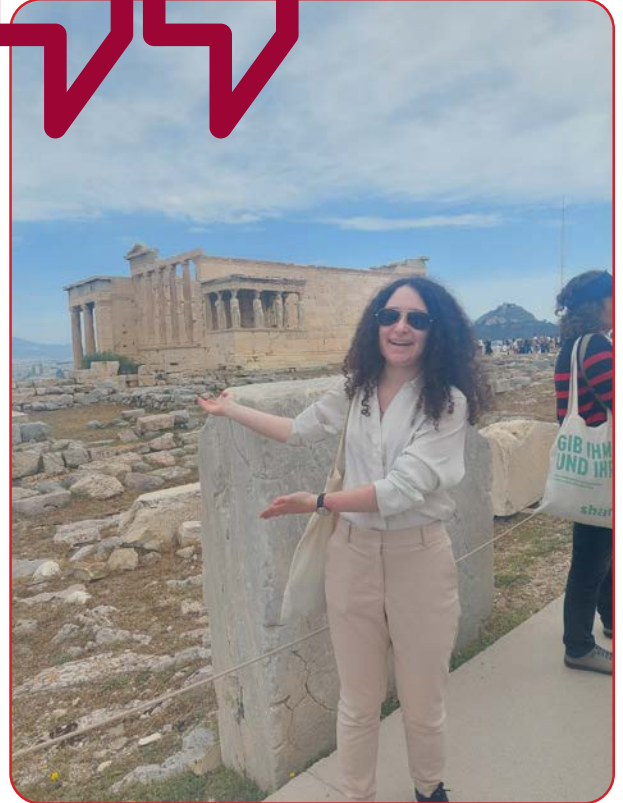
Fear interacts with so many parts of our lives and this is not a bad thing — it has an evolutionary positive function in how it's meant to keep us safe from threats. Now when I feel anxious or watch a horror movie, I think about how my research applies.

For example, creepiness comes from a transgression of social norms and violations of what we deem "natural". Thus, Nicolas Cage's Longlegs face looks scary because it's not quite human. I learned so much in this process, and I am so proud that my work will be published as an appendix in Dr. Toohey's upcoming book. In the future, I would love to explore fear in the ancient world specifically, particularly the fear of loneliness, as the ancients shared such unique experiences of this.

My summer research experience has taught me to always ask questions and there are no wrong questions.

Grace Herasymuik

Faculty of Arts

Supervised by Maria Bakardjieva

Help or Hassle: Analysing Teachers' Understanding of AI in Classrooms

Since the release of Open AI's large language model ChatGPT, teachers have had to adjust to a new experience with a technology never seen before. Due to the young age of ChatGPT, few studies exist focusing on teachers' experience with the new technology. This project aims to understand how a community of practice of teachers on Reddit use and frame ChatGPT within their classrooms. The Reddit forum R/Teachers 'Just Another AI/ ChatGPT Post', is a lively public forum with over 800,000 users where teachers discuss their experiences in education with other teachers. From this forum a sample total of 850 units made up of 17 posts, each with 50 respective comments, was used in my study. Through inductive coding and a thematic content analysis it was found that teachers arrived at the technology from other influences, used ChatGPT for their own time saving, had polarizing attitudes to adopting the technology, reached out to other technologies to solve plagiarism and had weary predictions for the future of education alongside AI. In situating the findings of this study within conceptual frameworks of social constructivism, the social framing of technology and sociotechnical imaginaries, this report identifies the ways in which teachers make sense of ChatGPT in the current educational landscape, the practices they develop around it and emphasizes the need for teachers to establish ways to use the technology that aligns with the ethical and pedological goals of students and teachers alike.

In their own words

If I've learned anything from my undergraduate research experience, it's to not limit oneself. If you have an idea that excites you, run with it and see what's possible.

Often in undergrad, we don't know if our questions or ideas are worth the effort of research, but they are worthy. This lesson took time for me to embrace. It started when the teaching assistant in a research methods class encouraged me to consider applying for PURE. After seeing how much my peers were using large language models (LLMs) like Chat GPT, I wondered how teachers were using it, too. Without my TA and supervisor's support in turning my assignment into a research proposal, my interests and goals today would look quite different. For my study, I collected posts from r/teachers and coded for key themes. My research has really changed my perspective on AI. It's changing education in so many ways. I am much more aware of how inaccurate it can be. Going into this project, I was out of my comfort zone in academic reading and writing. Being in second year, I had not yet had opportunities for long-form analysis. However, with this project, I wasn't limited to a word count. I could dive in as deep as I wanted to. Learning how to describe my thoughts and to make connections to others' thoughts has been so empowering, and I going to keep asking questions and pursuing my ideas.

My project taught me the importance of place and positionality while writing in Ireland and how hard it can be to research your community.

Hunter Holt-Barry

Faculty of Arts

Supervised by Daniel Voth

Deoraíocht: Understanding Irish Identity's Lasting Impact in Settler States

Upon arriving in settler states such as Canada, Irish emigrants fleeing from centuries of British colonialism found their status changed over time. Instead of remaining the oppressed, they became the oppressor. This project sought to analyze two questions: First, what was the impact and processes of settler-colonialism on Irish identity? And secondly, why does the larger Diaspora outside of Ireland feel so strongly about being Irish? Using the structure and analysis framework created by Dr. Starblanket and Dallas Hunt in Storying Violence (2020), it found that the settler-colonial system in Ireland was upheld by centuries of storying ideas of the Irish as savage, barbarians or otherwise undeserving of their land, and much of the colonial practices used in Ireland mirror that used in other countries. Secondly, stories of survival through oppression were passed down through families and became stories and collective memories that upheld Irish identity. There, however, exists a disconnection of "Irishness" where the Diaspora is seen as upholding stereotypes and dated understandings of Irish culture. Therefore, the Diaspora must better understand its role in settler colonial violence, authentically to Irish culture and commit to post-colonial projects rather than using their identity to resist or refuse them.

Maggie Hsu

Faculty of Arts

Supervised by Julia Chan

Generating Digital Intimacy: Understanding how Streamers Leverage the Affordances Provided by Twitch to Create Intimacy with Audiences

This study explores the dynamics of digital intimacy and power relations between streamers and viewers on Twitch, focusing on popular streamer Imane Anys, known on the platform as Pokimane. By employing a combination of qualitative and quantitative research methods—content analysis, textual analysis, and ethnography—the study examines how Pokimane leverages the platform's affordances to build and engage her audience. The research focuses on three key elements of her streams: camera setup, chatbox interactions, and microphone usage. Data was collected from two of Pokimane's streams spanning a three-year period, providing insights into how her content and interactions with viewers have evolved over time. Key findings suggest that streamers hold significant power in shaping the content and interactions within their communities. They direct the viewer's experience by choosing what to address and how to structure engagement, while viewers attempt to gain recognition through various forms of interaction, including donations and chat messages. This interaction is framed by the concept of "digital intimacy" (Ruberg and Brewer) where gender and power dynamics play a crucial role. Additionally, the study proposes that analyzing comments about appearance and the male gaze on Twitch would further enrich the understanding of gendered interactions on the platform. Ultimately, this research highlights how streamers like Pokimane manage and moderate their communities, offering a foundation for future studies on the social and cultural dynamics of livestreaming platforms.

Sofia Huarte Aguilar

Faculty of Arts

Supervised by Ann Levey

Epistemic Injustice and Hermeneutical Power: To Name the World and Make It So

Miranda Fricker's 2007 book *Epistemic Injustice: Power and the Ethics of Knowing* introduced the concepts of testimonial and hermeneutical injustice, two kinds of wrongs that burden knowers in their capacity to understand and communicate pertinent parts of their social lives and experiences on the basis of their socio-political identities and the marginalization that accompanies them. Since, many philosophers have endeavored to expand Fricker's ideas by pointing to the crucial relationship between her epistemic injustice and social structures and operations of power; this project is one such endeavor. Building on Amy Allen's analysis of Foucauldian constitutive and agential power, as well as George Monbiot's understanding of narrative politics, I bring forth an account of hermeneutical power, and explain the relationship between it and material power. My account of hermeneutical injustice also borrows from the critiques and expansions brought by Jose Medina and Sally Haslanger, whose work I utilize as a starting point to address the distortion of reality and objectivity that comes about as a result of hermeneutical injustice.

Participating in a summer research project made me realize how research can generate ideas for real solutions that improve mental health, especially for equity-deserving groups.

Saria James-Thomas

Faculty of Arts

Supervised by Brae Anne McArthur

Feasibility and Acceptability of a Classroom-based Mental Health Literacy Program: An Australian Pilot Study

Due to the COVID-19 pandemic, Australian adolescents have expressed significant worries about managing their stress and well-being. The education system has been noted as an ideal environment in which to deliver mental health literacy to students to address these growing mental health challenges. In an Australian school district, the aim of the current study was to evaluate the acceptability, feasibility, and perceived impact of running the Open Parachute program, which is designed to foster mental health literacy through classroom instruction. Teachers and leadership staff were recruited from schools that delivered the Open Parachute program during the 2022-2023 school year in South Australia. After delivery of the Open Parachute intervention, participants were invited to complete a post-intervention survey that asked them to report on their demographics, the feasibility and acceptability of the program, as well as the perceived benefit to teachers and students. Results show high program feasibility and acceptability, with 89% of educators intending to use the program again and 92% reporting they would recommend it to a colleague. Educators reported improved mental health literacy (50%) and student support skills (50%). This study provides preliminary evidence for the feasibility and acceptability of implementing the Open Parachute program.
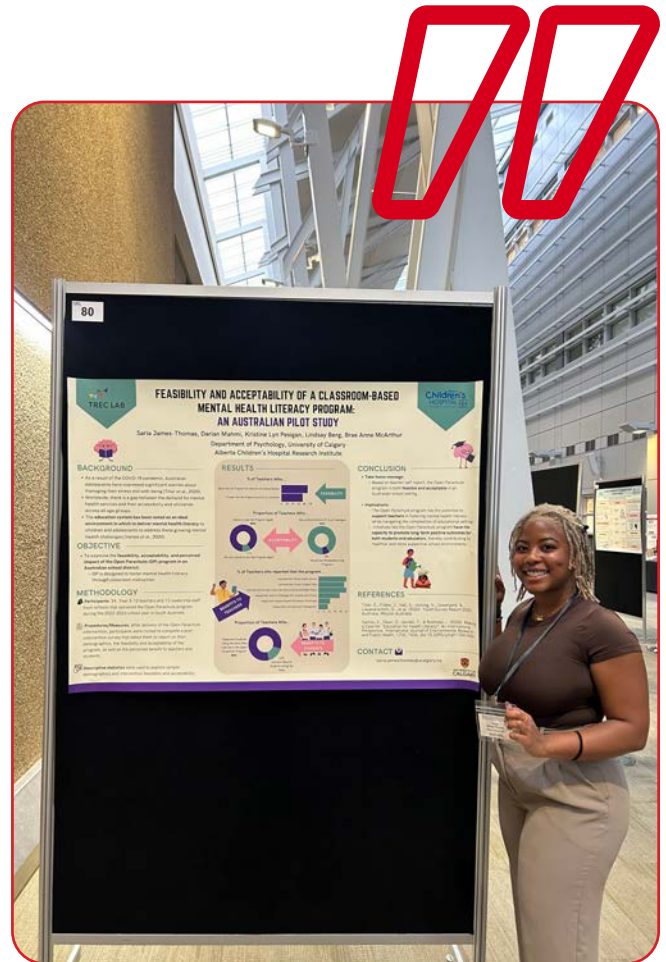
James Janzen

Faculty of Arts

Supervised by Susanne Cote

Studying and Digitizing Archives Relating to Paleontological Expeditions in Kenya

Dr. Basil Cooke was an acclaimed South African geologist and paleontologist. Among his many accomplishments, he led part of the University of California's African Expedition in 1947–1948. Following his retirement to British Columbia, he donated his personal archives to the Museum of Archaeology and Ethnology at Simon Fraser University. The existence of this collection was unknown to modern day paleontologists working in Africa, but it holds important information about the Berkeley African Expedition's paleontological work in Kenya and Egypt. The goal of this project was to properly document Cooke's archives. A secondary goal was to determine the precise locations of his fossil sites in Egypt and Kenya. By transcribing Dr. Cooke's field notes and other writings, conducting in-depth literature reviews concerning other expedition members, and consulting experts in Kenyan paleontology, this project confirmed where Dr. Cooke was digging in northern Kenya in 1948 and provided more specific locality information for a number of key fossils. The Egypt excavation locations unfortunately remain unspecified to the degree of some miles west of Qasr el-Sagha, but we know now that knowledge is not contained within Cooke's surviving records. This project culminated in the creation of a Finding Aid for the collection, which will help future researchers and curators to easily navigate the collection.

Chris Jost

Faculty of Arts

Supervised by Ajwang' Warria

Racialized Adolescents, Mental Health Promotion, and the Role of Spiritual Youth Leaders

Mental health is a necessary component of overall health and a universal human right (WHO, 2022). Racialized adolescents' mental health is of particular concern due to them potentially being exposed to systematic inequalities and discrimination (Abdi et al., 2023; Chaze, et al., 2015). At the same time, spirituality and religion have shown positive and negative influences on mental health and play a central role in spiritual and religious interventions (Aggarwal et al., 2023; Hodge, 2006). Despite the need to inform these interventions, there is a gap in the literature on the spiritual and religious intervention outcomes on Canadian racialized adolescent mental health (Aggarwal et al., 2023; Salami et al., 2022). The study was an attempt to address this gap by exploring the role of youth group leaders in promoting youth mental health within a Christian church. The study used a qualitative approach and case study design. Non-probability sampling methods and semi-structured interviews were applied in data collection with six youth leaders. We identified and described preliminary themes using thematic analysis: 1) Identifying challenges youth face, 2) Youth leaders' supportive role and responding to challenges youth face, 3) Challenges in supporting youth and recommendations, and 4) Youth growth and its motivational role in youth leaders. The preliminary findings illustrate in-depth how church youth leaders support racialized adolescents and offer recommendations to improve support for youth.
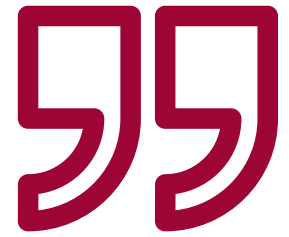
Sam Judson

Faculty of Arts

Supervised by Lindsay Amundsen-Meyer

Weaving Knowledge Together: Bringing Alberta Archaeology to the Public

Alberta is a province rich in many things. The province's natural resources, Rocky Mountains, expansive prairies and beautiful cities likely come to mind first, but most Albertans would not think to add 'archaeological sites' to this list. Very few Albertans are aware of the depth of Alberta's Indigenous past and how this is preserved in the archaeological record. Through fieldwork and literary research, the goal of this project was to learn more about what the public knows about archaeological sites in Calgary and the surrounding area, how they learnt this information, and how information about archaeology can be efficiently disseminated to the public in engaging ways. In the field, it quickly became clear many community members felt they knew about modern Indigenous culture, but were not as familiar with Precontact Indigenous culture, the depth of Indigenous history in Southern Alberta, or archaeology's role in sharing this past. Public engagement is important because Alberta has an incredibly deep and rich Indigenous history that very few Albertans are aware of, but which is preserved through archaeological sites. By celebrating this past, and helping educate the broader public about this heritage, the goals of truth and reconciliation can also be pursued as we increase intercultural competency by spreading knowledge about Calgary and Southern Alberta's incredibly vibrant Indigenous cultures, of today, and the past.

In their own words

Archaeology is a dynamic and growing field in Alberta, with many opportunities for researching, working, and learning about the place we all call home. For my PURE Award, I explored public engagement with two archaeological sites: Nose Hill and the John Ware homestead. At Nose Hill, our site had a total of 14 stone rings, also known as tipi rings, which held down tipi covers and now represent where a tipi or lodge once stood. My goal was to see if Calgarians knew about Nose Hill's archaeological history, and if they did, where they had learnt this information from. I found many Calgarians knew about modern Indigenous culture, mostly through Truth and Reconciliation, but did not know that Calgary has been inhabited by Indigenous people for as long as 10,000 years. It's estimated there could be hundreds of stone rings on Nose Hill, and more than 1,400 archaeological sites have been recorded in Calgary's parks. At the John Ware homestead, we collaborated with the University of Alberta's Institute of Prairie and Indigenous Archaeology. Ware is largely regarded as the first Black cowboy in Alberta. He was born into slavery in the southern states. After the United States' Civil War, Ware made his way to Alberta in the 1880s. For some, he is a revered figure, almost mythical, but many others have not heard of him. Currently, little is known about his day-to-day life, and understanding this would be a key piece to understanding Alberta's multicultural past. These stories need to be elevated, and they can challenge assumptions about diversity in the history of our province. After field research, I turned to the literature to learn how public and community engagement with archaeology looks around the world. In colonial nations, it can be challenging to conduct community-oriented archaeology due to the existence of imposed legislation and questions of property, but efforts are being made to change this. For example, the Navajo Nation has a fantastic model of running their own programs as Indigenous-led projects.

For me, talking to people and witnessing their awe and excitement at the significance of where they live demonstrates how powerful and impactful archaeology can be, especially when it prioritizes local and descendent communities.

Carol Kehoe

Faculty of Arts

Supervised by George Colpitts

Unwelcome Neighbours – The First Decade of the British American Oil Company Refinery in Calgary Alberta

Late Saturday night on 21 April 1945, an explosion at the British American Oil Company (B/A) refinery shook Calgary. The first explosion was followed by seven more over 27 hours. Flames and smoke rose 60 feet (18 m) into the air. The exploding tank was one of seven 80,000-barrel oil tanks along the west fence of the refinery. On the other side of the fence, people left their homes fearing for their safety. Within four years homes and municipal infrastructure nearest the tanks were removed, leaving behind a sterile industrial residential interface 300 foot wide. This research examines how B/A refinery came to be built next to homes despite strong local opposition, and how the refinery had a lasting impact on the community environmental grid. The historiography reviewed analysis of industrial development in sections of Montreal and Hamilton. Primary source materials were sourced from University of Calgary, Provincial and City of Calgary Archives. Materials were cross referenced to Calgary Herald and Calgary Albertan newspaper articles. Historical air photos provided spatial reference, and a site reconnaissance established current site conditions. Secondary sources included Area Redevelopment Plans published by The City of Calgary and site remediation reports held by the Province of Alberta. The environmental grid became both the foundation that supported building the refinery and the foundation that supported community resistance to the refinery. Conflicts between B/A and the community were resolved by replacing streets, laneways and residential property with a sterile industrial residential interface.

My summer research project has shown me that ideas are always evolving and deserve thoughtful consideration.

Tapisa Kilabuk

Faculty of Arts

Supervised by Adam Murry

Universal Land Teachings And Inuit Representation: A Call For Equity In Post-Secondary Indigenous Education

This paper advocates for amplifying Inuit perspectives within Indigenous academic frameworks, addressing disparities in the representation of Inuit culture in post-secondary institutions. It strongly emphasizes the importance of community engagement and the essential role of partnerships with Indigenous communities, including the Inuit, in research and education. The document discusses the impact of Settler colonialism on Indigenous resurgence theories and proposes embracing the universality of land teachings to integrate diverse Indigenous perspectives in academia. By challenging geographic biases, promoting inclusivity, and revolutionizing teaching methods, academic institutions can work towards correcting the marginalization of Indigenous perspectives and fostering a more comprehensive and respectful educational environment.

Sheroog Kubur

Faculty of Arts

Supervised by Pablo Policzer

TikTok on the Clock: How Political Candidates Use Influencer Logics

In modern democracies, we are seeing polarized political figures gain political clout, not for their ideologies but for the mystique they can build around themselves. While existing literature has investigated the ways political candidates use social media to develop their brands and connect with their supporters, little has been done to consider how Tik Tok is used, more specifically how political candidates market themselves on Tik Tok accounts. This project uses a mixed-method approach, borrowing from the most-different systems design in political science and a visual rhetorical analysis in communications to understand how three successful global right-wing leaders — Javier Milei in Argentina, Jair Bolsonaro in Brazil, and Giorgia Meloni in Italy — use Tik Tok accounts during the campaign period to understand the importance of social media presence for political candidates. The research found that candidates do not use these accounts as an extension of their campaign, but instead as an opportunity to more closely connect with their supporters on a human level, following the logic of social media influencers rather than politicians. This research suggests that the permanent campaign has shifted to be more cognizant of the prosumers of social media, adhering to the logic of the applications rather than existing political logics.

Bryan Lentz

Faculty of Arts

Supervised by Claire Midgley

Closeness and Sibling Relationships

Siblings play an integral role in development and how one relates to the world throughout the lifespan. They also often serve as a target to whom we compare ourselves, a process complicated by the qualities of the sibling relationship. This study examined how three factors of participants' relationships to their sibling (differentiation, warmth, and rivalry) related to their self-evaluation and motivation ratings after making an upward comparison to that sibling. Participants (N = 326, M_age = 29.30, SD = 9.16; 56% women, 39% men, 5% other gender identification) were randomly assigned to either describe their own experience of an upward comparison or to imagine themselves in one of four random comparison scenarios we provided. Using multiple regression and controlling for other relationship and comparison variables (strength and domain importance), we found that, in the imagined scenario condition, differentiation and warmth were positively correlated with self-evaluation ratings, and warmth was positively correlated with motivation ratings. Additionally, rivalry was negatively correlated with self-evaluation ratings. No relationship variables were significantly correlated with outcomes in the described scenario condition. These results shed light on the complicated and understudied nature of sibling comparisons.

Darryl Lim

Faculty of Arts

Supervised by Allen Habib

The Bullet That Missed America

In 2023, I produced a paper discussing a perceived halting in social progress. In this paper, I used concepts from the work of Amy Allen to set up a definition for social progress, and the notions of cultural techne, ideology, and consciousness raising developed in the work of Sally Haslanger in order to explain the necessary conditions for this progress. I then postulated that Jean Baudrillard's simulation theory may provide an explanatory account of the stagnation of progress by detailing methods by which meaning comes to be destroyed. On the coattails of my original essay, the purpose of this new project is to examine Baudrillard in greater detail and provide a more comprehensive account of simulation theory, applicable to the present day. This was done by studying the work of Baudrillard in further detail, and implementing his theory in a more contemporary context by applying concepts developed in his book Simulacra and Simulation to the coverage and aftermath of the attempted assassination of former US president Donald Trump. After this, an analysis of Baudrillard's proposed solution to the destruction of meaning is offered before an attempt is made to propose potential alternatives.

Alec McLeod

Faculty of Arts & Faculty of Science

Supervised by Gillman Payette

The Cycle of Logical Geometry: A Critical Analysis on the Study of Logical Diagrams

Logical diagrams, such as the famous square of opposition, have been used in logic since the time of Aristotle. Logical geometry is a current research programme focused on the study of such diagrams for over a decade. The aim of my research was to conduct a review of both the successes and potential shortcomings of the programme. In my review, I found that logical geometry has generated multiple techniques that have expanded their usefulness beyond logical diagrams, such as the bitstring method. Yet on the other hand, there are problems that I illustrate using examples from the literature. I propose that these issues stem not only from the methods used to analyze logical diagrams, but from the methods used to create the diagrams being studied. I present arguments for the case that despite the programme's insistence to the contrary, the diagrams lack effective use as a standalone tool to study logic. Overall, this research attempts to provide insight as to how well logical geometry achieves their goals, and what limitations exist that prevent them from fully achieving others.

One thing I was surprised about during my summer research project was how working by the lake brought me peace and calm and inspired a more profound focus and connection to my work.

Maria Medina

Faculty of Arts

Supervised by Lisa Roxanne Stowe

Qualitative Approach to Canadian News Coverage on the Israeli-Palestinian conflict of 2023-24

This study explores the impact of Canadian broadcasting on shaping public opinion, with a focus on developing international issues. News coverage of the Israel-Palestine conflict surged in 2023, accentuating the differences in perspectives. The decades-long conflict between Israelis and Palestinians is a consequence of historical, political, and overarching differences between the two, which have gained global attention due to the worsening hostilities that emerged in 2023.The question guiding this study is: How has news broadcasting in Canada affected audiences' opinions on the 2023-2024 Israeli-Palestinian conflict? The methodology employed was purposive sampling to find participants who actively engage with Canadian news coverage, which provided a representative sample per predefined criteria. Semi-structured interviews were conducted to gather qualitative data from the participants to examine their perspectives on the world and any biases they may or may not have identified in news reports on the subject. The study evaluated the impact of news broadcasts on individual opinions, observed trends, and looked for any potential shifts in opinions. As part of the data analysis phase, the interview data provided by the eight individual participants was observed to identify trends and insights that applied to the research objectives. The findings provided insights into the complex interplay between public opinion, opinions regarding conflict, and the impact of media coverage on individuals during the 2023-2024 Israeli-Palestinian crisis.

In their own words

Since I was a child, I've been interested by the news and eager to understand global events. Growing up as a second-generation immigrant, I've been aware of the diverse perspectives and experiences that shape our world; that no matter who you are, what you do, or where you come from, these events impact everyone. Before receiving my PURE Award, I was enrolled in a research methods course where our final assignment was to write a research proposal. Through discussions with my professor, I met my PURE Award supervisor, and discovered how to connect my interests in international conflicts, international relations, and communications. Due to the timeliness of my research topic, I had to search for sources extensively and conduct several interviews. Throughout, I've strived to use unbiased language, mindful of how harmful specific words can be to people from politically troubled regions.

This project has been both emotional and enlightening. I am deeply sympathetic to everyone affected by these current events; it is heartbreaking to witness, especially as my home country, Venezuela, has also experienced seemingly irreversible challenges.

Through interviews, I have come to fully realize the immense value of learning from others, and the power of interviews as a research method. These personal interactions have shown me that knowledge can come from anyone, regardless of their background or expertise, and that empathy and open-mindedness are important in academic pursuits. When a research topic truly interests you, it helps you see the world differently and opens your mind to new ideas you might never have considered.
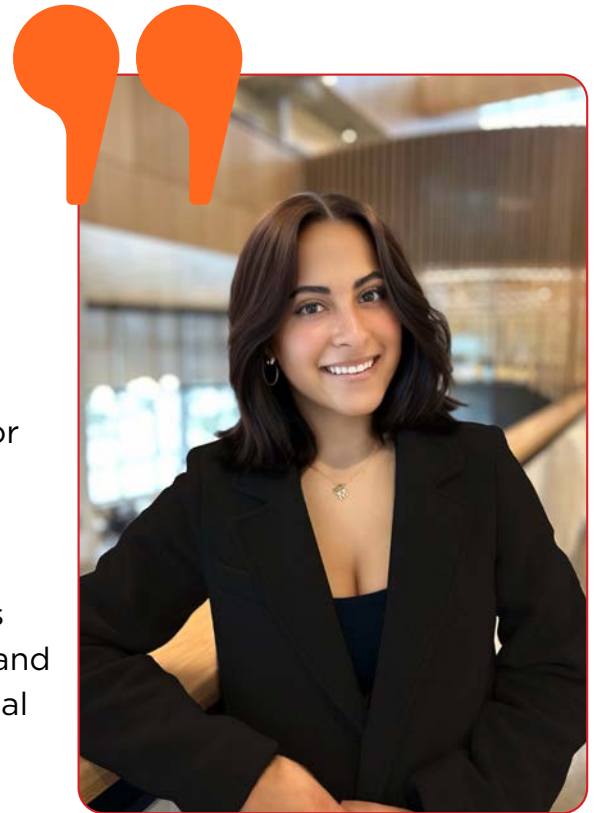
Matthew Mettam

Faculty of Arts

Supervised by Petra Dolata

Investigating Canadian-German Intercultural Encounters in Lahr, Germany, 1967-1994

Between 1967 and 1994, thousands of Canadian soldiers lived and worked on a Canadian military base in Lahr, West Germany as a deterrent against a potential Soviet invasion. Because of this long-term presence, the Canadian Forces Base Lahr is a site of both Canadian military history and Canadian-German intercultural interactions. This work aims to determine the extent of intercultural communication between Canadians

and Germans and to categorize both direct and indirect forms of communication. Using newspaper clippings of the Canadian newspaper for servicemen in Germany (Der Kanadier), VHS tapes, images, and secondary literature, it will show when and how interactions between Germans and Canadians occurred. Even though the Canadians did not speak much German, they still came into contact with local Germans and impacted the city of Lahr through military operations, living arrangements, constructing schools, playing sports, and driving. The complex nature of Francophone issues in the 1970s following the FLQ Crisis also played a critical role in the formulation of language and identity for the Francophone Canadians who served in Germany. In discussing intercultural exchanges, this work hopes to shed light on an often-neglected portion of Canadian military history, foster mutual understanding between Canadians and Germans based on a shared history, and provide a historical context for the modern German-Canadian relationship.
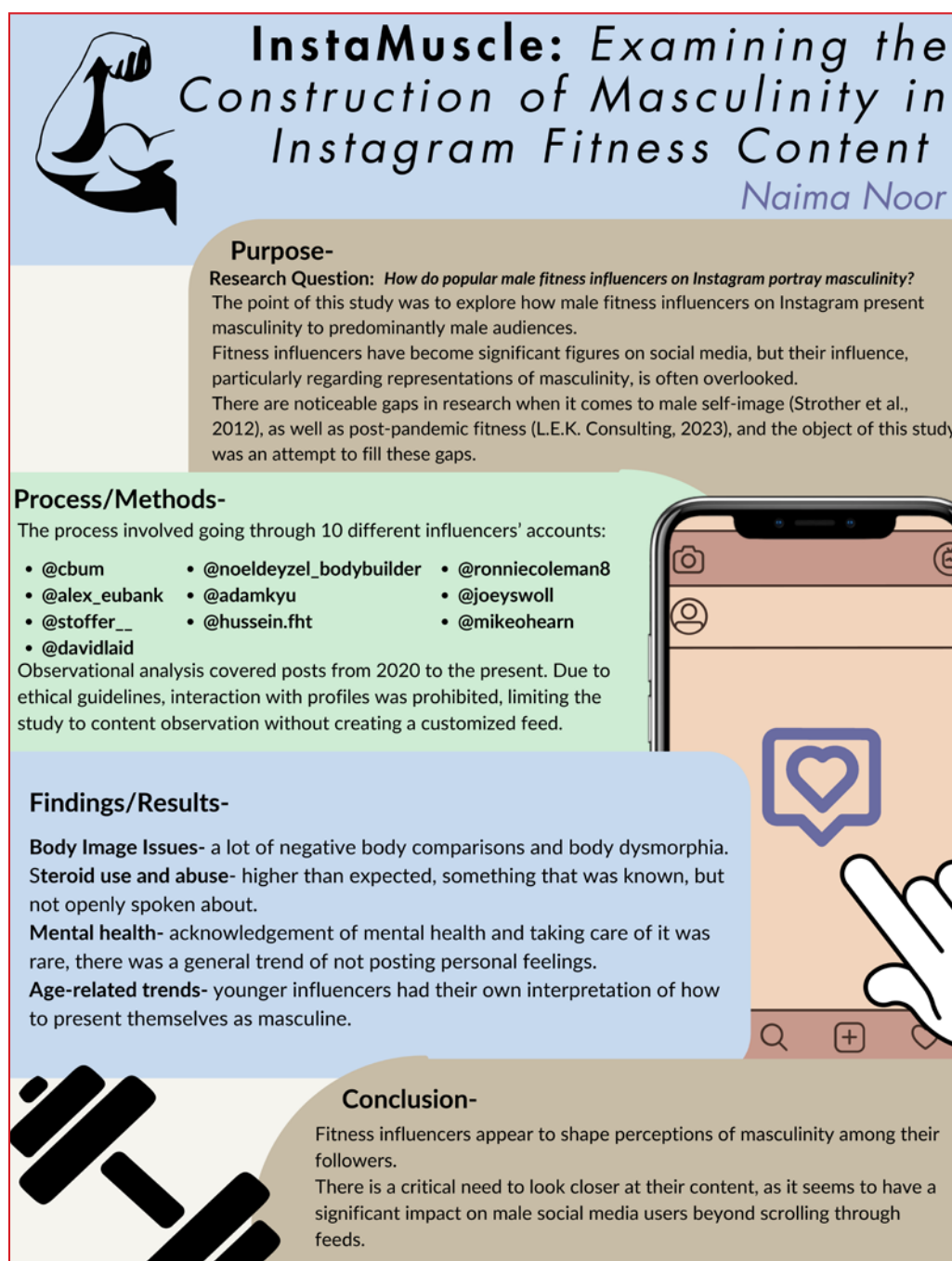
[Accompanying multimedia document (Storymaps)](#)

Naima Noor

Faculty of Arts

Supervised by Nazario Robles Bastida

InstaMuscle: *Examining the Construction of Masculinity in Instagram Fitness Content*

Naima Noor

Purpose-

Research Question: *How do popular male fitness influencers on Instagram portray masculinity?*

The point of this study was to explore how male fitness influencers on Instagram present masculinity to predominantly male audiences.

Fitness influencers have become significant figures on social media, but their influence, particularly regarding representations of masculinity, is often overlooked.

There are noticeable gaps in research when it comes to male self-image (Strother et al., 2012), as well as post-pandemic fitness (L.E.K. Consulting, 2023), and the object of this study was an attempt to fill these gaps.

Process/Methods-

The process involved going through 10 different influencers' accounts:

- @cbum
- @alex_eubank
- @stoffer__
- @davidlaid
- @noeldeyzel_bodybuilder
- @adamkyu
- @hussein.fht
- @ronniecoleman8
- @joeyswoll
- @mikeohearn

Observational analysis covered posts from 2020 to the present. Due to ethical guidelines, interaction with profiles was prohibited, limiting the study to content observation without creating a customized feed.

Findings/Results-

Body Image Issues- a lot of negative body comparisons and body dysmorphia.

Steroid use and abuse- higher than expected, something that was known, but not openly spoken about.

Mental health- acknowledgement of mental health and taking care of it was rare, there was a general trend of not posting personal feelings.

Age-related trends- younger influencers had their own interpretation of how to present themselves as masculine.

Conclusion-

Fitness influencers appear to shape perceptions of masculinity among their followers.

There is a critical need to look closer at their content, as it seems to have a significant impact on male social media users beyond scrolling through feeds.

Renee Pi

Faculty of Arts

Supervised by Jinhee Huh

Contracts and Campaign Effectiveness in Influencer Marketing

With influencer marketing investments reaching $21.1 billion in 2023, understanding how contract terms shape campaign outcomes is crucial. This study examines the relationship between contractual elements—payment amount, content guideline restrictions, contract duration, and exclusivity—and influencer marketing effectiveness. We explore how these factors impact campaign success directly and indirectly through influencers' engagement with their contracts. Our approach is an experiential survey and two 2 x 2 experimental surveys. The experiential survey collects data on influencers' past experiences, satisfaction with contract terms, and overall campaign effectiveness. To mitigate the limitations of self-reported data, we conduct experiments to assess the causal relationships between contractual elements and influencers' perceived satisfaction, likelihood of accepting contracts, and perceptions of engagement and fairness, which affect their campaign performance. The experiments focus on payment level and content guidelines in one survey, and contract duration and exclusivity in the other. This study aims to develop a framework offering insights and recommendations for optimizing influencer marketing strategies and enhancing brand-influencer relationships, contributing to the understanding of digital marketing dynamics.

Daman Preet Singh

Faculty of Arts

Supervised by Maria Victoria Guglietti

How We Frame Stories? Analyzing the News Media Coverage of Hardeep Singh Nijjar's Death

Entman (1993) defines framing as "select some aspects of a perceived reality and make them more salient in a communicating text" (p. 52). Framing is essential to the practice of journalists as it allows them to construct social reality. The identity of an immigrant diaspora is influenced by how the media frames them as framing has demonstrated effects (Nayar, 2008; Lecheler et. al, 2015; O'Donnell et. al, 2018) on public opinion. North American framing studies have mostly focused on either Islamic communities (Powell, 2011) or a broad South Asian diaspora (Indra, 1979) leaving the South Asian Sikh community out of the focus. This study looks at the news media representation of the Sikh community after the death of surrey-based sikh activist Hardeep Singh Nijjar in the summer of 2023, through a framing analysis of the media coverage of the case by five major Canadian news publications: The Globe and Mail, National Post, Toronto Star, Vancouver Sun, Calgary Herald. Informed by the themes and common frames I found during the analysis, the findings of the project are presented through a poster that constructs an image of a Sikh person using the terminology found in Canadian mainstream media to describe and frame the community. While the study looks to understand media framing during the media coverage of Nijjar's assassination by breaking them down, the poster works to reconstruct the image of a Sikh person.

Misha Storkova

Faculty of Arts

Supervised by Heather Leier

MISHA STORKOVA, SUPERVISED BY HEATHER LEIER   DEPARTMENTOF ART AND ART HISTORY, UNIVERSITY OF CALGARY

ZAPOMENUTÝ HLAS
[A FORGOTTEN VOICE]

A VISUAL ARTS EXHIBITION EXPLORING THE OPENLY QUEER HISTORY OF THE FIRST CZECHOSLOVAK REPUBLIC (1938-1940). THIS RESEARCH ACTS AS A RECLAMATION OF A SUPPRESSED HISTORY, AND AN EMBRACING OF INTERGENERATIONAL QUEER FOUND FAMILY, THROUGH THE INSTALLED MEDIUMS OF CYANOTYPE, TEXTILE, AND MULTIMEDIA ARTIST BOOKS. QUEERNESS IS INHERENT THROUGHOUT TIME AND SPACE!

SHOWING @ THE LITTLE GALLERY   →   SEPT 9,-20, 2024

In their own words

Research looks different in visual arts. We pitch our topic conceptually, and we generate visual works about that topic in different mediums. Instead of the final product being a journal publication, it's a solo gallery show – mine is planned for September 9th-20th at the Little Gallery. My PURE Award topic is the interwar period (1918-1939) in the First Czechoslovak Republic, and my mediums are those which have typically been labelled as 'folk arts,' such as textiles and printmaking. This period saw a boom in open queer culture, complete with artistic, literary, and activist movements. However, it was followed by the Nazi occupation and the Communist Regime. Most materials were burned, lost, or banned, and are still supressed today. To collect sources, I connected with grassroots organizations made of a few individuals committed to archiving this history. These connections to queer communities in the Czech Republic have been very important for me.

Much of my life, I've been told that queer-ness and Czech-ness cannot exist at the same time; that queerness is something Western infringing on Slavic culture. My research has helped me reconcile these two identities and to navigate dichotomies in my own thinking.

At times, it's difficult to think of what I am doing as "art." Textile mediums are historically sidelined as "craft" because they are associated with women and domestic spaces. As I commemorate different figures and pieces that were openly queer in this period, I am integrating my art practice — textile teachings from women in my family — into something that celebrates queer communities, past and present.

Adriana Quintero Narvaez

Faculty of Arts

Supervised by Jackson Cone

Developing a reliability-based cue weighting task for mice

Attention functions as a mental ability employed to selectively focus on a stimulus while there is an influx of competing sensory information in different modalities. Despite attention playing a crucial role in cognition, it is yet to be fully uncovered which neural networks underlie this process. Therefore, the research project involved developing a sensory-based task to relate attention to neural circuitry. Gaps in knowledge of attentional mechanisms are due to the use of less advanced technological methods, traditionally used in higher-order organisms like primates. Thus, this experiment utilizes mice as subjects, as modern neuroscience research strategies with rodents can overcome previous difficulties and provide precise insights into neural activity. The sensory-based task apparatus development involved the construction of the OHRBETS, where mice are head-fixed and trained to interact with a wheel, moving it in both directions, to receive a reward. If mice rotate the wheel with a set criterion of turns in the active direction, they receive a liquid reward, while the inactive direction provides them a time-out. This apparatus offers a richer repertoire of responses, allowing increased complexity and measures that can be obtained. The experiment included observations on whether mice successfully interacted with the apparatus, indicating learning as they progressed. Preliminary data indicates that mice interact with the wheel and learn complete discrimination between the active and inactive direction in 3 days and demonstrated cognitive flexibility after the directions were switched. Further experiments have the potential to shape our knowledge of neural pathways associated with attentional processes.

Participating in Indigenous communications research over the summer taught me about the adaptability and multiplicity of my culture's reclamation efforts and traditional creative practices.

Taylor Van Eyk

Faculty of Arts

Supervised by Arti Modgill

Challenging Settler Anxieties/ Reclaiming Our Terror

Horror films have not always been thought of, and are rarely immediately thought of, as artifacts of First Nations, Metis, and Inuit culture. This discourse and content analysis: Challenging Settler Anxieties/Reclaiming our Terror; Understanding how First Nations, Metis, and Inuit Storytelling redefine Horror Films in settler-colonial Canada by Anishinaabe communications student Taylor Van Eyk, aims to understand how Nation-specific ways of storytelling influence, define, and shape the visual and textual narrative creations

of contemporary First Nations/Metis/Inuit horror films as they reclaim discourses by challenging notions of Indigeneity created by historical settler-colonial horror. This study is comprised of a critical review of three contemporary Indigenous horror films where key data points are noted and then graphically categorized by the ways visual culture, oral culture, and film elements appeal to nation-specific storytelling methods or align the film within settler-colonial notions of horror. This study finds that nation-specific storytelling methods are informed by traditional or past creative and ideologic knowledge of a nation. The showcasing of this knowledge in a contemporary film has the potential to communicate to audiences in the future which challenges colonial notions of linear time. Indigenous horror films are dynamic creative sites and tools for reclamation which also carry teachings and transport knowledge beyond the perceived binaries of time and cognitive colonization.
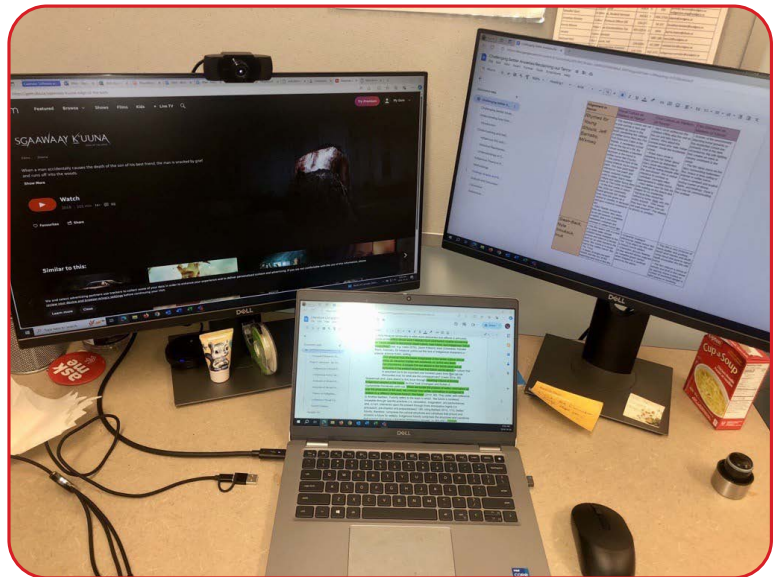
My research allowed me to explore the untold stories of my community, and in doing so, I uncovered a deeper understanding of my own identity.

Billy "Me" Wijaya

Faculty of Arts

Supervised by Mung Ting Chung

Echoes from Galang to Calgary: Tracing the Vietnamese Refugee Journey

This research involves studying into the intricate experiences of Vietnamese refugees and their descendants, focusing on those who have resettled in Calgary and exploring the challenges of cultural preservation, identity formation, and integration within a Canadian context. Through a qualitative approach involving in-depth interviews with refugees, their descendants, and loved ones, the study aims to unveil how these individuals maintain cultural ties while navigating the pressures of assimilation. The thematic analysis, enriched by historical context and supported by relevant literature, highlights the complex dynamics between maintaining tradition and swift adaptation required in a new country. Preliminary findings reveal the pivotal role of the local Vietnamese community in supporting or complicating efforts to preserve cultural heritage, underscoring the importance of community support. Families strive to honour their Vietnamese roots through language, cuisine, and traditional celebrations, despite the enduring impact of trauma and the challenges of integration. This research will showcase the remarkable resilience of the Vietnamese refugee community and contribute to the overall discourse on refugee integration and the preservation of cultural heritage in a multicultural society.
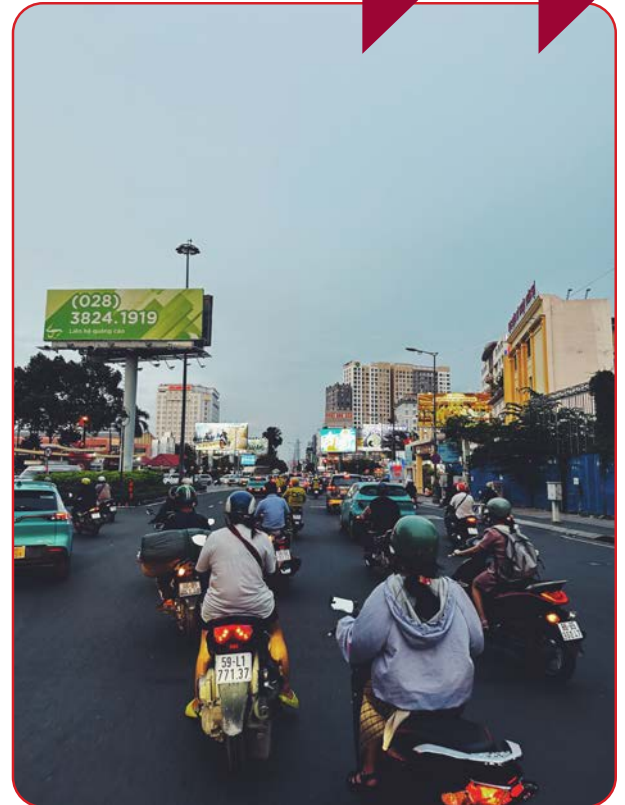
In their own words

I found who I am by looking into myself and my roots. My PURE Award story cannot be told without also sharing my mom's story. My mom is Saigonese and in 1989, she took the biggest risk of her life and fled Vietnam. She gave birth to me and my two brothers in Canada. Growing up, I knew only parts of her story. Travelling to Vietnam with a research question allowed me to retrace her journey and to connect her experience with the political and social conditions of the time. I saw so many places, from my grandpa's home where she grew up, to the beach where she escaped by boat. I learned that my mom and aunties tried to escape twice, but only my mom was successful. Because my mom was so young, the officials let her go the first time, but my aunties were imprisoned. After surviving a dangerous boat ride, my mom had to live in unspeakable conditions in an Indonesian refugee camp. My

mom explained that these risks were known to everyone; it was life-or-death, but when you're young, you don't feel like you have anything to lose. For her sisters, however, they had elders to care for and ultimately decided that staying behind was best for them. I visited the refugee camp and interviewed survivors. Even though it was one of the "better" Vietnamese refugee camps, for me, it would have been hell. This makes me appreciate my mom and aunties so much more.

I am so proud of the love and resilience that are part of my roots. Coming home from this experience, I know the same could be said for others, too.

I saw a pattern in how so many families who made it to Calgary had persevered through challenges. For instance, when my mom first arrived, she worked two jobs for $6 an hour and lived in a cramped duplex with eight other people. Other Vietnamese refugees endured similar, yet unique, hardships, but the one thing they all had in common was their perseverance, love, and resilience.
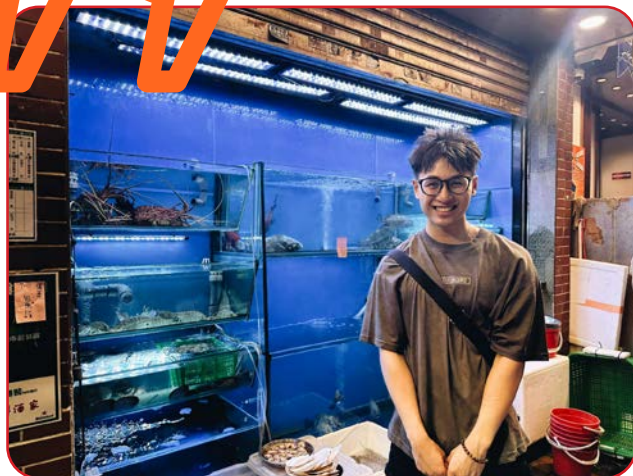
Cygnus Wiebe

Faculty of Arts

Supervised by Glenn R. Wilkinson

Realities of American Heroes on the Screen

My historical research over the summer, which is written about in my paper titled "Film to Reality: WWII American Cinema's Depictions of U.S. Soldiers," examines the historical role of the Office of War Information (O.W.I.), an American governmental agency in charge of the distribution of wartime information during the Second World War, particularly the O.W.I.'s relation, controlling, and overseeing of American cinema and in general Hollywood. In my paper, I focus on how the O.W.I. utilized films to propagate the idealization of American soldiers, fostering support for the war effort while obscuring the harsher realities of the conflict, especially concerning the negative aspects of American involvement in the war. Through my study, I delve into the O.W.I.'s strategic engagement with Hollywood to craft a narrative that rallied civilian support and served as a counter-narrative to enemy propaganda. In writing and researching my paper, I uncovered several key areas where the O.W.I. subtly integrated war messages into popular films, the portrayal of American heroism, and the simultaneous omission of the war's brutalities, such as civilian casualties, the mistreatment of women, and atrocities committed to prisoners of war. In analyzing films overseen by the O.W.I. and comparing them to actual events, my paper reveals the significant knowledge gap portrayed by an agency that promised facts to its American civilians. These areas highlight the O.W.I.'s critical role in shaping public perception through a carefully curated image of American valour and virtue. Furthermore, the paper discusses the long-term effects of these portrayals on American society's collective memory of the war, suggesting that O.W.I.'s cinematic strategy not only influenced contemporary views but also left a lasting imprint on American national identity. Through this exploration, my paper contributes to growing understanding of the complex interplay between government propaganda, cinema, and historical memory.

FACULTY OF KINESIOLOGY

Aarzo Karimi

Faculty of Kinesiology

Supervised by Saied Jalal Aboodarda

Effects of Ovarian Hormonal Changes on Determinants of Exercise Performance

Exercise performance has demonstrated contradictory profiles across the menstrual cycle, which has prompted concern for the inclusion of women in exercise science research. This study investigates the effects of endogenous and exogenous ovarian hormonal changes on exercise performance and associated psychophysiological responses. After a ramp-incremental test, combined monophasic oral contraceptive pill users (OCP), hormonal intrauterine device users (IUD), and eumenorrheic women (EUM) (n=17 in each group; 23±3.9 yrs) completed two cycling protocols in the heavy intensity domain to task failure. For OCP and EUM, sessions were performed in the active-and inactive-pill phases, and early follicular and mid-luteal phases, respectively. For IUD, sessions were separated by ~14 days. Neuromuscular evaluations, including isometric knee extension maximal voluntary contraction superimposed with electrical stimulation of the femoral nerve and transcranial magnetic stimulation of the motor cortex, were performed at baseline, every 5 min during cycling, and at task failure. Effort, pain, fatigue, dyspnea, and cardiorespiratory responses (e.g., ventilation) were recorded during cycling. There was no difference between the phases/sessions for OCP, IUD, and EUM for neuromuscular measures; however, task duration was longer and lactate production was greater in the early follicular phase for EUM ($p<0.001$ and $p=0.033$, respectively). Dyspnea and perceived fatigue were greater in the active-pill phase for OCP ($p<0.043$) and greater in session 1 for IUD ($p<0.032$). These measures showed no difference for EUM. These findings suggest that endurance performance may be affected by the menstrual cycle phases for EUM. Also, perceptual responses may exhibit modulations for OCP and IUD.

Ferzam Mahmood

Faculty of Kinesiology

Supervised by Mark Ungrin

Recombinant Expression of Erythrocruorin in Yeast and E.coli

The global blood shortage threatens the healthcare system due to limited blood donations and logistical challenges associated in providing timely transfusions. This research investigates whether Lumbricus terrestris erythrocruorin (LtEc), a naturally extracellular hemoglobin found in common earthworms can be recombinantly expressed in a yeast (Pichia pastoris) and E. coli chassis. Previous studies have shown that mammalian hemoglobin-based oxygen carriers (HBOCs) face challenges such as oxidative stress, nitric oxide scavenging and releasing heme and reactive oxygen species (ROS) into the bloodstream. LtEc does not face these burdens, however, has never been recombinantly expressed in a chassis. Current methods of acquiring the protein involve earthworm farming, which is both costly and inefficient. This project focuses on optimizing yeast and E.coli expression systems to produce LtEc efficiently. Early results demonstrate promising protein expression of 3 out of the 6 subunits needed for LtEc. Further genetic design is needed to create the other 3 subunits, moreover, testing must be done to ensure proper oxygen delivery as the naturally produced LtEc. This project presents a promising approach to addressing the global blood shortage by creating a novel production method for LtEc, allowing for more accessible transfusions in rural and humanitarian applications.

Gaby Nunez Noguez

Faculty of Kinesiology

Supervised by Saied Jalal Aboodarda

Delineating the effects of knee pain on neurophysiological responses during cycling

Although physical exercise is crucial in reducing metabolic and cardiorespiratory diseases in people suffering musculoskeletal complications, exercise program adherence is compromised in such populations due to exercise-induced pain. Knee pain in particular affects around 1/3 of adults, and is known to reduce engagement in physical activity, leading to physical limitations and impaired quality of life. Although cycling is recognized as the conventional form of exercise for people with knee pain, few studies have attempted to elucidate the impact of knee pain on the integration of neurophysiological, cardiorespiratory and psychological factors characterizing cycling exercise tolerance in people with knee pain. However, considering that other confounding factors such as fitness level or age might affect the outcome of a study exploring the neurophysiological responses to pathological knee pain, the study address this gap in the literature by performing a proof-of-concept on healthy individuals. For this aim, an experimental knee pain model including sinusoidal waveform stimulation of the infrapatellar fat pad (IFP) of the knee is used. The sample size calculation suggests that 20 healthy participants are required to complete three experimental sessions. After a ramp-incremental cycling test to determine ventilatory thresholds and peak power output in the first session, participants attend two identical experimental visits to complete a series of 5-minute bouts of cycling in the moderate and severe exercise intensity domains, with and without the experimental pain, Participants also perform isometric contractions to match the level of muscle electrical activity during cycling. During both cycling and isometric exercises, neuromuscular fatigue, corticospinal excitability and inhibition, cardiovascular measures (including blood pressure, heart rate variability, and oxygen consumption), and perceptual factors (including effort, breathlessness, leg pain, and fatigue) are measured. This is an ongoing study; however, the preliminary data suggest that corticospinal excitability tends to increase at the presence of experimental pain stimulus than the matching intensity control conditions. No clear differences in corticospinal inhibition has been observed. The outcome of this study will inform future research on clinical populations, ultimately assisting practitioners in prescribing effective and approachable exercise interventions to enhance the quality of life in people with knee pain.

Hannah Proctor

Faculty of Kinesiology

Supervised by Kelly Kaiser

Does Electrical Stimulation Improve Exercise Capacity after Spinal Cord Injury?

In able-bodied individuals, transitioning to an upright posture activates the sympathetic nerves that cause vasoconstriction and maintain blood pressure. Spinal cord injury (SCI) disrupts these signals and leads to dangerously low blood pressure termed orthostatic hypotension. As blood pools in the lower extremities, cerebral perfusion is reduced, often causing dizziness, syncope, and cognitive impairment. Epidural electrical stimulation (EES) of the hemodynamic hotspot in spinal segments T10-T12 has proven effective in restoring blood pressure responses to orthostatic challenge following SCI. A participant with a SCI and an EES device implanted over the hemodynamic hotspot underwent orthostasis using a head-up tilt test on separate days under two conditions: 1) no EES and 2) with EES turned on. Transcranial doppler ultrasound assessed cerebral blood flow in the middle cerebral artery, and bioelectrical impedance measured segmental blood volume changes during tilt. Without EES, participants experienced greater venous pooling and a reduction in cerebral perfusion during tilt. When EES was turned on during tilt, venous pooling was reduced and cerebral blood flow was maintained, effectively stabilizing blood pressure during orthostatic challenge. These preliminary results suggest that EES is a promising intervention for managing orthostatic hypotension by regulating blood volume changes during orthostatic stress, thus improving quality of life following SCI.

Dylan Tingley

Faculty of Kinesiology

Supervised by Faizal Careem

Modulation of Inflammatory Cell Death in Infectious Bronchitis Virus-Infected Macrophages via the COX-2/PGE2 Pathway

Infectious Bronchitis Virus (IBV) is a highly contagious coronavirus that infects chickens and costs the Canadian poultry industry millions each year. With the goal of discovering novel therapeutic targets for mitigating IBV pathogenesis, this study investigated the role of the cyclooxygenase-2 (COX-2)/prostaglandin E2 (PGE2) pathway, and caspases in viral replication and programmed cell death in chicken macrophages challenged with IBV. Cells were treated with a selective COX-2 inhibitor, exogenous PGE2, or a pan caspase inhibitor, following infection with either the Delmarva (DMV/1639) or Connecticut (Conn A5968) variants of IBV. RNA extraction, cDNA synthesis, and q-PCR was performed for determination of Intracellular and extracellular viral genome loads. Cell viability, apoptosis, and necroptosis were assessed using flow cytometry and visualized with immunofluorescence. Our findings demonstrated that COX-2 inhibition effectively reduced IBV viral replication and shedding for both strains, while exogenous PGE2 had no significant effect on either parameter. Pan caspase inhibition reduced viral shedding in both strains with minimal impact on viral replication. Nuanced, and strain specific results were seen in the viability and apoptosis assays that require further investigation. Ultimately, this study helped unveil the critical influence of targeted COX-2/PGE2 pathway modulation in IBV pathogenesis, offering insight into potential therapeutic interventions for combatting this pathogen.

Tousif Zaman

Faculty of Kinesiology

Supervised by Ryan Peters

Exploring Muscle Stretch Reflexes During Walking Using Novel Wearable Technologies

Muscle stretch reflexes, crucial for stable gait, are influenced by visual input. Traditional methods like H-reflexes only provide snapshots, neglecting muscle spindle receptor contributions. The study proposes that fusimotor drive adapts muscle spindle reflexes in threatening visual environments. A wearable system with a tendon vibrator, electrical stimulation, EDA, and EMG sensors was developed to assess stretch reflexes during walking trials under varying VR environments (ground level and 3m high). H-reflex amplitudes decreased, and EDA increased in VR, especially in the high walkway condition, suggesting enhanced spinal presynaptic inhibition. Conversely, NTV reflexes remained consistent. VR-induced threat modulates reflex gain, with H-reflexes decreasing and NTV responses remaining stable. This suggests a compensatory mechanism, potentially fusimotor drive, maintaining mechanical reflex gain despite increased spinal presynaptic inhibition.
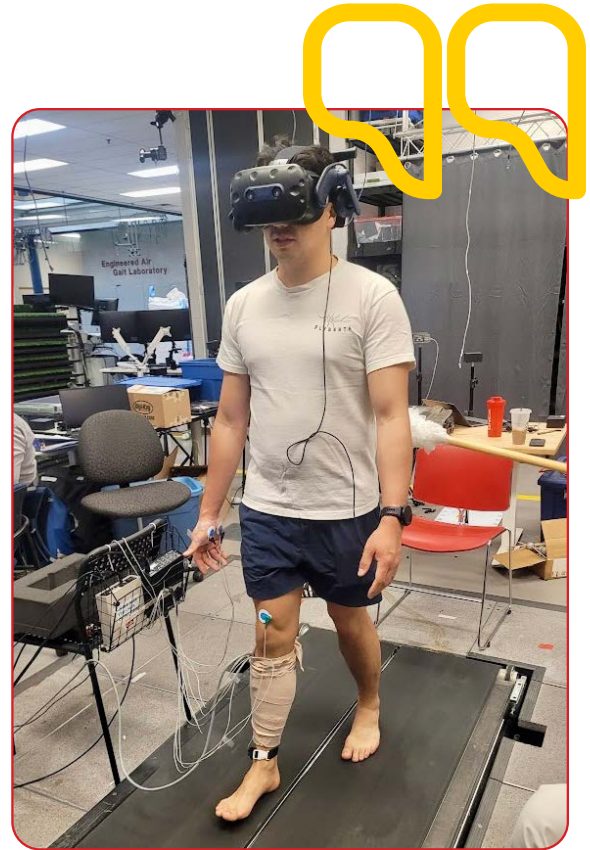
In their own words

Navigating the landscape of research is undeniably challenging, but my unwavering passion for the medical field propels me forward with purpose. This passion stems from a profound desire to shape my future self into someone who can make a meaningful contribution to medical science, particularly in the field of cardiology. The roots of this drive are deeply ingrained, inspired by my father's meticulous nature and dedication to precision. My journey thus far has been one of continuous growth. Immersing myself in activities such as volunteering at the Foothills ICU, Crowfoot Physiotherapy, and actively participating in research projects, has broadened my understanding of the practical and theoretical dimensions of healthcare.

The PURE Award was a transformative experience that taught me that adaptability and perseverance are the true catalysts for success in research. My project presented its own set of challenges. For instance, our recruitment process, despite offering incentives, encountered unexpected obstacles, leaving us with an imbalanced participant pool. This taught me the importance of adaptability in research, particularly when working with human subjects where engagement can be unpredictable. Each participant's unique responses to stimuli further complicated data collection, necessitating constant refinement of our approach. These experiences deepened my appreciation for the intricate attention to detail that research demands, ensuring the integrity and reliability of data collection.

Another challenge was learning to analyze complex data. Initially, the process was overwhelming. However, through perseverance, I made substantial progress by applying new analytical techniques. This experience underscored that the discomfort of learning something unfamiliar is the precursor to growth. Overcoming these challenges has reinforced the idea that expertise is earned through a willingness to step outside of one's comfort zone.

Looking ahead, I am more determined than ever to channel these lessons into my future work. With every challenge faced and overcome, I am one step closer to realizing my vision of contributing meaningfully to the field of cardiology. The pursuit of knowledge and the quest to improve the lives of others will continue to guide my journey, reminding me that the path to meaningful impact is paved with adaptability, perseverance, and passion.
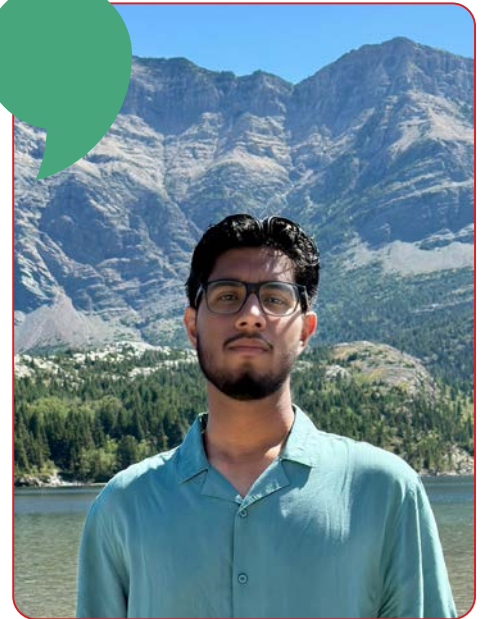
Bryn Topham

Faculty of Kinesiology

Supervised by Matthias Amrein

Kinematic Analysis of a Minimally Invasive Robotic Insertion Tool

Although minimally invasive surgical tools improve outcomes and diminish costs, there is often an insufficient balance between flexibility and rigidity, which compromises precision and ease of navigation. Being both dextrous and stiff, the proposed Robotic Insertion Tube (RIT) addresses current navigational limitations of endoscopic or laparoscopic procedures. The development of such accessible, low-cost medical technology is pivotal in democratizing medical care across varied socioeconomic and cultural backgrounds. The RIT is composed of multiple jointed elements, each rotating of a fixed angle. Our purpose is to create a Mathematica-based code that describes the kinematics of the RIT, as well as determines the optimal configuration of individual elements for the device to follow a predefined path. The configuration of the device is described by an array containing the rotation angle of each element with respect to the previous. In Mathematica, a curve defined by its parametric equations is "followed" by each element of the RIT, by minimising the distance between the head of the element and the curve. The code was tested using parametric equations of a semicircle as an example path. We now aim to apply this code to increasingly complex pathways, including various human anatomies from magnetic resonance imaging (MRI) data. The significance of this contribution is substantial, serving as the foundation for the device's control system and surgical planning software.

FACULTY OF LAW

Sean Hashimoto

Faculty of Law

Supervised by Stephanie Chipeur

Funding for Family Caregivers: Common Law and Policy Approaches

The forthcoming Canada Disability Benefit ("CDB") is an income-tested benefit providing annual financial support to eligible persons with disabilities, expected to provide working-age individuals with severe and prolonged disabilities with up to $2,400 per year of support. Much to the chagrin of many disability advocates, the federal government announced that the Disability Tax Credit ("DTC") would be the basis for determining disability eligibility for the Benefit. This report summarizes a segment of doctrinal legal research conducted for a broader report providing recommendations to the Canada Revenue Agency (CRA). We find that the DTC's interpretation of the phrase "all or substantially all of the time" as "90% of the time or greater"—a rule of thumb known as the 90% rule—is problematic, legally and because it presents a significant barrier for DTC and CDB applicants. Despite this, the CRA continues to use the 90% rule to determine eligibility for the DTC. This is problematic, as it defies the legislature's intentions of using a flexible test for determining eligibility. The inflexible and impersonal 90% rule instead forces quantification where it is unsuitable, creating an eligibility barrier for many applicants. Parliament will inevitably compound this problem by attaching yet another key financial support behind the 90% rule.

FACULTY OF NURSING

Mercy Ofiuvwo

Faculty of Nursing

Supervised by Michelle Cullen

Verbal De-escalation in Virtual Simulation

Nursing students and experienced nurses frequently experience verbal aggression from patients and family members. Undergraduate nursing students in the Faculty of Nursing at the University of Calgary currently receive a 20 – minute slide presentation on de-escalation techniques in their second year. This modality does not allow students to learn and practice verbal de-escalation skills. This research study seeks to evaluate the effectiveness of teaching verbal de-escalation in a virtual simulation environment to undergraduate nursing students. The aim of this project was to develop two interactive virtual patient simulations with real-time chat sessions for undergraduate nursing students to practice using their verbal de-escalation skills. Qualitative data was gathered from two focus group discussions with a student advisory board. A comprehensive review of the current literature related to verbal de-escalation and nursing was also undertaken. This data informed the development of each case. OLab Version 4.6 was used to develop both simulations. In total 7 participants of varying clinical expertise pilot tested both cases. 3 of these participants consisted of student advisory board members. Both virtual simulations were well received. Feedback was provided for both cases. Participants noted the simulations mimicked real life scenarios nursing students encounter in clinical practice. Student advisory board participants who participated in preliminary testing indicated the virtual simulations was a meaningful way to engage in learning about verbal de-escalation strategies. The next phase of this project will involve trialing these simulations with undergraduate nursing students in the University of Calgary.

Mikhila Sabu

Faculty of Nursing

Supervised by Nicole Letourneau

Parents' Perspectives on the Implementation and Integration of the Attachment and Child Health (ATTACHTM) Parenting Program using Normalization Process Theory

What are parents' perspectives on the implementation and integration of the ATTACHTM program at the community agencies they access? Mental health problems in children, including depression and anxiety, have been exacerbated by COVID-19. Children exposed to toxic stress (e.g., family violence, parental depression, low income) are particularly vulnerable. ATTACHTM is an intervention program for parents and children affected by toxic stress that promotes mental health, secure attachment, and healthy child development (Letourneau et al., 2023, 2024). ATTACHTM targets reflective functioning skills, helping parents to interpret their child's emotional and behavioural cues to improve management of toxic stress. Integrating such evidence-based parenting programs into real-world settings is vital for sustained implementation. This study explored how ATTACHTM can be integrated from research into everyday practice from the parents' perspectives. Building on a quantitative evaluation of the impacts of ATTACH™ in community agencies, this qualitative study employed normalization process theory (NPT), a sociological framework to understand parents' perspectives about implementing and integrating ATTACH™ into practice. Interviews with parents (n=13) were thematically analyzed to understand uptake, benefits, barriers, and challenges to the delivery of ATTACHTM.Assessment of data consolidation and preliminary analyses revealed several themes. Themes include: 1) accessibility and adaptability of ATTACH™, 2) perceived relevance and alignment with agency goals, and 3) ATTACH™'s focus on practical and interactive skill-building. Exemplar quotes elucidate these themes. Findings will be shared with the ATTACHTM team, parents, community engagement committees, and agency partners to validate findings. This study promotes effective integration and implementation of ATTACHTM, leading to healthier family dynamics and improved long-term mental health outcomes for children.

Misky Sanni

Faculty of Nursing

Supervised by Deborah White

Exploring Diversity, Equity, and Inclusion in Nursing Education

This research project examines the perception and integration of diversity, equity, and inclusion (DEI) in nursing education at the University of Calgary. The study focuses on understanding nursing students, faculty, support staff, and leadership perceptions of DEI, and identifying the challenges and facilitators to integrating and implementing DEI principles into nursing education. This qualitative descriptive study used semi-structured interviews, demographic surveys, and document review to gather data from nursing students, faculty, and support staff. Thematic analysis revealed five major themes: participant definitions of DEI, recognizing the importance of DEI in the nursing profession, the role of DEI in nursing education, representations of DEI at the University of Calgary, and the integration of DEI in policies and procedures. The study found that while there is a shared understanding of the importance of DEI, differences exist in the perception and implementation of DEI initiatives across participant groups. This research emphasizes the need for ongoing efforts to institutionalize DEI, promote diverse leadership, and adopt holistic admissions and recruitment practices to foster a truly inclusive learning environment.

FACULTY OF SCIENCE

Sandra Amin

Faculty of Science

Supervised by Estacio Pereira

My summer research was truly a transformative process, teaching me the power of inquiry while empowering me to act on my curiosity.

Investigating relationships between students' workload perception, stress, wellbeing, and learning environment of a flipped classroom

Estacio S. S. Pereira, Sandra Amin, Sefat Rimpu

꧁??? Research Question ꧁???

Investigating relationships between first year engineering student workload perception with stress, well-being and teaching practices of a flipped classroom learning environment.

Methods

- ✓ **Workload Perception:** NASA Task Load Index
- ✓ **DASS-21:** Stress items
- ✓ **Learning Environment**
- ✓ **Well-being:** Flourish Scale

$n = 161$

✗ < 100% Completion

modified $n = 88$

Structural Equation Modelling

Results

STEP 1) Identified components using confirmatory factor analysis

↑ Scores = ↑ Workload Perception

Learning Environment
- Assignment Structure
- Assignment Difficulty
- Learning Support
- Assignment Preparation Time
- External Factors

↑ Scores = ↑ Positive Learning Environment

Well-being

Flourish Scale

↑ Scores = ↑ Well-being

↑ Scores = ↑ Stress Levels

DASS-21

Stress

NASA Task Load Index
- Performance Challenges
- Learning Satisfaction
- Physical Activity

STEP 2) Identified relationships using structural equation modeling

Assignment Structure → Learning Satisfaction

Assignment Structure → Performance Challenges

Stress → Well-being

Conclusion

Overall, this study showcases the critical nature of considering workload alongside other teaching practices to encourage student wellbeing without sacrificing academic excellence.

Pereira et al., 2024

Through my summer research, I have gained valuable insights into what I would enjoy pursuing in the future.

Abdu Bura

Faculty of Science

Supervised by Gerald Pfeffer

PBMC RNASeq Profiling of ALS Reveals Male-Specific Dysregulation in the Peripheral Immune System

Amyotrophic Lateral Sclerosis (ALS) prevalence, severity, and progression rate differ between the sexes, with males being more susceptible. The underlying molecular and cellular mechanisms, including differences in inflammatory response, are not well understood. In this study, we conducted RNASeq profiling of Peripheral Blood Mononuclear Cells (PBMCs) from ALS patients and sex-matched controls, with the objective of identifying genes and cellular pathways that are differentially expressed (DE) between the sexes. The ALS Male vs Healthy Male comparison revealed the most DE genes, primarily related to immune response and inflammation. Pro-inflammatory cytokines, such as IL-8, were highly enriched in Male ALS, while showing no changes in females. We also observed that anti-inflammatory signals, such as IL-10, PPAR, and LXR/RXR, were inhibited in Male ALS. Comparing healthy females with healthy males showed higher immune activity in females than males. Finally, cell-type deconvolution was performed to estimate proportion of immune cells in all groups. This also showed that healthy females have higher immune activity than healthy males. A potential explanation could be that females have more active baseline immune activity, as observed in previous studies, while male immune cells over-activate in ALS leading to more severe inflammatory symptoms. In conclusion, our findings show that ALS involves extensive dysregulation in the peripheral immune system, specifically in males. As our small sample size is major limitation, we are in the process of sequencing more samples to validate our findings.

In their own words

I am an international student from Ethiopia, studying Neuroscience. Conducting research as an undergraduate has been incredible. For my PURE Award, I researched sexual dimorphism in amyotrophic lateral sclerosis (ALS). ALS is the progressive death of motor nerve cells. The sensory nerve cells are still alive so people can sense things, but because the motor nerve cells die, the muscles lose communication. In the worst cases, patients cannot talk or breathe, often leading to death.

For a long time, I've known that I wanted to pursue a career in neurodegenerative diseases, but I didn't know what was possible in the field. Researching at the Hotchkiss Brain Institute allowed me to explore both the scientific and clinical research paths of neuroscience.

Most of my day is spent coding, where I analyze the expression of genes between different conditions. Being able to take numbers and translate them into something that describes how people are impacted by ALS is incredible. After initial analyses, our lab comes together to pinpoint the underlying reason why a particular group could be displaying a symptom. This is the exciting part. We have amazing tools to isolate variables that might be factors. If we change the variables, we can see the relationship between the variables. These are the kinds of scientific discoveries that can make a real difference in patients' lives. I am so grateful for this experience, as so many talented people across the world don't have access to these kinds of opportunities. This honour makes me push myself harder, and I am excited for future research opportunities.

Ollie Barnett

Faculty of Science

Supervised by Darla Zelenitsky

Comparative analysis of the nasal cavity and paranasal system in four sympatric nodosaurids and ankylosaurids from the Upper Cretaceous (upper Campanian) Dinosaur Park Formation of Alberta, Canada

The thyreophoran clade Ankylosauria is characterized by complex and convoluted nasal airways and paranasal sinus system. Despite being a taxonomically diverse clade, little is known about the morphological variation in nasal internal structures that exists within Ankylosauria, particularly between closely related and sympatric taxa. Here we virtually reconstructed and compared the morphology of the nasal airways and paranasal sinuses of four contemporaneous ankylosaurs, the ankylosaurids Anodontosaurus lambei and Euoplocephalus tutus and the nodosaurids Edmontonia rugosidens and Panoplosaurus mirus, from the Upper Cretaceous (upper Campanian) Dinosaur Park Formation of Alberta, Canada, by segmenting CT scan slices with the software Amira. As previously demonstrated, the nasal cavity and paranasal sinus system of ankylosaurids is more complex and convoluted than those of nodosaurids. However, we observed few differences in the morphology of the nasal cavity and paranasal sinuses between the ankylosaurids Anodontosaurus (TMP 1997.132.1) and Euoplocephalus (TMP 1991.127.1), the two being largely identical. From the nares, the airway initially takes a dorsomedial course of the rostral loop that makes multiple turns before exiting through the choana. In contrast, the nasal cavity morphology differs considerably between the nodosaurids Edmontonia (TMP 1998.74.1) and Panoplosaurus (ROM 1215). From the nares, the nasal airway of Panoplosaurus is characterized by a rostral loop that twists laterally and then continues to the caudal loop before exiting ventromedially through the choanae. In Edmontonia, the airway is funnel-shaped and lacks the coiled rostral loop present in Panoplosaurus, thus the airflow followed a more direct anteroposterior route to the choana. The differences in nasal cavity morphology observed between Edmontonia and Panoplosaurus suggest that this feature could be important for nodosaurid taxonomy and systematics. Whereas Edmontonia has previously been argued to be congeneric with Panoplosaurus, the observed differences in nasal cavity morphology are significant and are here argued to support a generic distinction.

Yvonne Chen

Faculty of Science

Supervised by Johnathan Canton

How "Danger" Signals on Cells Drive Cross-Presentation and Anti-Tumour Immunity

Antigen cross-presentation is a process generates cytotoxic T cells that defend the body against cancer, viruses, and other pathogens. Without cross-presentation, the body would have very limited means of detecting and combating infection and tumours. Cross-presentation requires dendritic cells to ingest antigens from cells that have "danger" signals and present these antigens to the T cells. Recently, the Canton lab has gathered evidence that a putative pore-forming protein known as APOL7C is recruited to phagosomes of dendritic cells to initialize cross-presentation by rupturing the phagosomal membrane and faciltates the escape of antigens to the cytosol to be presented to T cells. Still, the exact mechanism of how APOL7C is selectively recruited to phagosomes remains largely unknown. Interestingly, a receptor uniquely expressed in dendritic cells known as DNGR-1 has been implicated in triggering phagosomal rupture in a NADPH-oxidase dependent manner. Using immunofluorescent assays and confocal microscopy to visualize APOL7C, my project investigated whether APOL7C pore formation on dendritic cells and DNGR-1 signaling are mechanistically linked. More specifically, a drug treatment known as R406 was used to inhibit DNGR-1 signaling, and APOL7C recruitment on phagosomes was quantified to determine the relationship between DNGR-1 signaling and APOL7C recruitment. Our results show that DNGR-1 signaling does indeed lead to APOL7C recruitment to phagosomes since there is a statistically significant decrease in APOL7C recruitment when DNGR-1 is inhibited with R406. These findings give us insight into the molecular mechanisms of cross-presentation and open new avenues for vaccine and cancer therapy development.

Hannah Cheung

Faculty of Science

Supervised by Cindy Barha

A Systematic Review Of The Relationship Between Midlife Physical Activity Levels And Later-Life Cognition: Potential Sex Differences

As the population ages, older individuals become susceptible to cognitive decline affecting memory, attention, reasoning, and overall functional independence. As life expectancy increases, this will continue to burden Canada's healthcare system and the quality of life of many aging Canadians. To combat this, lifestyle factors like physical activity in midlife have been suggested to have a positive effect on cognitive function. However, some studies have also found the opposite of this indicating that midlife physical activity has no relation to cognitive function in older age. This systematic review will work to address this conflict by looking at the relationship between midlife physical activity levels and later life cognition in normal older adults. As midlife marks the period of many neuroendocrine and metabolic changes that vary among male and females, this study will also look at the sex differences in this relationship. We searched electronic databases for studies that included midlife (40 to 59 years old) assessments of physical activity and valid neuropsychological tests in late life (60 years and older). With the systematic review tool, Covidence, this literature was screened according to our inclusion and exclusion criteria. Currently we have identified 19 eligible studies. Following the screening process, data will be extracted, and a meta-analysis will be performed. The results of this systematic review will reveal the relationship of midlife physical activity and late life cognition while also highlighting the potential differences between sex. This will address the current knowledge gap and work to promote the cognitive health of the aging population.

Arpit Chitkara

Faculty of Science

Supervised by Ann Barcomb

Utilizaition of Natural Language Processing in Scraping Smart City Requirements

Traditional road hazard detection systems, which rely on manual inputs and constant network connectivity, are inefficient for real-time monitoring and reporting, creating challenges for urban infrastructure management. To address this issue, the research aims to develop an advanced solution using machine vision and geolocation technologies. The goal is to create a pothole detection system capable of offline operation, storing location data locally and syncing it once connectivity is restored, ensuring accurate and efficient reporting in areas with limited network access. The research began by investigating existing smart city applications to assess their capabilities and limitations. A key component was the development of a questionnaire designed to gather public feedback on roadway services and reporting systems, ensuring the system aligns with user needs. An ethics proposal was submitted to ensure compliance with research standards. Additionally, we explored the use of machine learning (ML) algorithms for real-time pothole detection on mobile devices, focusing on accuracy and system performance. Initial findings indicate that integrating machine vision, geolocation, and offline functionality significantly improves pothole detection compared to traditional methods. The research offers insights into improving road hazard detection and contributes to smart city solutions, enhancing infrastructure management and streamlining reporting for better urban maintenance.

Erica Chow

Faculty of Science

Supervised by Frank Maurer

AI Support for UX Testing of XR Applications

As the realm of extended realities advances, it is becoming extremely important to ensure that applications within an extended reality environment are functional and have stable user interfaces. The purpose of this research project was to create a tool which integrates extended reality (XR) prototyping with usability testing. The first component of this project is a prototyping tool which utilizes generative Artificial Intelligence to create a digital twin of real-world environments within an XR environment. The second component is a tool that deploys usability testing applications within XR environments. This project integrates the two components by taking the AI generated environments and deploying the testing tool within it. This approach allows for the usability testing of XR applications in virtual environments, ensuring test replicability and software reliability while reducing potential risks and resource costs. The result of this research was the completion of a tool that allows the user to generate and manipulate various objects to create custom environments, then deploys a placeholder application on top of the scene. This research project demonstrates an innovative approach to support XR usability testing, leveraging AI generated environments for improved testing efficiency and reliability.

Labib Chowdhury

Faculty of Science

Supervised by Jason Anderson

Preparing and Identifying Permian-age Fossils from the Briar Creek Locality of the Texan Nocona Formation

The Texan Red Beds, a series of lower Permian strata, yields fossil data on the evolution and ecology of early tetrapods. The Briar Creek bonebed in the Nocona Formation (~290 Ma) is a particularly productive locality in the Beds, bearing temnospondyl (Aspidosaurus, Eryops, Trimerorhachis, Zatrachys), embolomere (Archeria), nectridean (Diplocaulus), synapsid (Dimetrodon, Edaphosaurus, Ophiacodon) and reptiliomorph (Diadectes, Bolosaurus) remains. This project involved excavated and surface-collected fossils recovered on field expeditions to Archer Co., TX in 2007 and 2009. I cleaned the material with toothbrushes and air-scribes, and subsequently consolidated them with ultra-thin polyvinyl acrylate (PVA) glue. I used a Nikon D200 to photograph the prepared material. Well-preserved specimens could be identified as belonging to certain taxa by comparison with published descriptions. I report Dimetrodon sp., Edaphosaurus boanerges and temnospondyl fragments from this collection. The prepared material contributes to the sample for future palaeontological work.

Kate Cochran

Faculty of Science

Supervised by Emma Spanswick

Identification of the Polar Cap Boundary Using Electron Density Profiles

The polar cap boundary (PCB) defines the location on the surface of the earth, in longitude and latitude, of the transition between regions of open magnetic field lines, those connecting to the interplanetary magnetic field, and those of closed magnetic field lines, originating from and returning to Earth directly, in the Earth's magnetosphere. This location serves as an important anchor in magnetospheric mapping, as near-Earth space phenomena can have different behaviours on differing field lines. I aimed to determine a method to obtain the location of the PCB from electron density datasets from U of C's ionospheric tomographic inversion model (UCTomo), by correlating optical Redline Geospace Observatory (REGO) imager data and the PCB obtained from such optical data, to slices of electron density at different altitude resolutions from the UCTomo dataset. Some correlations were found for specific times and dates, however more research is required for a robust relationship between luminosity and electron density to be identified for usage in constant determination of the location of the PCB over the Canadian sector. UCTomo has potential to identify characteristics of the ionosphere in a scientific context, and validity of the utilization of REGO images for PCB identification over more than one imager site for extended periods of time is evident.

Aidan Dempsey-MacKillop

Faculty of Science

Supervised by Jerrod Smith

Representations of Finite Groups Distinguished by Normal Subgroups of Prime Index

Groups are a mathematical object consisting of symmetry transformations which can be composed. They are of interest in applications to physics and chemistry where symmetries of atoms and molecules can be studied using groups. One method of probing at a group's structure is called representation theory, where a representation is a way to relate the group's structure to the language of linear algebra, which is a well-understood branch of mathematics. The analogy here is that the representations of a group is like the spectra of light through a prism; by studying each of these pieces we can recover information about the whole. Specifically, in this project we studied distinguished representations, which behave in a certain constrained way on a smaller subgroup N contained in G. This constrained behaviour is incredibly relevant in higher-level results in representation theory. Our conclusion is that when this subgroup N is normal and of prime index, the representations of G distinguished by N can be classified in a succinct way, that they are exactly the representations inflated from the quotient group G/N.

Gabriela Dziegielewska

Faculty of Science

Supervised by Ian Hunt

Improving interactive learning tools for study of university-level organic chemistry

This research project aims to enhance the learning experience and outcomes in university-level organic chemistry and spectroscopy courses through the development of a unique interactive tool for students, by tasking students with proposing a correct HNMR spectrum based on the structure of a given molecule. The purpose of the interactive tool is to be a complementary self-study resource for students in organic chemistry and spectroscopy classes, or to be used in controlled environments, i.e., tutorials. The tool was programmed

using HTML/CSS and Java programming languages and incorporated as its own page on the website. A literature search was performed to determine the concepts in HNRM spectroscopy, particularly related to interpreting spectra, that students most often struggled with. The findings of the literature search helped inform the kinds of structures that were used in the program. Quantitative data collection could not have been done during the research term as the spectroscopy class CHEM559 does not run doing that time. Therefore, to inquire into whether the access to this tool improves students' understanding and proficiency with analyzing HNMR spectra, data collection will need to be performed past the term of this research project.

Ahmed Elshabasi

Faculty of Science

Supervised by Wesley Willett

Collecting Information Needs For Egocentric Visualizations While Running

We investigate research challenges and opportunities for visualization in motion during outdoor physical activities via an initial corpus of real-world recordings that pair egocentric video, biometrics, and think-aloud observations. With the increasing use of tracking and recording devices, such as smartwatches and head-mounted displays, more and more data are available in real-time about a person's activity and the context of the activity. However, not all data will be relevant all the time. Instead, athletes have information needs that change throughout their activity depending on the context and their performance. To address this challenge, we describe the collection of a diverse corpus of information needs paired with contextualizing audio, video, and sensor data. Next, we propose a first set of research challenges and design considerations that explore the difficulties of visualizing those real data needs in-context and demonstrate a prototype tool for browsing, aggregating, and analyzing this information. Our ultimate goal is to understand and support embedding visualizations into outdoor contexts with hanging environments and varying data needs.

This summer, I immersed myself in the exciting world of research with my professor and her PhD student, unraveling interesting insights through a literature review, conducting analysis and gaining valuable experience!

Maham Fatima

Faculty of Science

Supervised by Lora Oehlberg

Validity in Literature Reviews and Transcripts on Participatory Methods for Visualizing Older Adult's Health Information

This study investigates the accuracy of systematic literature review methodologies conducted on research of participatory methods for visualizing older adult's health information. The research aims to compare the results of literature reviews conducted by my supervisor's experienced PhD student Gina Freeman, and myself, a research student. The research aimed to assess differing levels of familiarity impacted the consistency of the literature review coding. It also aimed to test the database and its reliability for coding. The study involved conducting two separate literature reviews using the same database categories. Results were compared to identify similarities and discrepancies in the inclusion and exclusion criteria. Discrepancies were resolved through joint discussion. These discussions and our comments revealed inconsistencies were often due to terminology confusion. Adjusting or clarifying these increases the reliability and accuracy of the literature review. These recommendations were considered when making a more detailed database for the next full literature phase of the literature review and tested on a random selection of papers. This research highlights the importance of consistent and clear criteria and benefits of documentation in systematic literature reviews. The analysis of the "validity buddies" - two coder's results will help future interdisciplinary systematic literature reviews benefit from the findings including the need to clarify terminology across disciplines and having clear cut criteria to improve the accuracy and reliability of reviews in interdisciplinary research on participatory methods for visualizing older adult's health information.

Norav Gainda

Faculty of Science

Supervised by Deborah M. Dewey

Prenatal Exposure to Essential and Non-Essential Metals and their Impact on Cognitive and Behavioural Development on Children

Humans are exposed to various environmental chemicals, including essential and non-essential metals. Prenatal exposure to certain metals has been linked to poorer child neurodevelopment. Metal concentrations in maternal blood during the second trimester were available from the Alberta Pregnancy Outcomes and Nutrition (APrON) Neurotox cohort. In 309 mother-child pairs, we examined whether maternal concentrations of 11 metals (i.e., antimony, arsenic, cadmium, copper, lead, magnesium, manganese, mercury, molybdenum, selenium, zinc) were associated with child IQ and behavior. Child IQ was assessed using the Wechsler Preschool and Primary Scale of Intelligence, Fourth Edition (WPPSI-IV). Behavior was assessed using the Behavior Assessment System for Children, 2nd Edition (BASC-2) for children aged 3-5 years. In single-exposure models, cadmium had a negative association with full-scale IQ (FSIQ). Trends ($p<0.10$) were observed for lead and FSIQ, copper and somatization, and magnesium and somatization. In sex-stratified models, positive associations were observed between mercury and anxiety and arsenic and anxiety in males. In females, positive associations were observed between antimony and internalizing problems, antimony and somatization, and copper and somatization. Using multiple-exposure models, LASSO and double LASSO regression, associations were found between cadmium and FSIQ (β: -6.03, 95% CI: -12.73 to 0.67, $p=0.08$), antimony and internalizing problems (β: 8.60, 95% CI: -1.03 to 18.23, $p=0.08$), and antimony and depression (β: 10.15, 95% CI: -0.15 to 20.45, $p=0.053$). These findings suggest that prenatal exposure to cadmium and antimony may be detrimental to neurodevelopment in young children.

Participating in a summer research project made me realize the impact of innovative teaching on student learning, and I'm proud of myself for contributing to such intriguing research.

Temiloluwa Fatokun

Faculty of Science

Supervised by Michelle Jacobsen

Innovative Strategies for Teaching in Biological Sciences: Flipped Learning

This literature review explores the impact and effectiveness of flipped learning as a pedagogical approach in biological and medical sciences. The purpose is to review prior research on how the flipped learning method impacts student engagement, comprehension, and academic performance compared to traditional teaching models. It aims to address the gap in educational practices by assessing the educational potential of flipped learning in biological and medical sciences education. The literature review synthesizes findings from both quantitative studies, which analyze student performance metrics, and qualitative research, which explores student and instructor perspectives through surveys and interviews. The review covers various biological sciences courses over multiple academic terms, comparing outcomes in flipped classrooms with those in traditional teaching environments. This comprehensive analysis highlights the documented benefits and challenges of flipped learning. The reviewed studies suggest that flipped learning significantly enhances student engagement and academic performance. Students in flipped classrooms demonstrate higher levels of understanding and application of biological concepts, particularly in assessments that emphasize critical thinking and problem-solving skills. Additionally, the approach has been shown to benefit a diverse range of students, accommodating different learning needs and promoting inclusivity in educational settings. The literature indicates that flipped learning is an effective strategy for improving educational outcomes in biological sciences. By fostering active learning, deeper comprehension, and critical thinking, it serves as a valuable tool for educators aiming to improve student success in complex scientific disciplines. The review also underscores the importance of further research into the integration of emerging technologies, to optimize flipped learning environments and support diverse educational contexts.

In their own words

I am a second year Biological Sciences student, and my PURE Award research was on the use of flipped learning as a teaching strategy in my discipline. Flipped learning (FL) is a relatively new teaching method that instructors and students are exploring together in higher education. Having experienced flipped learning in my own courses, I decided to do a literature review on how FL's used in different parts of the world, so I could learn more about its strengths, challenges and how instructors and students are adapting FL to their contexts. This was my first time doing research, and I was lucky to have the support of my supervisor, Dr. Michelle Jacobson.

At first, the volume of materials to read and think about was intimidating, but I learned that this type of research — a deep dive into scholarship — is my preference. It suits who I am as a person and showed me there are even more subjects still to learn about.

I want to understand what others have thought and read, and make a personal contribution based on my experience, too. The thrill of this learning feels quite new, so everything is still intriguing to me, but I am so proud of myself for trying something I had never done before. I hope other students, particularly ones who feel nervous about interviews and laboratories, find (and bravely take!) opportunities like this, for personal and intellectual development.

Bryan Gonzalez

Faculty of Science

Supervised by Benjamin Tutolo

Formate-brucite adsorption as a model for ancient concentration mechanism

The discovery of the Lost City hydrothermal field and other alkaline hydrothermal vent systems have spurred interest and investigations into the alkaline hydrothermal vents as the site where life originated. This is due to the generation of hydrogen gas in situ via serpentinization leading to a reducing environment capable of reducing inorganic CO_2 into methane and formate which could have been significant in producing the first proto-biomolecules. One mechanism seldomly investigated in most theories for the origin of life is how these precursors to life would locally concentrate in the ancient oceans. One answer to this problem may lie in brucite, a mineral product of serpentinization at alkaline hydrothermal vents with studies investigating its sorption properties with various molecules. This study extends these insights to investigate brucite-formate sorption interactions across a range of pH over time. The study precipitated brucite using flow-through reactors in order to modulate the morphology of the brucite crystals from nuclei to highly structured crystals to have their sorption capabilities tested. Formate sorption to brucite would be tested over time using a colourimetric spectroscopy assay. In preliminary results, the crystal nuclei were tested for their sorption capacities and found no apparent sorption of formate at pH. By testing one of the critical mechanisms necessary to bring life, this study advances the knowledge surrounding the surface dynamics of brucite and will continue to investigate the well-developed brucite crystals and their interactions with formate across various pHs in order to answer the questions surrounding life's origin.
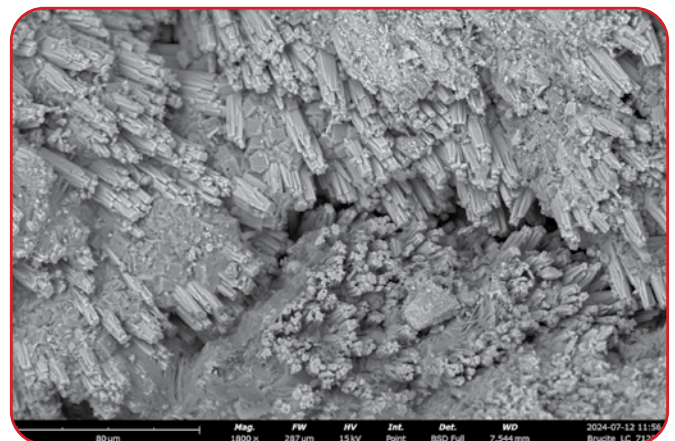
Aidan Hamilton

Faculty of Science

Supervised by Kelsey Lucas

Fishing for Information; A Morphological Comparison of Freshwater Fish Species

North America is home to a vast number of freshwater fishes, some are unique to specific waterways, while others can be found almost anywhere. This project created a framework of data with which members of like species can be compared in terms of their physical traits. Using museum specimens from the University of Michigan Museum of Zoology and the University of Calgary's Museum of Zoology, I compared the morphology of northern pike (Esox lucius) over geographic area. I found a marked difference between specimens found in the Milk River (MR) and those in a Reference Group (RG) including specimens from other parts of Alberta as well as Eastern Canada and the Northeastern United States. There is a high level of variation between the MR and RG specimens in terms of their fin lengths. Because fin size is an indicator of swimming speed, a potential explanation is that the MR's fast flow speed has led to increased fin sizes in this population. Specimen age is a confounding factor since MR specimens are considerably older than the RG specimens. Further study is required to determine if there is a distinct morph in the Milk River.

Research taught me that real discoveries happen somewhere between "I've got this" and "Wait, what did I just do?"— and I'm grateful for every moment of that journey.

Yovan Hewawasan

Faculty of Science

Supervised by Aravind Ganesh
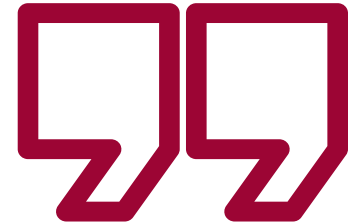
Prevalence, Characteristics, and Recurrent Event Risk of Cerebrovascular Fibromuscular Dysplasia in Patients with Ischemic Stroke or Transient Ischemic Attack: A Population-level Study

Fibromuscular dysplasia (FMD) is a rare, idiopathic, nonatherosclerotic, non-inflammatory vasculopathy with limited population-level data. We aimed to evaluate the prevalence and characteristics of cerebrovascular fibromuscular dysplasia (cFMD) in a population-level cohort of ischemic stroke and transient ischemic attack (TIA) patients. Our study included patients diagnosed with ischemic stroke/TIA in Alberta from April 1, 2016, to March 31, 2017, followed for 5 years until March 31, 2022, for recurrent stroke/TIA events. Cases of suspected cFMD were identified using overlapping approaches, including direct neuroimaging review and keyword searches (e.g. web, dissection, tortuosity, string of beads, medial fibroplasia) in radiologist reports. Five-year risk of recurrent events was estimated using logistic regression adjusted for age, sex, and vascular risk factors. Among 7,745 patients, 34 cases of cFMD were identified, with a population prevalence of 0.44% (439/100,000). Patients with cFMD were similar in age to those without, they had similar vascular risk factors and were more likely to be female. Twenty-seven (81.8%) cFMD cases had tortuous vessels on CT angiogram. Recurrent stroke/TIA occurred in 23.5% of the patients; this was not significantly higher than patients without cFMD. cFMD is a rare finding in patients with stroke/TIA, which primarily affects females and the extracranial proximal ICA. While these patients had notable rates of recurrent stroke/TIA and mortality, these were not significantly higher than in those without cFMD. Our findings merit further validation in larger cohorts of cFMD.

Krisa Hua

Faculty of Science

Supervised by Philip Egberts

Influence of Surface Roughness on Graphene's Frictional Behavior through Potassium Hydroxide Etching of Silicon Wafers

Graphene is being investigated extensively as a solid lubricant and protective coating due to its remarkable mechanical characteristics and capacity to decrease friction. In this work, we examine the effects of surface roughness on the adherence of monolayer graphene on silicon wafers utilized as substrates. Potassium hydroxide (KOH) solutions were used to etch silicon wafers at different concentrations (5% to 40%) to change the surface roughness. Both treated and untreated wafers' topography and roughness were examined using white light interferometry. Based on the results, the wafers' surface roughness reduced at KOH concentrations below 20% and peaked at 20%. On the other hand, the roughness exhibited variations with an overall rising tendency at concentrations greater than 30%. Notably, further tests showed that at high KOH concentrations, surface roughness occasionally surprisingly reduced. These results imply that although silicon wafer roughness may be effectively modulated by KOH etching, more research is needed to understand the behavior at higher concentrations. This study advances our knowledge of how chemical etching affects the interactions between graphene and silicon, which may have ramifications for enhancing the functionality of graphene-based coatings.

Aditi Ilangovan

Faculty of Science

Supervised by Tyler Willamson

Path Analysis Examining Associations Between Maternal Adverse Childhood Experiences (Aces) And Child Internalizing And Externalizing Concerns At Age Eight

Existing literature has shown that maternal adverse childhood experiences (ACEs), including abuse, neglect, and household dysfunction, can influence outcomes among their children, including internalizing concerns (e.g., anxiety and depression) and externalizing concerns (e.g., aggression and non-compliance). However, the psychosocial pathways that account for this risk transmission from others to children are poorly understood. While some research has explored contextual factors at the level of family and maternal functioning individually, cascades of risk have yet to be examined. Thus, a path analysis was conducted among 1,994 mother-child dyads to investigate the association between maternal ACEs and child internalizing and externalizing concerns at age eight, via maternal adult attachment insecurity (i.e., anxious and avoidant), romantic relationship functioning, and depression and anxiety symptoms. Maternal ACEs were significantly associated directly with child internalizing concerns (β = .06, p = .025) and indirectly via both maternal attachment anxiety and avoidance, lower romantic relationship functioning, and depression, (β = .002, p = .006; β = .003, p = .005, respectively). Maternal ACEs were directly associated with child externalizing concerns (β = .06, p = .018) and indirectly via both maternal attachment anxiety and avoidance, lower romantic relationship functioning, and depression, (β = .001, p = .008; β = .002, p = .010, respectively). These findings highlight the role of several maternal contextual factors in shaping children's downstream internalizing and externalizing concerns following maternal ACEs exposure.

Eyuel Kahsay

Faculty of Science

Supervised by Jennifer Adams

Enhancing STEM Education through Interdisciplinary Approaches: Integrating Computational Technologies, Social Justice, and Creative Pedagogies to Foster Inclusive and Engaging Learning Environments

This study investigates how integrating interdisciplinary approaches, computational technologies, and creative pedagogies can enhance STEM education by promoting equity, diversity, inclusion, and accessibility (EDIA). Employing a mixed methods approach, we combined quantitative surveys of 220 undergraduate students and qualitative interviews with students, faculty, and educational stakeholders at the University of Calgary. The findings reveal that interdisciplinary methods significantly increase student engagement and understanding, with students scoring 15% higher on standardized tests. The integration of computational technologies, including AI and machine learning tools, improved problem-solving skills by 20% and personalized learning experiences by 25%. Creative pedagogies, such as project-based learning and arts integration, enhanced collaboration skills by 15% and increased student engagement by 25%. However, barriers to EDIA persist, particularly for underrepresented groups lacking access to resources and mentorship. The study concludes that a holistic integration of these approaches can create more inclusive and engaging STEM learning environments. Future recommendations include implementing mentorship programs, inclusive curriculum design, community engagement, technology integration, and creative teaching methods to address EDIA challenges in STEM education.

Avneet Kaur

Faculty of Science

Supervised by Jan Dettmer

Earthquake Hazard Assessment at Sites along the Eastern Denali Fault in Southwestern Yukon

The presence of a potential seismic gap along the Denali Fault in south-west Yukon means that magnitude 7 earthquakes could occur in this region. This project considers the empirical quantification of earthquake hazards for several sites in this region that exhibit various site-specific soil properties. Earthquake data over the course of several years from five stations in Yukon have been analyzed and compared with each other to recognize how different soil and subsurface compositions affect the amplitudes of seismic waves experienced at each of these locations. The catalogue includes a total of 2864 recorded earthquakes that have magnitudes between 5.5 and 6.5, are at least 200 kilometers away from all five seismic stations and occurred between October 14, 2021 and April 27, 2024. The results show that the seismic wave amplitudes are systematically higher at stations KLRS and BRWY, regardless of earthquake locations or magnitudes. Notably, there is no difference between the site responses to ground shaking at the KLRS and BRWY locations, indicating similar amplification in the vicinity of the potential seismic gap along the Denali Fault. These results provide new information to understand site-specific earthquake hazards near the eastern Denali Fault as part of the earthquake hazard assessment and study of western Yukon conducted by Dr. Gosselin (Geological Survey of Canada) and Dr. Dettmer (University of Calgary).
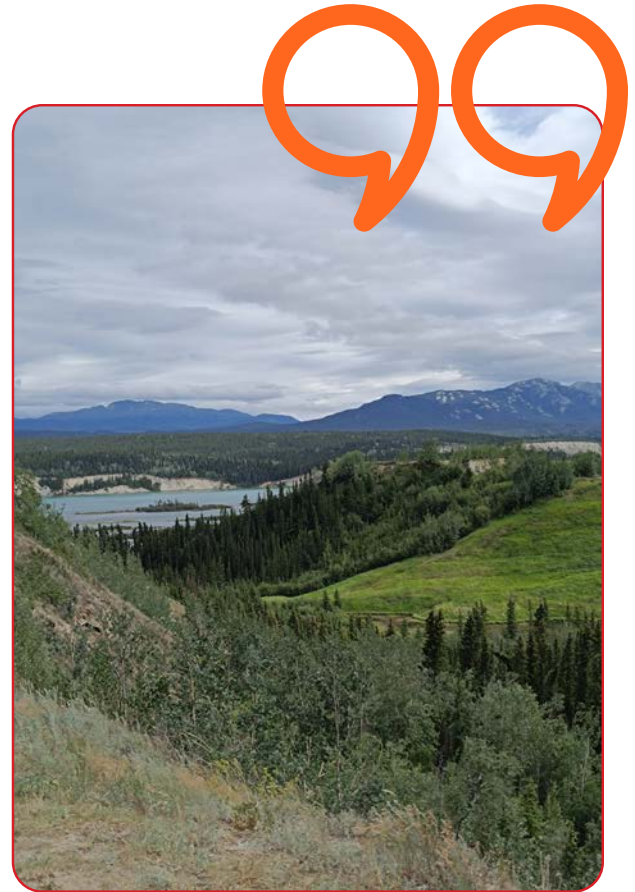
Zachary Kokot

Faculty of Science

Supervised by Barry Sanders

Efficient Measurement Techniques for an Ultracold Atom based Quantum Simulator

An essential component of quantum computing is the measurement and characterization of quantum states created by quantum devices. Recently, an appealing class of measurement approaches, categorized as shadow tomography, has become popular for their reduced measurement requirements in exchange for reduced accuracy. Based on an existing paper titled Predicting Many Properties of a Quantum System from Very Few Measurements by Hsin-Yuan Huang, Richard Kueng, and John Preskill we implemented and verified the performance of a shadow tomography procedure. The intention of this was to adapt the procedure for use on a quantum simulator based on ultracold neutral atoms trapped in an optical lattice. We hypothesized that the periodic structure of the optical lattice would allow us to further reduce the measurement overhead. Disappointingly we did not have the opportunity to test this hypothesis, but this would remain a goal for future exploration of this topic. Ultimately, the procedure proposed in the aforementioned paper performed as their theoretical work suggested and offers a promising technique that could be used to reduce measurement overhead in near-term quantum devices.

Lily Koochak

Faculty of Science

Supervised by Signe Lauren Bray

An Exploration of Autism Spectrum Disorder Symptomatology and White Matter Morphology in Preterm and Full-term Born Children

Birth prior to 37 gestational weeks, preterm birth, annually affects around 15 million children worldwide. As a result, these children face increased likelihood for behaviours aligned with autism spectrum disorder (ASD) – such as repetitive behaviours and social challenges. Atypical white matter (WM) morphology and development, specifically in the corpus callosum (CC), has been identified in both preterm children and children with ASD. However, no studies have yet examined the potential correlation between WM morphology in preterm children and the severity of ASD symptoms. The primary objective of this study is to explore the association between gestational age and ASD behaviours, and to investigate if WM morphology in the CC plays a role in mediating these effects. 248 children (126 females, 112 males) with ages ranging from 3.29-8.50 (mean = 5.34, SD = 0.88) and gestational ages ranging from 24.71 – 42.29 weeks (mean = 34.88, SD = 5.66). Children underwent diffusion MRI scans and parents completed the Autism Spectrum Quotient for Children (AQ-Child) cognitive assessment. Linear models were produced accounting for gestational age, age of child at testing, and their sex. To date, findings show a significant negative correlation between the presence of ASD features and gestational age. Fiber cross-section in the CC plays a role in mediating the effects. Overall, supports for both preterm-born children and children with ASD can be better implemented when the behavioural and morphological implications of these conditions are more comprehensively understood.

In their own words

When my dad underwent heart surgery in high school, I felt absolutely terrified about the outcome. His procedure was novel, and if not for someone's medical research into new heart surgery techniques, his recovery may have been very different. This experience with medical research sparked a personal passion for me. Today, I volunteer at the Alberta Children's Hospital and witness first-hand the impact that medicine (and the research behind it) can have on the lives of families — similar to my own experience.

When applying for the PURE Award, I sought a project that connected my interest with medicine and my love of working with kids. Dr. Signe Bray's research lab was the perfect combination. For my project, we explored the role of preterm birth on autism spectrum disorder (ASD) behaviours, and how we can visualize those behaviours in specific white matter tracts in the brain. My role was supporting data analysis by creating models that bridge the ASD behaviours with preterm birth.

Going into this project, I never anticipated the amount of organization required for a study. There is immense effort by the whole team to ensure each aspect of the project runs smoothly.

Starting out can feel incredibly overwhelming, but I've learned this feeling is perfectly healthy; it means you are learning and growing. Remembering to take everything one day at a time has been incredibly helpful. I had to be patient with myself, and I hope others can give themselves that same grace when starting out.

Summer research gave me a valuable first-hand experience of the scientific process left unexplored by my regular curriculum.

Gabriel Komo

Faculty of Science

Supervised by Claudia Gomes da Rocha

Modeling Neuromorphic Network Nanomaterials as Smart Electronic Switches: Computationally Approached

Nanowire networks (NWNs) are complex materials made of an entanglement of nanoscale wires that can be used for brain-inspired technologies. A computational package to simulate their structural and electrical properties has been developed over the years, but its simulation capabilities have not been broadly tested and compared with state-of-the-art experimental works. In this project, the existing computational package was expanded and tested for physical accuracy for the first time. More specifically, various "virtual experiments" setting the NWNs at distinct physical initial conditions and external perturbations were devised so their electrical response could be simulated and analyzed. Quantities investigated for a static transport scenario include percolation, number of junctions, and sheet resistance, as a function of density and wire length. For a dynamic transport scenario, the current and voltage curves were acquired as a function of time, from which hysteresis loops were identified as a fingerprint of memory, i.e., the simulated systems remembered information from past excitations. We confirmed that the package can make insightful predictions about the NWNs as electronic building blocks and can be used to inform experimentalists willing to simulate their enhanced physical features in a nanodevice.
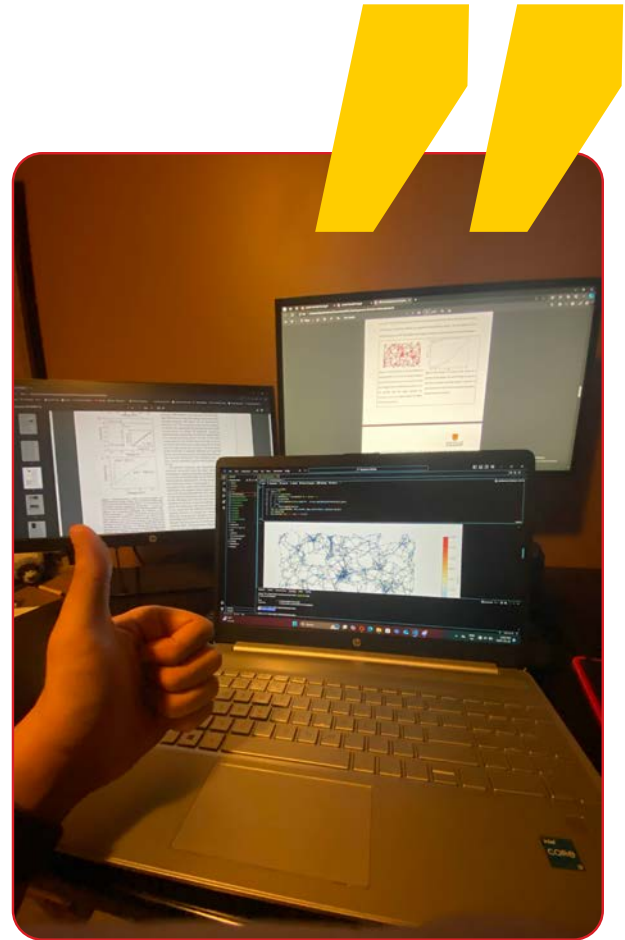
Kay Le

Faculty of Science

Supervised by Hans Osthoff

Measurement of Henry's Law constants of isopropyl nitrate and isobutyl nitrate in deionized water and n-octanol

Isopropyl and isobutyl nitrate (iPN and iBN, respectively) are important atmospheric trace gases that act as reservoir species of nitrogen oxides (NOx = NO + NO2) and are able to transport NOx from polluted to remote areas. In spite of their importance, there has been little research on their partitioning between gas and liquid phases. To accurately measure their global distributions, knowledge of their temperature dependent Henry's law constants (HScp) as well as their octanol-water coefficients (KOW) is required. Here, we report HScp values for iPN and iBN in deionized water and n-octanol at temperatures of 281.65 K and 298.15 K that were measured using a jacketed bubble column apparatus coupled to a gas chromatograph with electron capture detection. For deionized water, HScp of iPN was found to be (0.94 ± 0.03) M atm-1 at 298.15 K, in disagreement with the only two earlier studies in the literature, which ranged from (0.79 ± 0.04) M atm-1 to 0.56 M atm-1. In addition, HScp of iPN in deionized water were found to be (2.44 ± 0.09) M atm-1 and (1.29 ± 0.05) M atm-1 at 281.65 K and 293.15 K, respectively. Values for HScp in n-octanol for iPN and iBN were measured for the first time, from which the KOW of iPN was calculated to be (37 ± 2) at 298.15 K. Additional experiments need to be conducted with both iPN and iBN to solidify their temperature dependence of HScp and KOW and to gauge environmental implications.

Maia Le

Faculty of Science

Supervised by Jurgen Gailer

The Stability of Thimerosal and Phenylmercuric Acetate in Certain Physio-chemical Conditions

Metal poisoning is currently one of the biggest health concerns, as humans are chronically exposed to toxic metal species in the environment in this day and age. Mercury, in particular, enters the human body in various ways, be it through ingestion (i.e. methylmercury ($MeHg^+$) in tuna) or through pharmaceutical drug use and consumer products. Two organomercurials are of particular interest: thimerosal (THI), which is commonly used as a vaccine preservative; and phenylmercuric acetate (PMA) found in lens cleaning fluids. While adverse health effects of the aforementioned mercurials are somewhat understood, little is known about the full biochemical mechanisms by which they damage the human body. As such, a molecular toxicology approach is employed to establish the basis of biochemical interactions between these organomercurials and the organs and cells. For this research, Reverse Phase High-performance Liquid Chromatography coupled with Flame Atomic Absorbance Spectroscopy (RP-HPLC-FAAS) is employed, in order to investigate the retention behaviour of THI and PMA under certain physico-chemical conditions. THI and PMA are found to elute in a reasonable retention time (< 5 mins) with the mobile phase mixture of 50 mM phosphate buffer pH 7.4 and acetonitrile in a 50:50 ratio. Another study on the degradation of thimerosal is also conducted, by dissolving thimerosal in a solvent containing sodium chloride and a thiol – either L-Glutathione or L-Cysteine - and observing its stability. Even though the full mechanism behind its degradation is yet to be explored during this research term, we are able to conclude that thimerosal changes rapidly in an environment with 0.8% sodium chloride and 10 mM L-Cysteine.

Charlotte Leung

Faculty of Science

Supervised by Kelsey Lucas

The Effects of Temperature on Three-Spined Stickleback Behavior

Rising temperatures across the globe poses concern for the lifestyle of ectothermic organisms. An environment that is constantly evolving would change the internal molecular workings of ectotherms as they adjust their internal bodily processes to adapt to their surroundings, which impacts energy budgets and behaviour. I examined how temperature would impact the behaviours of three-spined sticklebacks (Gasterosteus aculeatus), a small prey species important in marine food webs, by acclimating individuals to different temperatures and performing three assays that measure activity level as a proxy for energy expenditure, aggression, and boldness. Collected behavioural data were subjected to an ANOVA test in the program R. I hypothesized that warm acclimated sticklebacks would exert more energy, as well as having higher levels of aggression and boldness, while the cold treatment would spend less energy and have a decreased degree of aggression and boldness. However, while sticklebacks in the warm treatment did exert more energy compared to the cold treatment, there was more difference in aggression and boldness between individuals within the same treatment than between treatments. Results could be supported by various literature in which warm temperatures facilitated the breakdown of stickleback sociability, causing fish to expend more energy guarding their territory from other sticklebacks. Contrastingly, aggression and boldness levels are individualized as both are due to personality traits. This study is important as it would shed more light into how ectotherm behaviour would change in response to warming climates.

Sua Lim

Faculty of Science

Supervised by Usman Alim

Exploring Non-Cartesian Computing for Enhanced Deep Learning Architectures

This study investigates the potential of Non-Cartesian Computing to improve the performance of deep learning architectures, particularly in the domain of image segmentation. The research addresses the question: Can non-Cartesian deep learning models outperform traditional Cartesian models in segmentation tasks? The purpose of the study is to design and evaluate deep learning architectures that integrate Cartesian and non-Cartesian domains, with a focus on enhancing segmentation accuracy and robustness. To achieve this, the study employs a mixed-methods approach, beginning with a comprehensive exploration of deep learning concepts, followed by practical experimentation with established CNN architectures like VGG16 and UNet using datasets such as MNIST [3], CIFAR [4], and DUTS [5]. Building on this foundation, the research leverages the Non-Cartesian Deep Learning (NCDL) framework [1] to develop custom architectures that transition between Cartesian and non-Cartesian representations. These models were rigorously tested and compared against traditional 2D Cartesian UNet models using the DUTS [5] dataset and the Medical Segmentation Decathlon [2] dataset. The findings reveal that non-Cartesian models, particularly those with step-like structures alternating between domains, offer enhanced segmentation performance when using certain loss functions, demonstrating improved accuracy in specific scenarios. The study concludes that Non-Cartesian Computing holds significant promise for advancing deep learning, particularly in applications requiring high-precision segmentation, such as medical imaging.

Oceanna Liu

Faculty of Science

Supervised by Gerald Zamponi

Signaling complexes between TRPM3 channels and ORL1 receptors

My project, titled 'Signaling complexes between TRPM3 channels and ORL-1 receptors', completed under the supervision of Dr. Gerald Zamponi, had two aims: to determine if TRPM3 channels (of the transient receptor potential family) form a molecular complex with ORL-1 receptors (opioid receptor-like receptors, of a seven-transmembrane domain G-protein coupled receptor family), and to determine the general effect of this interaction. Both TRPM3 and ORL-1 contribute to the signaling mechanisms in the peripheral nervous system of pain and analgesia. It is known that TRPM3 channels are inhibited by distinct GPCRs, but it is unknown whether TRPM3 form molecular complexes with these GPCRs or if there is another regulation independent of G protein inhibition. Since ORL-1 receptors have been shown to internalize in response to sustained agonist application, we hypothesized that TRPM3 channels complex with ORL-1 are removed from the plasma membrane too. The first aim used co-immunoprecipitation to isolate TRPM3 and ORL-1 protein complexes, and western blotting to visualize them. This aim was successful- a complex was seen. The second aim used a biotinylating assay to determine the effect of TRPM3 channel plasma membrane expression by ORL-1. Decreased TRPM3 channels were seen as a result of ORL-1 complexing. The aims of this project were to explore a new regulatory mechanism of TRPM3, for the purpose of contributing valuable insight into finding potential targets for the therapeutic treatment of chronic pain.

Maria Mansi

Faculty of Science

Supervised by Diwakar Krishnamurthy

Creating a Next Letter Prediction Algorithm to Aid Nonspeaking Autistic Individuals in Communication

Approximately one third of autistic individuals are nonspeaking, meaning they are not able to communicate their thoughts and needs effectively through speech alone. Many from this population have learned to communicate by typing on keyboards and letterboards, often with the support of a Communication and Regulation Partner (CRP). This method has opened numerous doors for nonspeaking individuals, enabling them to pursue dreams such as post-secondary studies and publishing books. Increased access to these communication resources has allowed nonspeakers to express themselves and share their perspectives, significantly improving their quality of life. In recent years, virtual letterboards have emerged as a promising advancement to further enhance the communication experience and increase independence in typing. Since this technology is designed for use by nonspeaking individuals with autism, overstimulation, visual clutter, and impulsivity are all key considerations in order to design a communication tool that best supports its users. The goal of this project is to address these considerations by integrating a predictive text algorithm into the virtual letterboard. This real-time feedback aims to facilitate more efficient and intuitive text entry, allowing users to focus on typing without being distracted by an excess of visual elements. Once finalized, the predictive text program will be tested in a user study to determine whether the addition of predictive text is an effective method for reducing visual clutter and streamlining the process of communication via virtual letterboard. Ultimately, our aim is to enhance quality and ease of communication for nonspeaking individuals, empowering them to engage more fully with the world around them.

Kamilah Maudsley

Faculty of Science

Supervised by Fabian Neuhaus

Investigating the Physical Accessibility of Wet Chemistry Teaching Laboratories

The goal of this project was to develop a tool which could be used to assess the physical accessibility of wet chemistry teaching laboratories. Primary research consisted of reviewing guidelines related to physical accessibility in laboratory contexts and methodologies for auditing the accessibility of built spaces. Stakeholder perspectives regarding physical accessibility in chemistry were also explored. Using criteria proposed I guides to laboratory accessibility, a 93-point checklist of features which would make a lab accessible to physically disabled students was generated. An audit of a wet chemistry teaching laboratory was conducted to test the checklist's efficacy at gauging a space's physical accessibility. Thirty recommendations were given to improve the accessibility of the lab that had been audited. New ways of classifying checklist points, creating accessibility criteria, and conducting audits were proposed. Ultimately, it was determined that the accessibility audit tool developed would benefit from interviewing students and scientists with disabilities and testing through the audit of laboratories spanning different design eras. It was also found that the built environment of a lab is only one factor which affects the physical accessibility of that space.

My research this summer allowed me to make an impact in the field of sport injury prevention, while giving me the opportunity to give back to the youth sports community that I grew up in.

Gavin McLennan

Faculty of Science

Supervised by Carolyn Emery

Injuries and Concussions in Canadian Adolescent Club Rugby: Are Girls at Higher Risk

Rugby is a collision sport with high injury and concussion rates reported internationally. A paucity of research considers elite adolescent Canadian club rugby, as previous injury research has focused on high school rugby. This study aims to explore match injury and concussion rates, types, mechanisms, and severity across girls and boys adolescent (ages 11-18) club rugby. In a large prospective cohort study, SHRed Concussions, validated injury surveillance was completed during the 2023 club rugby season in Calgary, Alberta. Participants completed preseason testing and preseason questionnaires which included demographics and medical history. Injuries were recorded by study personnel and validated by a study therapist. Individual match participation (hours) was documented. Injury incidence rates (IRs) were estimated by gender using Poisson regression (adjusting for cluster by team and offset by exposure hours). Overall, 167 girls (N=8 teams) and 140 boys (N=8 teams) participated. An overall injury rate of 45.3/1000-match-hours (95%CI:36.9-54.9) was observed. Of injuries collected (n=116, 57% girls; 43% boys), the most frequent injury locations were the head (n=43, 37%), followed by the knee and ankle (n=17, 15% each). Concussion was the most frequent injury type (n=41; 59% girls, 41% boys). Injury and concussion rates were higher for girls [48.2 injuries/1000-match-hours (95%CI:36.8-62.0) and 18.5 concussions/1000-match-hours (95%CI:11.7-27.7)] compared to boys [41.8 injuries/1000-match-hours (95%CI:30.2-56.2) and 15.5 concussions/1000-match-hours (95%CI:8.8-25.2). The tackle was the primary mechanism for most injuries observed (n=61, 53%). Overall, median severity due to injury was 10 days of time-loss (IQR:2-22). Injury and concussion rates in Canadian youth club rugby were observed to be higher for girls than boys. Future work to identify gender-specific prevention strategies to reduce injuries is needed.
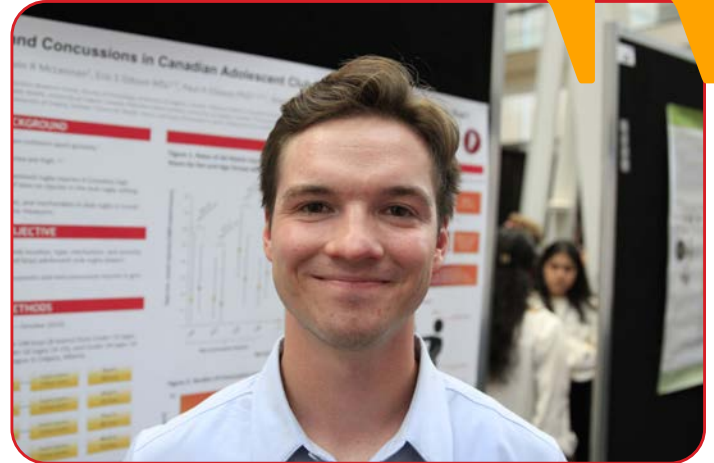
Sarthak Monga

Faculty of Science

Supervised by Tyler Bonnel

AI and Animal Behavior: Tutorials in Reinforcement Learning Ecology

This project aimed to create a series of tutorials designed to introduce undergraduate students to ecological reinforcement learning using Unity and ML-Agents. The goal was to provide a guided pipeline for building environments, bodies, and brains for AI agents, making it easier for students to study ecological models. Initially, we developed a basic Unity environment featuring a rollerball controlled through heuristics, which interacted with food objects. Later, we expanded the scope by training the model using deep learning, leveraging Google Colab and ML-Agents to provide GPU access. Throughout the project, I developed tutorials that facilitated setting up Unity, creating environments, and using pre-built reinforcement learning models. These tutorials addressed common errors and challenges, helping future students navigate Unity and ML-Agents more efficiently. Although we faced challenges with creating complex bodies and integrating advanced camera vision due to hardware limitations, the tutorials remain a valuable resource for new students. The outcome is a set of beginner-friendly resources aimed at simplifying the learning curve for ecological reinforcement learning in Unity.

Participating in a summer research project made me realize that, although I hadn't considered it much before, research could genuinely be a fulfilling career path for me
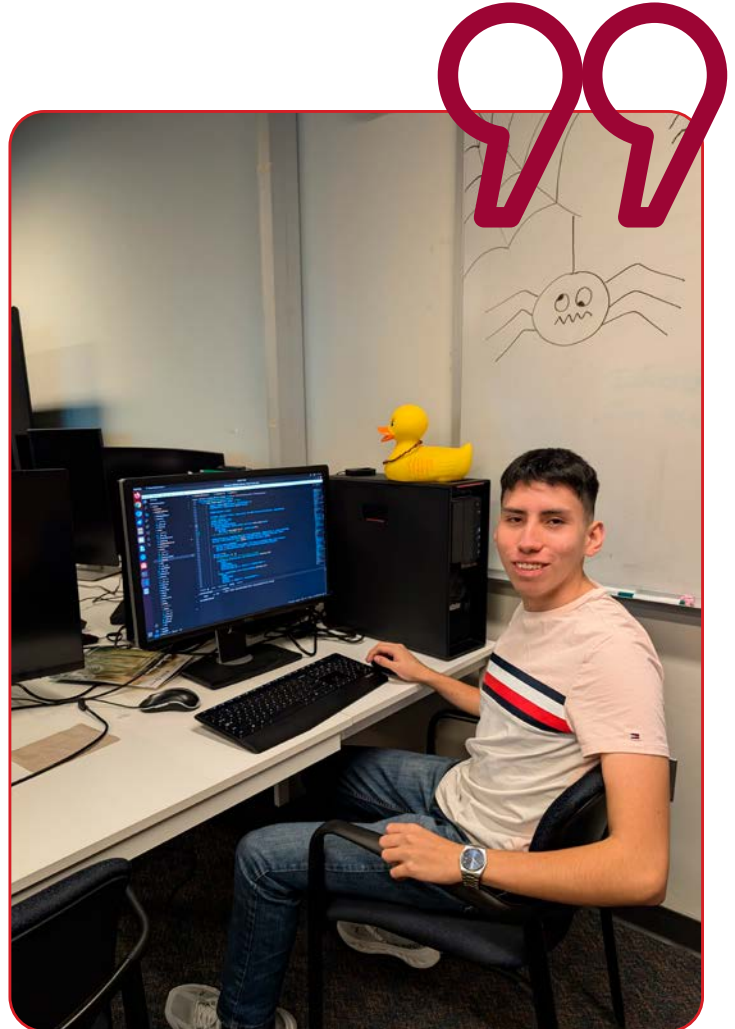
Mauricio Murillo

Faculty of Science

Supervised by Farhad Maleki

SynthSet: Generative Diffusion Model for Semantic Segmentation in Precision Agriculture

We propose a novel methodology to address data scarcity in semantic segmentation tasks in precision agriculture, where obtaining large-scale datasets with pixel-level annotations presents a bottleneck for the development of generalizable deep learning models. Leveraging Denoising Diffusion Probabilistic Models and Generative Adversarial Networks, we propose a dual diffusion model architecture for generating realistic agricultural data along with their pixel-accurate segmentation masks without any human intervention. We utilize a super-resolution model to enhance the quality of the generated images and improve the fidelity between the generated images and their corresponding masks. We show the proposed method's effectiveness in eliminating the data bottleneck in the task of wheat head segmentation in two ways. First, the high quality of the generated samples showcases the method's capacity to generate and expand semantic segmentation datasets. Second, models trained with our generated data on a downstream segmentation task show promising performance when evaluated with an external test set of diverse real wheat fields. These results show how the proposed methodology is effective in addressing data scarcity in semantic segmentation tasks, and indicate the methodology can be adapted for various segmentation tasks in precision agriculture and beyond.

Sarah Neumann

Faculty of Science

Supervised by Tricia Stadnyk

My summer research project has taught me that you may fail because of some troubles you can't control, and that's okay.

Sungjin Park

Faculty of Science

Supervised by Michelle Dolgos

Investigating zinc(ii) doping effects on the novel piezoelectric material 0.675bi(fe2/8ti3/8mg3/8)o3–0.325pbtio3

Piezoelectrics are a class of materials that translate between electrical and mechanical Piezoelectric materials convert mechanical energy into electrical energy and vice versa, enabling their use in actuators, sensors, and energy harvesters. However, their application is limited at high temperatures due to the Curie temperature (TC), above which they lose piezoelectric properties. This restricts their utility in high-temperature environments such as automotive and aerospace industries. The Dolgos research group has developed a promising low-lead piezoelectric ceramic, $0.675Bi(Fe_{2/8}Ti_{3/8}Mg_{3/8})O_3$–$0.325PbTiO_3$ (BFTM-PT), with a high TC of 650 °C and excellent piezoelectric performance. However, like many high- TC piezoelectrics, its performance declines above 150 °C due to the depolarization temperature (Td). Previous studies suggest doping as a method to enhance Td. This research investigates the effect of substitutional doping with metal cations, including cobalt(II), gallium(III), niobium(V), zirconium(IV), and zinc(II), on BFTM-PT. Among these, zinc(II) doping successfully formed a phase-pure product without competing phases. Notably, increasing zinc(II) concentration induced a monoclinic to tetragonal phase transition, altering the material's crystal structure. These findings demonstrate zinc(II)'s successful integration into the BFTM-PT structure. Further research is needed to evaluate whether zinc(II) doping can enhance Td while preserving the piezoelectric properties of BFTM-PT, opening the door to broader high-temperature applications.

Noah Pinel

Faculty of Science

Supervised by Jerrod Smith

A Bridge between Graph Theory and Representation Theory

By observing the relationship between the adjacency operator of a Cayley graph and the defining action of the regular representation of a finite group we are able to construct a bridge that allows us to go from one side to the other. The aim of this work is to make use of this bridge so that we can do spectral analysis of Cayley graphs over groups that are constructed from wreath products. In general, spectral analysis in the world of graphs reduces to Eigenvalue computations of square matrices of order n, as n can be arbitrary, this raises issues with regards to computational complexity. By crossing this bridge into the world of representation theory we are able to reframe our graph theory problem into a representation theory one. Specifically, we get an isomorphism between the adjacency operator of some Cayley graph and a special direct sum of matrix irreducible representations that coincide with the decomposition of the regular representation. Meaning, if we can find all irreducible representations of the base group of our Cayley graph we can use this isomorphism to get our spectra in a much simpler form. We make heavy use of Clifford Theory and the so called "Little Group Method" for these allow us to retrieve all of the irreducible representations of particular classes of wreath products, meaning we have a general way now to do spectral analysis of complicated Cayley graphs.
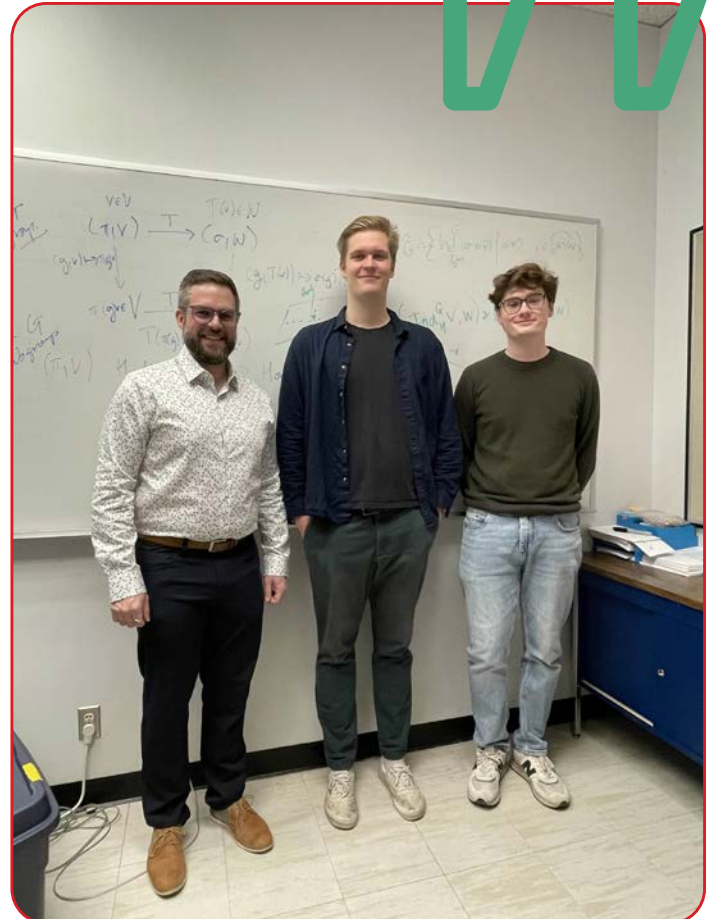
Apolline Pistek

Faculty of Science

Supervised by Jeff Biernaskie

Development of an in-vitro Assay to Assess the Impact of Stiffness and Pro-Regenerative Cytokines on Dermal Fibroblasts

When all the layers of the skin are destroyed, hypertrophic scarring typically occurs which leaves the skin stiff and contractile, impairing function and diminishing quality of life. Such scars form by overreactive fibroblasts that are recruited to fill in wounds and deposit inappropriate or excessive amounts of extracellular matrix. Unfortunately, there is limited knowledge regarding skin regeneration and ways to combat this overreactive state. Previous work in the Biernaskie Lab has identified several proteins/genes that are associated with either fibrosis or skin regeneration in mammalian animal models. The purpose of this project is to explore the therapeutic potential of selected 'pro-regenerative' proteins by studying their effects on cultured human fibroblasts. However, in vitro experiments typically use tissue culture plastic which has a super-physiological stiffness which may inadvertently induce a pro-fibrotic state and potentially mask the effects of any pro-regenerative factors. Hence, an in vitro assay was developed that uses silicone substrates with a stiffness comparable to skin, in order to better evaluate the pro-regenerative effects of candidate therapeutics and to assess the role of stiffness in modulating these responses. After seeding fibroblasts on substrates of various stiffnesses and incubating with and without potential regenerative factors, immunostaining, ELISA, and qPCR will be used to measure inflammatory cytokines and other markers associated with scar formation. We expect to find that stiffness impacts the sensitivity of fibroblasts to our candidate therapeutics and that an optimal stiffness can be employed to detect regenerative responses in our in vitro system. In future work, promising pro-regenerative factors identified in vitro will then be tested in animal models to further assess if these therapeutics can reduce the severity of fibrotic scars following injury.

Isha Safdar

Faculty of Science

Supervised by Jamie L. Benham

Comparative Success of Recruitment Strategies for a Pilot Study Among Women with Polycystic Ovary Syndrome

PCOS is a hormone disorder affecting 5-18% of women in the world with reproductive, metabolic, and psychological effects throughout their lives. Hyperandrogenism, irregular cycles and polycystic ovary morphology are the characteristic features of PCOS. Although PCOS affects a substantial number of women in our population, in research it is underrepresented. We conducted a pilot study of 35 participants to determine distinct glucose patterns in people with PCOS using Continuous Glucose Monitoring (CGM). To assess feasibility of conducting a larger prospective cohort study, we evaluated participant recruitment by assessing the rate of recruitment and determined which recruitment forms are the most effective for this underrepresented population. Various methods of recruitment were used which included putting up posters in public spaces, advertising on Facebook groups, word-of-mouth and clinical recruitment. Through the study we were able to see that none of the participants were recruited using more than one technique indicating that all four recruitment strategies used in this study were crucial for reaching women with PCOS.

What I value most about conducting a summer research project is having the opportunity to apply theoretical knowledge to pressing issues close to my heart.

Sarah Sait

Faculty of Science

Supervised by Gregory Cairncross

Isolation of quiescent and slowly proliferating neural stem cells from the SVZ using platelet derived growth factor C (PDGFC)

Our work shows for the first time that murine neural stem cells (NSCs) can be isolated and maintained in a stem-like state using platelet derived growth factor C (PDGFC). PDGFC is a member of the PDGF family of ligands, and like PDGFA, exerts its biological effects via PDGF receptor alpha (PDGFRa). PDGFC is expressed in the brain in glia with high levels in the subventricular zone (SVZ). Here we show that PDGFC-isolated multipotent NSCs are maintained in a quiescent state. These quiescent cells express NSC markers SOX2 and Nestin and divide rapidly when PDGFC is replaced by epidermal growth factor (EGF)/fibroblast growth factor (FGF), the gold standard for culturing NSCs. Moreover, they can differentiate into oligodendrocyte progenitor cells (OPCs) in PDGFC+FGF. To examine the identity of quiescent cells isolated from the SVZ using PDGFC, we compared their gene expression patterns to NSCs isolated using EGF/FGF and found a stemness profile in both. Furthermore, with respect to the in vitro system, cells in PDGFC were more similar to SVZ tissue than those in EGF/FGF, implying a less artificial growth condition. Additionally, transcriptomes of OPCs in standard PDGFA+FGF to those in PDGFC+FGF were indistinguishable, suggesting that PDGFC can substitute for PDGFA in OPC isolation. Our findings suggest an underappreciated role for PDGFC in the regulation of NSCs in the mammalian brain.
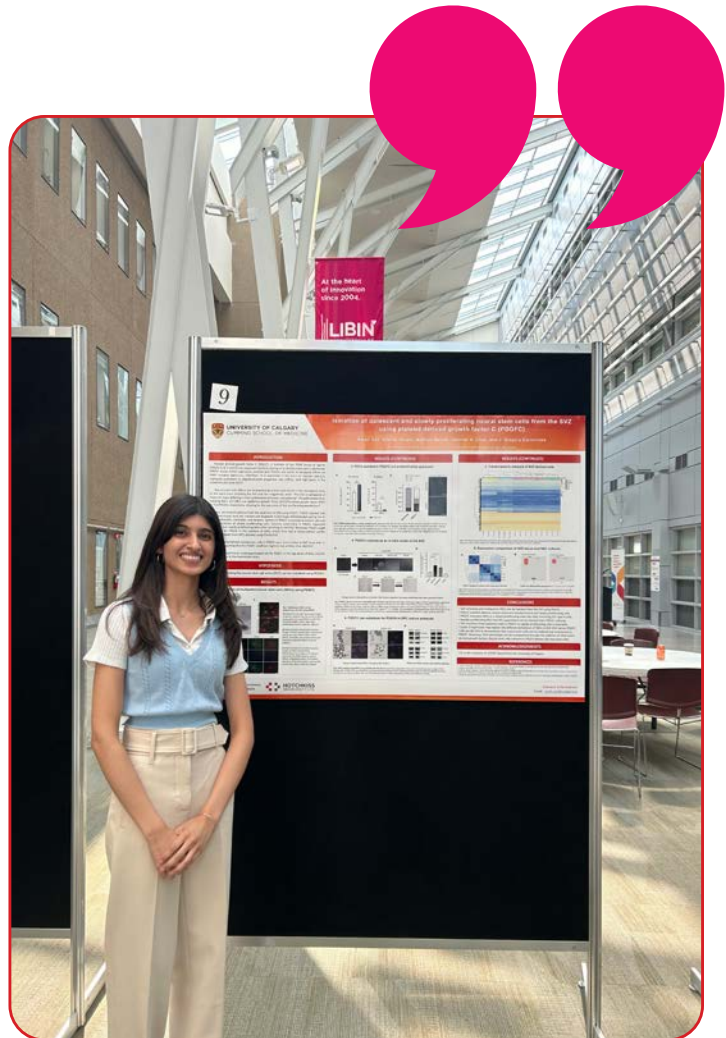
Through my summer research, I gained a hands-on appreciation for the complexity of the extracellular matrix and the meticulous process of isolating it within biological systems — an experience that deepened my understanding of scientific precision and perseverance.

Sanraj Singh

Faculty of Science

Supervised by Robert Newton

Comparitive Study of Decellularization Protocols for Tissue Extracellular Matrix
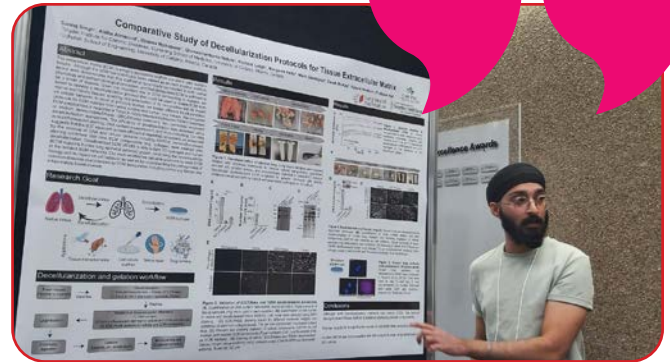
The extracellular matrix (ECM) is a highly specialized scaffold into which cells reside in tissues. Although the ECM has historically been viewed as an inert physical scaffold, recent work demonstrates that this scaffold is dynamically remodelled in both normal physiology and pathophysiological processes, and that deregulated ECM is sufficient to be a driver of disease. Given the important role of ECM remodelling in disease, we aimed to develop a decellularization protocol that could be used to isolate ECM from normal and fibrotic tissues, enabling characterization of its composition and its impact on cellular behavior. In proof of principle studies, we tested different decellularization protocols for ECM isolation from native porcine and human lung tissues. We compared ECM preparations in response to Triton X-100/ammonium hydroxide (TX/NH) treatment or sodium deoxycholate/DNase (SDC/DNase) treatment; two commonly employed decellularization approaches. The efficiency of decellularization was assessed using immunofluorescent staining, DNA content measurement, and immunoblotting. Our data suggests that the SDC approach is more efficient at depleting cell content, as evidenced by the removal of DNA and cellular proteins including GAPDH. Immunofluorescent staining confirmed that core ECM components (e.g.
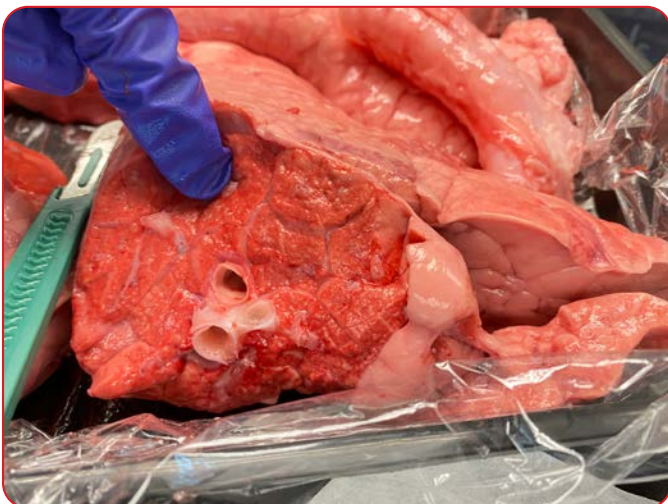
collagen) were retained after decellularization. Decellularized ECM (dECM) is able to form 3D hydrogels and human dECM supports human lung epithelial spheroid growth, confirming the biocompatibility of the isolated ECM networks. Our work establishes valuable protocols to study ECM biology and its impact on cell behavior as well as for understanding the pathogenesis of common diseases characterized by ECM deregulation including pulmonary fibrosis and inflammatory bowel disease.

Michael Schieman

Faculty of Science

Supervised by Omid Haji-Ghassemi

Structural Determination and Method of Regulation for Sac6p EF-Hand Domain

Plastins are a class of actin-binding proteins conserved across eukaryotic organisms, playing a crucial role in cellular functions such as motility and structural integrity. Overexpression of plastins in humans has been linked to cancer metastasis through the formation of filopodia, highlighting the importance of understanding their regulation and structure. This study focuses on Sac6p, the yeast S. cerevisiae ortholog of human plastins, specifically investigating the structure of its EF-hand domains. While mammalian plastins bind calcium via these EF-hand domains to mediate structural changes and actin binding, Sac6p likely lacks this calcium-binding capability due to changes in the amino acid sequence. However, it is similarly regulated by calcium inside cells through an unknown pathway. The aim of this study was to determine the structure of the Sac6p EF-hand domain using X-ray crystallography and to determine the binding capabilities of human Calmodulin to the EF-hands of Sac6p using isothermal titration calorimetry (ITC). Although the final structural determination is still pending, successful crystallization of the Sac6p EF-hand domain was achieved. In addition to this, preliminary ITC data suggests Sac6p does not significantly interact with human Calmodulin. These findings reveal a need for future studies into the regulatory mechanism of actin bundling by Sac6p.

In their own words

I always knew if I was to do research, it would be something involved with cancer. Several of my family members have contracted the disease, thankfully not too severely, but cancer, nonetheless. This interest was a way for me to be passionate about whatever I'd be working on, and to potentially see the effects research can have on improving people's lives.

Growing up in rural British Columbia in a town smaller than UCalgary's campus, university wasn't really advertised to high school students. Deciding to go to university felt risky, but I am so glad I did.

In lectures, I met my supervisor and learned I was interested in proteins. He prompted me to apply for a PURE Award so I could enter his new study at a ground level. Over the summer, I've worked with planstins, which have to do with cell shape and movement. They're often over expressed in cancer cells, so by researching what they bind to and what that looks like, we can explore potentially slowing cancer metastasis. This experience has been so unique from learning in a classroom. At the start, I assumed research was a linear process, but trial and error play a huge role. Just because something worked once doesn't mean it will work again. I've learned that to me, resilience means pushing myself to keep trying new things and to keep learning from my supervisor and others in the lab. It's hard in the moment, but if you keep pushing yourself, things will work out.

Ammar Sleitin

Faculty of Science

Supervised by Nicolas Jacquelot

The Role of Type 2 Innate Lymphoid Cells in PD-1 Blockade Therapy Efficacy

Immune cells protect us against infections and cancer. However, these cells can become dysregulated, expressing molecules that negatively regulate their function. These include programmed cell death protein 1 (PD-1). Anti-PD-1 antibodies (α-PD-1), designed to block PD-1 and restore the ability of T cells to kill cancer cells, have improved cancer prognosis in the clinic. However, this is not a universal cure, and many do not respond to these treatments. We previously demonstrated that PD-1 negatively regulates type 2 innate lymphoid cells (ILC2s). However, it is unknown if ILC2s play a role in the efficacy of PD-1 blockade. This project investigated the impact of ILC2s in PD-1 blockade therapy. We used an ILC2-deficient mouse model to study how ILC2s influence α-PD-1 treatment. ILC2-deficient mice and heir controls (ILC2-sufficient) were inoculated with MC38 tumour cells and treated with α-PD-1 or isotype control. We evaluated changes in treatment efficacy and tumour progression. We observed increased tumour size and weight in ILC2-deficient mice compared to treated controls. Additionally, no significant difference was observed between α-PD-1 and isotype-treated ILC2 deficient mice. Preliminary findings suggest a reduced response of ILC2-deficient mice to α-PD-1 compared to controls, indicating that ILC2s may influence PD-1 blockade therapy efficacy. Future experiments will confirm these results, and evaluate changes in treatment efficacy and the influence of ILC2s in shaping the tumour microenvironment via flow cytometry. By identifying a novel PD-1 pathway, this project supports combination therapies targeting ILC2s and PD-1 blockade to enhance treatment response.

One thing I was surprised about doing a summer research project is how rewarding it feels to see theoretical models like modal logic actually work in practical applications.

Ahmed Tahmid

Faculty of Science

Supervised by Gillman Payette

Exploring Decision Methods for Scotch-Jennings Forcings

Inconsistent data poses significant challenges across various sectors, from healthcare to finance, where data reliability is critical for decision-making processes. This research explores the application of Schotch-Jennings Forcing, a paraconsistent logic method, to address inconsistencies in databases. By building upon previous theoretical work, we aim to develop an efficient algorithm that can derive meaningful conclusions from inconsistent datasets without trivializing the results. By focusing on modal logic KD, we are ensuring that the system maintains logical consistency while handling multiple conflicting data points. Our approach optimizes a decision-making algorithm that helps in identifying consistent subsets within inconsistent datasets. It is basically an algorithm that generates proof trees according to the modal logic KD. This enables us to evaluate the level of inconsistency and derive valid inferences from contradictory information. The successful implementation of this algorithm, tentatively named "Algorithm X," will enhance the reliability of data processing in fields like healthcare, where inconsistencies in patient records can lead to serious consequences, such as improper medical treatment. Through this research, we address both theoretical and practical aspects of data inconsistency, offering a novel solution to an enduring problem in database management.
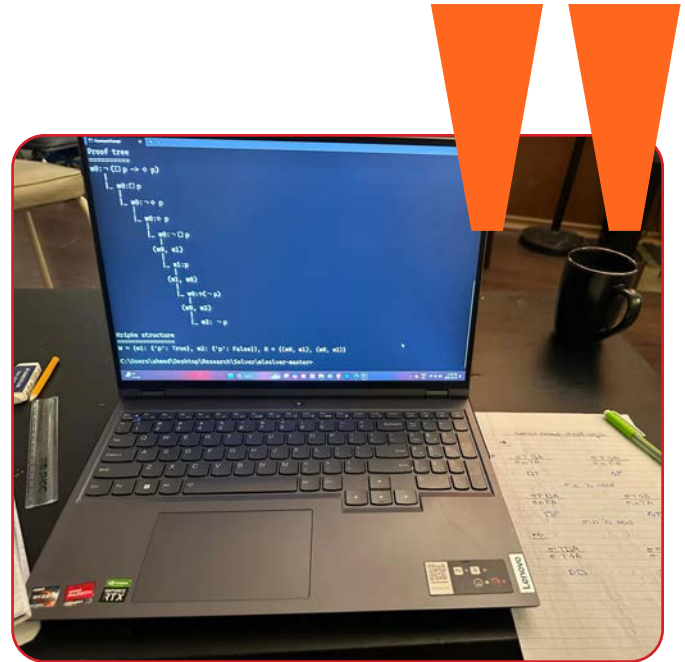
Jarin Thundathil

Faculty of Science

Supervised by Ryo Suzuki

Augmented Physics: A Machine Learning Powered Tool for Creating Interactive Physics Simulations from Static Diagrams

Augmented Physics is a machine-learning powered tool we designed for creating interactive physics simulations from static textbook diagrams. Our purpose was to explore the use of augmented reality and artificial intelligence tools for enhancing physics learning. Using open-source computer vision libraries including Segment Anything and OpenCV, our system can semi-automatically extract diagrams from physics textbooks and generate interactive simulations to supplement the extracted content. These simulations are seamlessly integrated into scanned textbook pages by overlaying them with the original diagrams, facilitating interactive and personalized learning experiences across a range of physics concepts including gravity, optics, circuits, and kinematics. We conducted a design elicitation study with seven physics instructors to yield four key augmentation techniques: 1) augmented experiments, 2) animated diagrams, 3) bi-directional manipulatives, and 4) parameter visualization. We confirmed the viability of our system though a technical evaluation, usability study (N=12), and expert interviews (N=12). Our findings suggest that digital augmentation of physics diagrams using Augmented Physics improves engagement with content and facilitates personalized learning experiences in physics education.

Alireza Vafisani

Faculty of Science

Supervised by Yani Loannou

Temperature-based Knowledge Distillation: Training DistilBERT from BERT across Multiple Temperature Settings

This project explores how knowledge distillation can be used to train a smaller model, DistilBERT, using information from a larger model, BERT. Knowledge distillation helps transfer knowledge from the bigger model (the "teacher") to the smaller one (the "student"). The goal is to make the smaller model perform well while being faster and more efficient and keeping an accuracy very close to the teacher model. One key factor in this process is the temperature used during training. Temperature controls how "soft" or "sharp" the predictions from the teacher model are, which helps the student model learn from both the certain answers and the less certain, more exact predictions. We trained the DistilBERT model at 9 different temperature settings, ranging from 1 to 9, to see how temperature affects the learning process. For each temperature, we trained the model and evaluated its performance using metrics such as accuracy, F1 score, and loss. We saved the models, tokenizers, and plots that show how the models performed over several training epochs. The results help us understand how temperature affects the quality of knowledge distillation and can guide future research on making models faster and more efficient while maintaining good performance. Moreover, knowledge distillation helps us saving time and resources. In future work, we aim to measure bias and fairness in smaller models like DistilBERT. By incorporating fairness metrics, we can evaluate whether the distillation process maintains fairness or introduces biases during model compression.

Selena Wang

Faculty of Science

Supervised by Matthew Hill

Examining THC's Effect on Reward-Seeking Behaviour

With more than a quarter of Canadians reporting recreational cannabis use in 2023, research is necessary to explore this increased trend to better our understanding of how cannabis and THC-dominant cannabis products impact the brain and behaviour. THC is the primary psychoactive component of cannabis and is responsible for producing the intoxicating effects experienced by users through its interactions with the bodies' endocannabinoid system. The objective of this project was to investigate how exposure to acute THC vapour affects incentive value, motivation, and reward-seeking behaviour. Through an operant reward-based paradigm using a seeking and taking lever sequence, rats were trained to encode the value of a sugar pellet reward following exposure to vehicle (polyethylene glycol) or THC (10%) vapour. During a reward extinction test, the rats' responses to the seeking lever were motivated by the incentive value of the reward. A two-way ANOVA test with repeated measures assessed the responses of vehicle and THC groups at baseline and testing timepoints. Based on the statistical tests and comparison, there was a significant effect of drug treatment during testing and time on the VEH group. THC did not result in a significant difference in reward-seeking behaviour from baseline to testing, while the rats exposed to the vehicle encoded the reward as highly salient and showed an increased in reward-seeking behaviour. The findings from this project contribute to the growing knowledge of THC and cannabis' effect on motivation, reward, and its interactions with the endocannabinoid system.

Josh Wildeman

Faculty of Science

Supervised by Paul Barclay

Design and Optimization of Antennae for Optically Detected Magnetic Resonance

Diamond microdisks with a high density of nitrogen vacancy (NV) centers can be leveraged for many quantum sensing applications. Optically detected magnetic resonance (ODMR) is a measurement of photoluminescence (PL). This occurs when the spin state of an NV colour center is altered by a microwave (MW) field on resonance at ~ 2.87 GHz. The MW field drives a transition to the +/- 1 spin state; these electrons can then be driven to the excited state with a green laser. The spin +/- 1 state has a much larger probability of photons entering the singlet state which has a larger lifetime than a normal PL emission from the excited state to ground state. When this process is driven you can observe a decrease in NVPL due to a high population of the singlet state. Currently the lab uses a nonideal approach to deliver MW fields to our devices. This work involves the design of an MW antenna capable of spin state transition. The main criteria being a resonant frequency of ~ 2.87 GHZ, a large bandwidth to address multiple resonances, and a strong MW field directed upwards. This was done by reviewing literature in which similar antennae were created. This resulted in the simulation of two different designs in ANSYS. Optimization was performed to achieve manufacture specs that also met all requirements. From here the designs were fabricated by PCB Way and tested using a Vector Network Analyzer (VNA) to analyze the reflection coefficient S11. It is appreciated that the antennas fabricated can effectively deliver MW fields to devices.

My summer research project allowed me to form connections and meet new like-minded people.

Teagan Young

Faculty of Science

Supervised by Adela Kincaid

Preserving Our Waters Together: ERWP, and Indigenous Communities River Project

This research project titled Preserving Our Waters Together: ERWP, and Indigenous Communities River Project by Teagan Young aims to critically reflect on the framework of braiding Indigenous and scientific knowledge by actively engaging with the Elbow River Watershed Partnership (ERWP) educational programs. ERWP is a non-profit organization dedicated to protecting and conserving the Elbow watershed. My research approach includes many different hands-on and reflective methodologies to help answer the overarching research question of how local Indigenous perspectives on water conservation can be integrated into the field school program. The 4Rs of Indigenous research, Respect, Relevance, Reciprocity, and Responsibility, serve as a valuable lens for structuring my findings and conclusions. Reflecting upon my experiences, I identified future recommendations for projects that can help further develop the growth of Indigenous knowledge in the organization's environmental education programs. The insights gathered throughout this project highlight how important educational programs can be in braiding knowledge systems together. Engaging with communities and youth in land-based learning settings provides a powerful and effective means of fostering mutual understanding and collaboration.
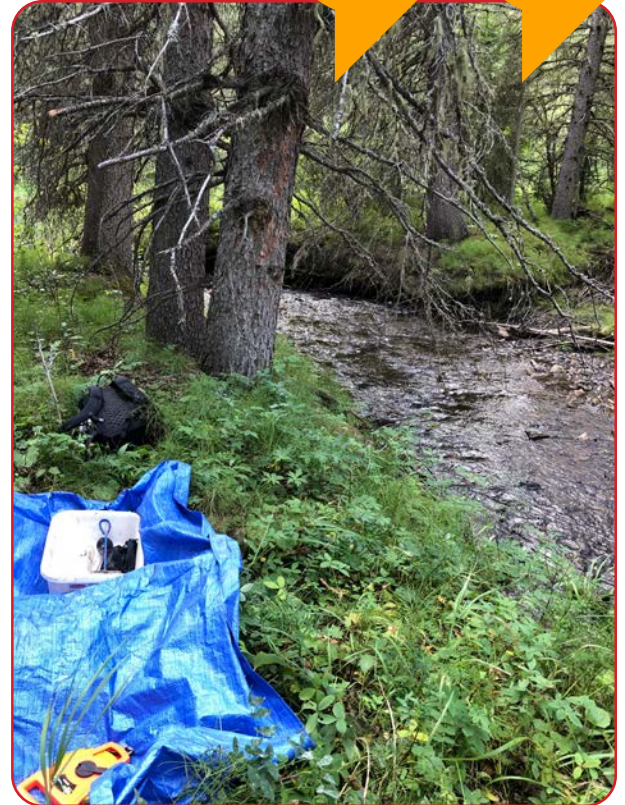
In their own words

My whole life, I have reflected on my Indigenous identity. My mother is Tahltan, and I was born and raised in Treaty Seven territory, in the city of Calgary. When I was younger, I visited my family for the salmon run, an important cultural event. While we were fishing, the Tahltan conservation officers took measurements of the fish. I had never seen science work with culture in that way before. When I applied for the PURE Award, I wanted to weave my interests in science and Indigenous knowledge in a similar way. For my research, I am working with the Elbow River Watershed Partnership (ERWP), a non-profit that offers school education programs, to explore how local Indigenous perspectives on water conservation can be integrated to their curriculum. They have several programs, where the students engage in water testing and learned about the ways in which people and do harm and protect water quality. Working with the ERWP and connecting with community educators has been so rewarding. In my final report, I am exploring what conservation means from an Indigenous lens and how Indigenous knowledge can be honored in education. Figuring out how to write this report in a way that is readable and respectful of Indigenous knowledge has been challenging, but my supervisor has been a huge support.

Like the ERWP participants, this is a learning journey. Things will not be perfect the first time, and that's ok. What's important is that I am learning and building new connections — thanking the land along the way.
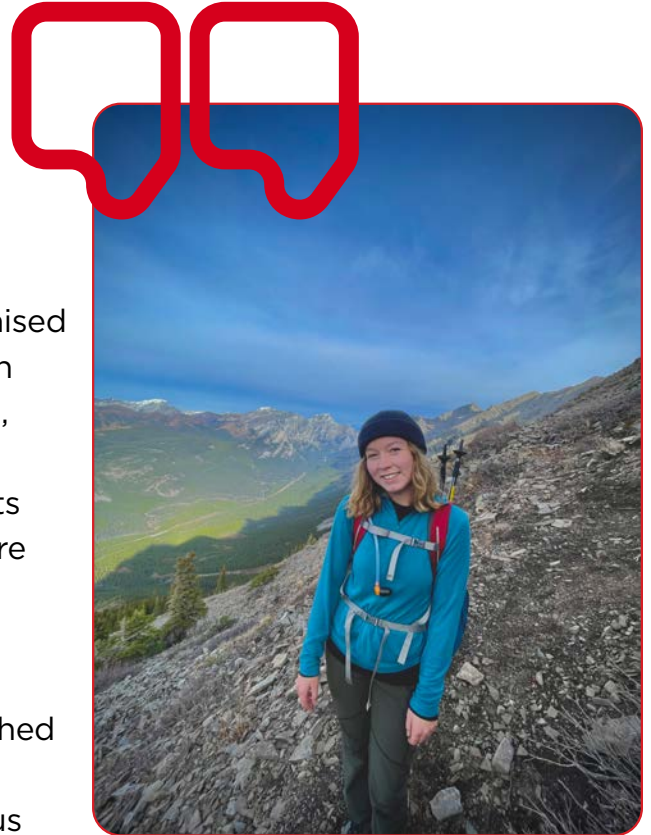
Haruka Yoshino

Faculty of Science

Supervised by Matthew Taylor

Unveiling Compact Elliptical Galaxies with the James Webb Space Telescope

Compact elliptical galaxies (cEs) are a relatively unexplored class of galaxy due to their small size and rarity. By exploring the kinematic properties of cEs, I aim to shed light on their origins and their place in the process of galaxy evolution. To do this, I wrote wrapper scripts in Python to statistically fit observational spectra from the James Webb Space Telescope to stellar population models, identified potential black hole candidates, and compared my results to literature values. Out of the four galaxies I studied, one known as VCC-1297 is a strong candidate for hosting a supermassive black hole. However, the data also implies the existence of a double nucleus, which has otherwise only been seen in the Andromeda Galaxy. Further work on this galaxy involves getting to the root of this double nucleus and identifying whether it is truly two black holes, or one black hole with undiscovered properties. As of now, preliminary results say VCC-1297 is the core of a formerly more massive galaxy, and the other three aren't, but other avenues of inquiry need to be explored before definitive conclusions can be made.

FACULTY OF
SOCIAL WORK

My research on anti-Asian racism has strengthened my sense of community and deepened my commitment to confronting systemic challenges.

Matsuyuki Hara

Faculty of Social Work

Supervised by Hieu Van Ngo

Anti-Asian racism in Canada: lived experiences, impact on mental health, and access to services and support

The Asian population is the fastest growing demographic in Canada. However, the Asian community has endured approximately 300 years of discrimination, including historical events such as the Chinese Head Tax and the internment of Japanese Canadians during World War II. Ithas often resurfaced prominently during crises such as the COVID-19 pandemic but tends to fade from public attention once the immediate crisis subsides, highlighting a cyclical neglect of underlying issues. This study explores the experiences of anti-Asian racism faced by Asian Canadians between 2017 and 2022. Through comprehensive data collection involving surveys (n=513) and individual and focus group interviews (n=32), the research aims to capture the lived experiences of Asian Canadians, assess the impact of racism on their well-being, and identify their needs for support. Key findings reveal significant health impacts due to racism, such as increased stress and mental health issues, alongside barriers to accessing formal support services. Based on participants' insights, the study proposes practical action plans, including public education programs, training for leaders and mental health professionals, and developing community-based and online services. These recommendations aim to bridge the gap between policy and practice, ensuring better support and prevention strategies for anti-Asian racism. By emphasizing culturally responsive services and promoting ongoing research, this study seeks to foster an inclusive and supportive environment for Asian Canadians.

Joanna Galasso

Faculty of Social Work

Supervised by Patricia Johnston

Exploring birth trauma and birth evacuations in Arctic Canada: How Inuit women continue to be primary resources for each other in a context of limited perinatal care, supports and services

Limited perinatal care, services and supports in Arctic Canada contribute to poor health outcomes for Inuit mothers and babies. The long-standing birth evacuation policy, which requires Inuit women in the Kivalliq Region, Nunavut, travel to give birth in hospitals, serves as a primary example of this point. Evacuation, structural barriers, racism and discrimination and other barriers together contribute to experiences in pregnancy and childbirth that can be highly traumatic. Birth trauma, or significant distress associated with childbirth, can hold detrimental impacts to the wellness of mothers, and implications for relationships with their infants, partners, family and community. Yet, limited information concerning birth trauma experienced by Inuit women in the context of evacuation exists. The creation of supports and services for Inuit women during the perinatal period requires better understandings of Inuit women's birthing experiences, including those experiences associated with birth trauma. Descriptive statistics from surveys completed by Inuit women in Kangiqliniq (Rankin Inlet) and Arviat, Nunavut, Canada as part of the Inuit Perinatal Health Hub project, were summarized, organized to better understand what resources women in the Kivalliq region require. Tentative findings from the surveys, alongside insights from town-hall style meetings and focus groups, suggest birth evacuations coupled with a lack of Inuit-centered, developed and managed resources, may contribute to Inuit women experiencing birth trauma. Insights from this work serve to inform discussions concerning the need for and creation of culturally relevant socio-health care, supports and resources for Inuit women during the perinatal period.

In their own words

Had I listened to my inner critic, I would never have applied for a PURE Award. I learned that the only limitations we have are the ones we put on ourselves.

I am in my second degree in Social Work, with experience in midwifery and perinatal and pediatric chiropractic. In returning to university, I thought of research as mainly quantitative in nature, and I couldn't wrap my head around its impact in the social work realm. I also thought I was too old and had too many responsibilities to engage in research fully. When my supervisor, Dr. Patti Johnston said she was looking for someone with perinatal experience for her study, I put myself out there and everything came together. Currently, there is not much research on what Inuit communities need in birthing supports, and we wanted to capture different Inuit voices.

This research was the most emotionally challenging experience I have ever had. I have sat in rooms with women and families with losses and miscarriages, and this was harder.

Throughout our interviews and surveys, we asked community members about their experiences, what they want, and how they support each other. There was so much I did not know about forced maternal evacuations and the trauma involved. Participants shared stories of the kinds of perseverance and support they provide one another. It has been incredible to read and listen to their stories. Our qualitative data captured such important information, and I've completely changed my thinking about the nature of research and my ability to engage in it. After my PURE Award is complete, I will continue working with Dr. Johnston as a research assistant, where we hope to present our findings at an international conference. Hopefully, this will extend into my master's thesis a year later.

Ayan Jama

Faculty of Social Work

Supervised by David Nicholas

Redefining Home: Compassionate Responses to Homelessness

The research project titled "Redefining Home: Compassionate Responses to Homelessness" aims to conduct a comprehensive literature review to develop empathetic and innovative strategies for tackling homelessness. This project will review and synthesize academic research, policy documents, and practical interventions to identify gaps, challenges, and effective practices in the field. By shifting the focus from mere shelter to the broader concept of "home," the project seeks to enhance understanding of homelessness and advocate for responses that emphasize compassion, dignity, and holistic support. This review will provide a foundation for creating strategies and policy recommendations that address the multifaceted nature of homelessness, ultimately aiming to improve both grassroots and policy-level responses.

In their own words

When telling my story, it's important to include both of my PURE Award projects, as one informed the other. The PURE Award has been so important to me. I had never participated in research in this capacity before. It's been rigorous but worth it. In 2023, I researched autism spectrum disorder (ASD) in the Somali diaspora, which has higher rates of ASD compared to other demographics. Coming from a Somali community in Minnesota, my cultural and religious upbringing taught me to think about disabilities as limiting. Soon, I realized this bias was impeding my research progress, as I was focused on the limitations of autism rather than the strengths of autism. In this moment, my internal dialogue was hard on myself, but I was determined to consider it a learning opportunity. People with ASD aren't incapable; they have their own goals, and they need supports that meet their unique capabilities. Now, I appreciate a holistic approach to supporting others and have applied this learning to my 2024 research on homelessness, where I explored the concept of "home."

With homelessness, compassion means considering, "what are our lawmakers doing? How do we help these populations obtain housing and meet their needs now?" rather than "why are they choosing this?."

This connects to my workplace; we provide services for individuals experiencing homelessness/disability by providing wrap-around services for their needs. When homeless encampments in Edmonton were taken down this year, our unit felt the impact. This deeply affected me. I've bonded with several houseless individuals, and they are some of the kindest people I have met. No matter their circumstances, they will make a community of their own. Our supports need to strengthen that community, rather than divide it.
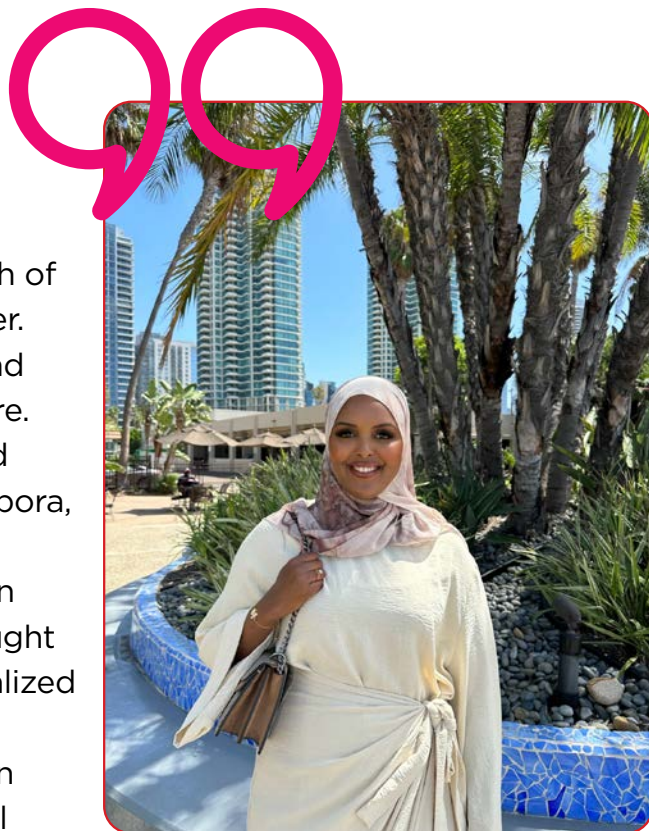
Danial Jamal

Faculty of Social Work

Supervised by Tanvir Turin Chowdhury

Understanding Anti-Muslim Racism: Perspectives and Experiences of Muslim and Non-Muslim Students at the University of Calgary

Islamophobia and anti-Muslim racism are pervasive issues that manifest in various forms, including discrimination, hostility, and exclusion, particularly affecting Muslim students in post-secondary institutions. Despite the growing body of research on Islamophobia globally, limited empirical data exists on how these forms of racism impact students in Canada. This study aims to explore the experiences of anti-Muslim racism among Muslim students at the University of Calgary (UCalgary) and to assess the perceptions of non-Muslim students regarding these experiences. Using a quantitative research design, the study employs a purposive sampling method to gather data from Muslim and non-Muslim students at UCalgary. Data collection is facilitated through an online survey distributed via the university's communication channels. Muslim students will report their experiences of anti-Muslim racism, including its impact on their mental health, academic performance, and social interactions. Non-Muslim students will provide insights into their understanding and awareness of anti-Muslim racism on campus. The survey will combine Likert scale measures with open-ended responses to capture both quantitative and qualitative data. Findings from this research will identify the prevalence of anti-Muslim racism, gaps in support services, and areas for improvement in fostering an inclusive environment. The study aims to inform university policies, contributing to broader equity, diversity, and inclusion (EDI) initiatives. By understanding the lived experiences of Muslim students and the perspectives of non-Muslim students, this research will offer recommendations for enhancing the support systems and cultural sensitivity at UCalgary. Ultimately, it seeks to contribute to scholarly discourse on anti-Muslim racism in higher education and to drive meaningful change towards a more inclusive academic environment.

My summer research project has taught me the importance of collaboration and how diverse perspectives can lead to innovative solutions.

Andrea Murphy

Faculty of Social Work

Supervised by Julie Drolet

Transformative Social Work: Anti-Oppressive Practice with a Green Social Work Lens

Climate change poses significant risks to communities, especially those already vulnerable due to socioeconomic or environmental factors. Green Social Work plays a crucial role in this context by integrating environmental sustainability with social justice to address both the immediate and long-term impacts of floods. This research aims to explore the integration of anti-oppressive principles with environmental justice within social work practice. The 2013 Southern Alberta flood serves as a pivotal case study to understand the intersection of social inequalities and environmental degradation. Community interviews were conducted with residents of Banff and Canmore, Alberta, who experienced the 2013 flood. While the disaster forced residents to evacuate, the response showed the community's resilience, with volunteers and first responders uniting to provide support. Canmore demonstrated a strong sense of solidarity. The Town of Canmore has since developed a flood resilience strategy, including the Cougar Creek Flood Mitigation Project, and a Climate Action Plan, highlighting efforts to reduce risks, promote sustainability, and address the impact of future floods.

FACULTY OF VETERINARY MEDICINE

Lindsey Hampton

Faculty of Veterinary Medicine

Supervised by Marie-France Roy and Brielle

AMR profiling of commensal fecal E. coli in domestic and feral horses in Alberta

Antimicrobial resistance (AMR) is a global problem that threatens human and animal health. While there has been much speculation regarding the role of animals and veterinary medicine in the spread of AMR, our current knowledge of AMR in Alberta horses or their role in the spread of AMR is very limited. The aim of our study was, therefore, to investigate current AMR patterns in domestic and feral horses in Alberta, while exploring the role that hospitalization, antimicrobial drug (AMD) administration or contact with other species might play in this complex problem. Fecal samples collected from various horse populations were used to isolate commensal fecal E. coli (a known AMR sentinel species) for AMD susceptibility testing. Fecal samples were collected from the following populations: 1) hospitalized horses on Day 0 and Day 2 or 3 of hospitalization, receiving or not receiving AMD; 2) feral horses before and after co-grazing with domestic cattle and 3) co-grazing cattle. Results suggest that feral horses usually harbor very little AMR E. coli, however, increased AMR in feral horses might be associated with grazing alongside domestic cattle or proximity to more populated areas. Additionally, domestic horses appear to have, overall, a higher prevalence of AMR E. coli compared to feral horses and AMD administration seems to influence their AMR profiles. The results of this study will increase our understanding of prevalence and dynamics of AMR in Alberta horses and help us identify interventions that might limit the spread of AMR in the future.

HASKAYNE SCHOOL OF BUSINESS

Being my first experience in the field of research, the PURE program allowed me to discover new dimensions of myself, pushing me beyond my perceived limits and expanding my understanding of what I can achieve.

Tu Anh Hoang

Haskayne School of Business

Supervised by Luminita Enache

Accounting Challenges with Blockchain Technology and Cryptocurrency

This paper examines the challenges that blockchain technology and cryptocurrency presents to the field of accounting. Before analyzing these challenges, we will define and discover the evolution of both blockchain and cryptocurrency, while also studying their applications and impact across various sectors. In this research, we gathered documents from the Big Four companies (Deloitte, PwC, EY, KPMG), and compared the accounting standards between the IFRS and the ASU 2023-08 amendments to explore the significant accounting challenges from blockchain and cryptocurrencies. Our primary result indicates that there are three potential challenges for accountants when working with cryptocurrencies and blockchain. These include the price volatility of cryptocurrencies, the complexity of blockchain technology for adopting and auditing, and the lack of a clear accounting standard for digital money. In an additional analysis about the case of FTX and the legal framework for cryptocurrencies in Canada, the U.S., and the UK, we found that the regulatory gap is a big problem in the crypto ecosystem which prevents auditors from finding financial frauds.

Naomi Phan

Haskayne School of Business

Supervised by Mark Anderson

Critical Thinking Micro-Credential Curriculum Design

Critical thinking is recognized as a vital skill for accounting professionals, yet it is often inadequately developed in traditional curricula due to the focus on technical content. This study addresses the gap by designing and implementing a micro-credential aimed at enhancing critical thinking skills among business students, particularly in accounting. The research employed both qualitative and quantitative methods, integrating the micro-credential into two accounting courses and collecting feedback through surveys. Findings revealed that students found the badge beneficial, with over 75% rating it as moderately to extremely helpful. However, feedback highlighted the need for more interactive and engaging content. Based on this input, the micro-credential was revised, incorporating interactive videos, enhanced case analyses, and debate discussions to foster deeper engagement. Despite positive responses, the study faced limitations, such as the inability to objectively measure the badge's effectiveness using the Watson-Glaser Critical Thinking Appraisal due to delays in obtaining IRISS approval. Future research will focus on objective assessments to better evaluate and refine the micro-credential. This study underscores the potential of micro-credentials in developing critical thinking skills, offering a scalable solution that can complement traditional accounting education.

Ayesha Sheikh

Haskayne School of Business

Supervised by Tunde Ogunfowora

Examining the Predictive Validity of the HEXACO@work Model for Future of Work Behaviours

This paper examines if the HEXACO@work personality inventory predicts employee reactions and attitudes to the future of work. The study uses a two-time point quantitative survey method to assess HEXACO@work traits and employees' attitudes to certain future of work variables. The analysis shows that Extraversion and Openness are moderately correlated to future of work variables. Extraversion and Openness are also predictive of these variables. The study shows that it is important for organizations to consider these variables in the design of their future workspaces. Not all employees will have favourable reactions or attitudes towards some of the advancements in their work environment. This study emphasizes the importance of considering individual differences when heading into the future.

My summer research project has taught me to stay open to new opportunities and to explore different avenues whenever possible.

Janice Ton

Haskayne School of Business

Supervised by Justin Weinhardt

Entrepreneurial Success and Well-Being: The Mediating Effects of Metacognition

Entrepreneurship allows individuals to derive meaning from their work due to the high levels of autonomy. Yet, it is often also associated with significant challenges and setbacks that can negatively impact one's mental health and well-being. This study investigates the role of metacognition - a self-regulator\ process involving awareness and regulating one's thinking-in improving entrepreneurial firm performance and well-being. Specifically, we examine the mediating effects of metacognition on entrepreneurial performance and well-being through goal progress. A sample of 236 self-identified North American entrepreneurs participated in a survey that assessed metacognitive awareness, psychological well-being, and perceived firm performance. Structural equation modelling (SEM) was used in our analysis, which found that metacognition positively influences goal progress and entrepreneurial satisfaction if interruptions are minimal. However, we found that this effect diminishes once interruptions increase, underscoring the importance of managing environmental factors such as interruptions. These findings contribute to the entrepreneurship literature by validating the measure of adaptive cognition (MAC) scale, exploring the mediating role of goal progress, and the moderating effect of interruptions on entrepreneurial outcomes. In the dynamic and often uncertain nature of entrepreneurial ventures, this study emphasizes the crucial role of metacognitive awareness in maintaining motivation and enhancing well-being.

In their own words

Throughout my degree, research was not on my radar. I wasn't sure how research fit into my concentration in organizational behavior and human resources, nor how to develop the skills I thought as necessary to do research well. Without knowing it, I had research questions I wanted to ask, and knowledge and skills that set me up for research success. Previous corporate internships provided me with direct experience of what organizational learning policies and procedures can look like in the workplace. Yet, I wanted to know how and why they came to be, and particularly, how they connect to equity, diversity, and inclusion. When I heard about my supervisor, Dr. Justin Weinhardt's, project on metacognition in the job search process, I saw a potential research match. So many young people, particularly from equity-deserving groups, are having difficulties finding work after graduation. We wanted to learn what methods individuals can use to improve their job search strategy to ultimately gain employment. As someone who is about to graduate and experience the job-search process, I am more passionate about our topic every day. Dr. Weinhardt's mentorship has been such an important part of my research success. At first, I doubted about my abilities. I felt out of place, like I couldn't translate my business writing into research writing. He told me my assumptions were incorrect. With his feedback and constructive criticism, I now have the knowledge and skills to connect my experiences with scholarship, and I consider my academic writing a strength. We will continue to collaborate next year and hopefully publish in the future.
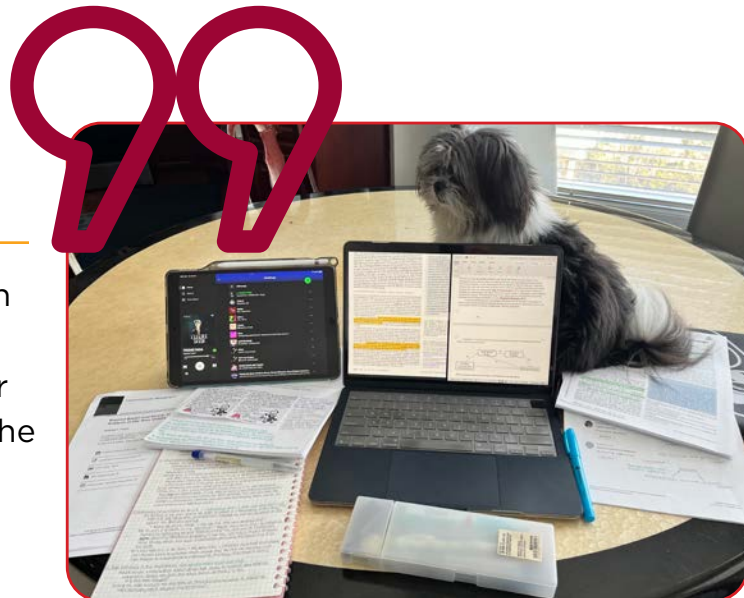
Georgino Issak

Haskayne School of Business & Faculty of Science

Supervised by Alfred Lehar

Blockchain User Behaviour: A Study on Smart Contract Interaction

Blockchain technology has transformed the management of digital assets and transactions, with smart contracts at the forefront of this change. Embedded directly into the blockchain, these self-executing, programmable contracts ensure transparency and efficiency in digital interactions. Operating autonomously when predefined conditions are met, these smart contracts are crucial to many decentralized applications and protocols. As blockchain technology continues to evolve, gaining insights into how users interact with its foundational elements, particularly smart contracts, becomes increasingly essential. Leveraging a comprehensive dataset of over 150,000 labeled Ethereum addresses, including more than 30,000 addresses associated with centralized exchanges, and over 10,000 Ethereum-based tokens, we analyze user activity patterns. Our analysis encompasses a range of behavioral dimensions, from economic standing and geographic distribution to smart contract usage diversity, frequency of interactions, and the depth and duration of user engagement, among others. By utilizing public transactional data, we can observe authentic user behavior in a non-intrusive manner. This data-driven approach strives to reveal a multifaceted picture of how blockchain applications shape user strategies and motivations, highlighting the diverse ways in which user groups engage with these technologies across different contexts. Our analysis aims to deepen insights into the evolution of the digital economy and the diverse ways individuals adopt and leverage these innovations.

Makenna Osis

Haskayne School of Business & Schulich School of Engineering

Supervised by Naor Cohen

Leadership in Young People

Childhood is a critical period of emergence for many behaviours associated with leadership in adults such as communication, conflict resolution, influence, empathy, and decision-making. Despite the well-established connection between early development and adult leadership, empirical research historically overlooked the focus on leadership development in youth. While there is a significant body of research on adult leadership, few studies specifically investigate the emergence of leadership behaviours in young children, particularly in the context of play. This paper argues that play, both structured and unstructured, serves as a vital environment for the natural development of leadership skills in young children. We conducted a structured literature review to address this gap. Our findings underscore the importance of play-based contexts as a platform for leadership development interventions in children.

SCHOOL OF ARCHITECTURE, PLANNING AND LANDSCAPE

Gianluca Cross-Bussoli

School of Architecture, Planning and Landscape

Supervised by Alberto de Salvatierra

Conversion of Vacant Land to Urban Farms: A Business Case

This research project examines the urban food production potential of the city of Calgary through the conversion of vacant lots into urban agriculture. This research was divided into five components. First, a literature review was conducted to understand the state of food production and food insecurity around the world, in Canada, and within Calgary. Conventional and unconventional agriculture practices, policy documents pertaining to urban agriculture (broadly), and information about existing urban agriculture operations in Calgary (specifically) were also examined. Second, a geospatial inventory of existing community gardens in Calgary was created using ArcGIS— complemented with a parallel investigation of their governance structures, practices, and spatial distribution trends. Third, an informal outreach initiative was formulated to seed conversations with local experts on urban agriculture while connecting with The City to better understand existing food policies, experiences working in the field, challenges and costs, and relevant policies and City programs. Fourth, a second geospatial inventory of vacant lots was created, also using ArcGIS. And fifth: relevant data and variables from the prior four components were distilled into a bespoke Python simulation script designed to calculate potential outputs based on the availability of land, Calgary's growing season potential, and the cost of conversion to urban agriculture. Through the above methodology, this research has found that if every vacant lot in Calgary were converted into urban agriculture, the lots could provide 1.69 billion servings of vegetables annually—accounting for 44% of the recommended annual adult vegetable intake for the population of Calgary. Furthermore, these lots could provide over 10,000 jobs, generating $94.7 million in wages. If produce is donated, the lots could also save their consumers $294 million total annually or $587 dollars per household annually on groceries—60.7% of the average Canadian household's annual vegetable expenses. If produce is sold, these lots could instead generate $294 million in revenue. Ultimately, this research is organized as a municipal-facing report that hopes to catalyze and convene the various decisionmakers in this policy space, while making ample use of geospatial and data visualizations to illustrate the scope, breath and depth of the analysis conducted.

My summer research was a meaningful opportunity to explore collaboration and representation in design education, allowing me to engage with diverse perspectives and learn about tools to facilitate inclusive learning environments.

Farah Haji

School of Architecture, Planning and Landscape

Supervised by Matthew Parker

Elevating the Student Experience

This study investigates pedagogical opportunities that work to cultivate an inclusive, adaptive, and supportive learning environment within design education. The scope of this work is limited to technical skill building courses with an emphasis on 2-dimensional and 3-dimensional Computer-Aided Drawing (CAD) and modeling software in the Bachelor of Design in City Innovation (BDCI) program at the University of Calgary. During its inaugural year, the BDCI emphasized the importance of fostering an inclusive and sensitive space; This study works to further support these values and provide avenues of opportunity for the faculty and students to consider. This exploration was facilitated through an extensive literature review, accompanied by dialogues with faculty at the School of Architecture, Landscape, and Planning (SAPL). The findings from this study reveal that models of teaching, such as Universal Design for Learning (UDL), Peer to Peer learning, and Affordance Based Design can provide a cohesive and mutually dependent interaction between curricula, learning spaces, and the student-teacher experience. Based on this understanding, a learning framework has been developed in which students are provided resources to learn 2-dimenstion and 3-dimension CAD tools through a flipped classroom and engage in peer-based collaborative activities to develop individual and collective fluency. This study contributes to the discussion focused around supporting and representing diverse learners within design education and continuing to develop research in evolving teaching practices.
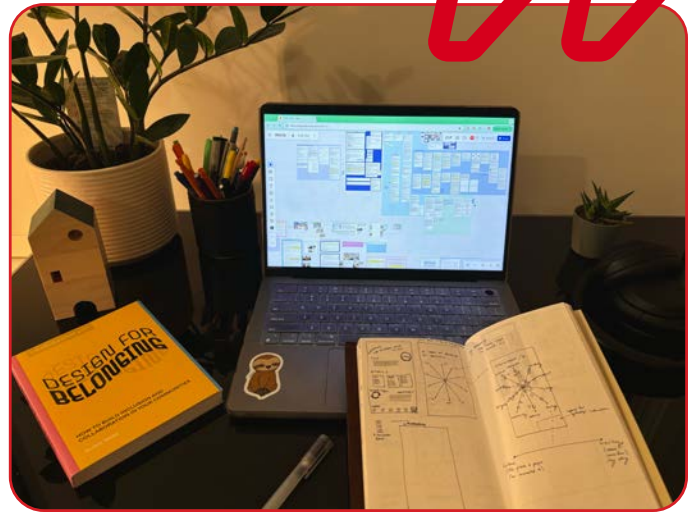
Jack Mclaughlin

School of Architecture, Planning and Landscape

Supervised by Chad Connery

Localized Assemblies; Indexing Material Fabrication Systems in the Alberta Context

This report aims to share an inquiry of historical and contemporary materials, extraction, and architectural precedent in the province of Alberta. It additionally explores extrapolative future carbon-conscious construction techniques that embody these concepts. It is intended to be an entry-level baseline for further design research into material fabrication potentials and critical regionalist approaches to architectural production within the province. Definitions of relevant concepts and precedents are curated and presented and It contains discussion and visualization of construction, material usage, as well as architectural trends since the first major colonial settlement of the province. The main portion of the findings has been partitioned by each common material category where uncovered information allows, and is structured as an exploration of the historical use, modern use and description of community partners and innovations for each. A listing and further description of each community partner and resource encountered is included to make the information gathered accessible to other design researchers and set a baseline takeoff point for possible future collaborations to bring public exposure to Alberta's innovative construction industries and build awareness of carbon-conscious architectural practices.

Daniel Snell

School of Architecture, Planning and Landscape

Supervised by Douglas Robb

Alberta's Atomic Ambition: Rewriting Alberta's Energy Landscape

Investigating the potential applicability of Small Modular Reactors (SMRs) in Alberta's evolving energy landscape. SMRs are portable nuclear reactors that produce a consistent base-load power with nearly no carbon footprint. An emerging technology that offers Canada a rapidly decarbonization agenda. Focusing on Alberta's heavy reliance on the oil and gas industry, SMRs bring about decarbonization within the sector, while allowing operations to continue. Nonetheless, cautions must be established to prevent the incentivization of the oil and gas industry through net zero energies such as SMRs. Benefits such as modularity, flexibility, economic opportunities, and lower emissions become apparent. However, there are inherent risks associated with SMRs with respect to social acceptance, environmental protection, and waste management. Historically, nuclear fuel extraction had poorly impacted Indigenous communities, resulting in intergenerational health impacts. These impacts must be considered before introducing SMRs into Canada's energy landscape. Who stands to benefit? Who and which communities are most at risk? As we push for the introduction of SMRs, design plays a critical role in negotiating decisions. Through modularity and capabilities, how can we integrate SMRs into communities to become a part of them, an addition for individuals to be proud of inviting in? While Alberta had committed to implementing SMR technology by 2035, the experience of an SMR must be studied to prevent securitized infrastructure and celebrate clean energy. Although researchers acknowledge inherent risks posed by nuclear energy, they also recognize the threat of continued investment in Alberta's fossil fuel sector in regard to global climate emergency. Urgent action is necessary.

SCHULICH SCHOOL OF ENGINEERING

Fardin Aryan

Schulich School of Engineering

Supervised by Ronnie de Souza Santos

Algorithmic Discrimination in Machine Learning and AI

Algorithmic discrimination is a growing concern as machine learning and artificial intelligence systems become integral to decision-making processes in industries such as employment, criminal justice, finance, and healthcare. Although these systems are often perceived as objective, they can inadvertently reflect and reinforce societal biases present in the historical data they are trained on, leading to unjust and unequal outcomes. This paper examines the concept of "fairness debt," a term used to describe the accumulated bias that arises when fairness is sacrificed in favour of other development priorities, such as accuracy, efficiency, or time-to-market. Drawing from 86 peer-reviewed studies, this research categorizes the types of algorithmic discrimination that emerge in different fields, such as sexism and racism, and identifies the primary root causes, including training bias, historical bias, and design bias. The long-term effects of this bias—such as the proliferation of discrimination, exacerbation of social inequalities, and reduced algorithmic accuracy— are analyzed in depth. The paper advocates for fairness-aware algorithms, regular audits, and a multidisciplinary approach to mitigate the effects of fairness debt, ensuring that automated systems do not reinforce existing inequalities. This research provides critical insights into the dynamics of algorithmic bias and offers strategies to create more equitable software systems.

Pelumi Abiola-Oseni

Schulich School of Engineering

Supervised by Robyn Mae Paul

Innovative Foundations: A Study of Civil Engineering Practices among Resilient Refugees

Refugee communities often exhibit remarkable innovation as a means of survival. This research seeks to shift perspectives from a deficit-based view to an asset-based approach by highlighting these communities' innovations and experiences. The focus is on equipping students to become effective facilitators in challenging environments, such as refugee camps. Using qualitative methodology, the study involved interviews with student refugees who engaged in the co-design process, contributing to the interview process, outcome analysis, and implementation. These interviews offered valuable insights into refugees' daily lives, survival strategies, and their impact on views about engineering innovation. The project also included literature reviews on engineering education in refugee camps, refugee experiences, and innovative case studies. These reviews revealed global instances where refugees created innovative solutions to meet their needs. To address research gaps, a module development plan is proposed to integrate refugee knowledge and innovation into engineering curricula. In conclusion, by exploring refugee experiences and innovations, this research promotes a more inclusive perspective on community-driven engineering. This approach enriches engineering education and its practical applications, allowing students to engage with diverse perspectives and create more effective, culturally relevant engineering solutions for the communities they serve.

In their own words

Any story about me must begin with my first name. I am Oluwapelumi Abiola-Oseni, which means "God is with me" in Yoruba. This principle has been my source of inspiration throughout university. Early in my degree, with a desire to be a light and affect positive change, I joined the Schulich Changemakers Network where I learned about the Student Refugee Program and bonded with a few student refugees. Their stories inspired me, and I soon realized that I wanted to research the social aspects of engineering innovation, particularly its impact on people, architecture, and sustainability. Throughout my degree, I've had a busy extracurricular schedule and faced some academic struggles, but this identity of "God is With Me" sustained my faith in overcoming challenges. Through prayer in a difficult semester, God led me to email Dr. Robyn Paul to express my research interests. I am so grateful I followed God's prompting because Dr. Paul has been instrumental. We've explored how refugees apply their professional skills when living in refugee camps. In such settlements, the inhabitants become innovators to meet their daily needs, from water management to entrepreneurship. Through my literature review and interviews, I've learned that these innovative solutions have applications beyond civil engineering. Our findings will be disseminated through a research paper that explores what innovation means to refugee students. We are also creating a module for a sustainable systems class next summer, where I hope to inspire other students to bridge the gap between theoretical scenarios and real-life experiences, gaining new perspectives on the resilience behind refugee communities. Ultimately, my name's meaning, "God is with me," reflects not only my personal journey but also my commitment to supporting and uplifting those around me through my work.

Michael Belger

Schulich School of Engineering

Supervised by Marjan Jose Eggermont

Modeling Ethical Decision-Making in Engineering: An Agent-based Exploration of Cooperation under the Prisoner's Dilemma

Critical challenges in engineering, such as environmental degradation and public safety breaches, extend beyond technical expertise and are deeply rooted in human behaviour. Addressing these issues requires cultural transformation rather than merely advancing technology. This research explores the potential of engineering education to serve as a catalyst for such a transformation. This study investigates the research question: How do external reward systems and social dynamics influence the ethical decision-making of engineers, despite their baseline understanding of ethics? Using Agent-Based Modeling of the Prisoner's Dilemma, this research simulates decision-making among engineering students ("agents") to explore patterns of cooperation and defection. Preliminary findings suggest that maintaining ethical practices in engineering communities may require a critical mass of cooperative individuals. The model seeks to identify thresholds where cooperation sustains or collapses, shaped by external factors like rewards and social dynamics. While definitive conclusions are limited by the exploratory nature of the model, further refinement to include long-term strategic thinking could provide a more accurate representation of real-world decision-making. Regardless, this research highlights the potential of engineering education to foster ethical transformation.

Asem Binafaf

Schulich School of Engineering

Supervised by Mohamed Helaoui

Active Antenna Arrays and Radio Frequencies

This study aimed to understand current methodologies in the field of testing devices that utilize radiofrequencies for communication by reviewing key research papers and exploring associated code bases. The research involved an extensive literature review and attempts to comprehend complex coding frameworks relevant to the field. The focus was on understanding existing work rather than developing new contributions. The study provided a clearer understanding of the current state of research and identified key challenges in code comprehension, setting the stage for future research or possibly projects. The project underscored the importance of a strong foundational understanding and highlighted the difficulties of engaging with complex material without sufficient guidance to conduct new research.

Hannah Blakely

Schulich School of Engineering

Supervised by Artem Korobenko

Running Programs to Model Airflow in Wind Turbines

The purpose of this project was to assist Dr. Artem Korobenko's team in developing programs tomodel stratified air flow around wind turbines. As difficulties were encountered in trying to implementthis, we revisited the group's previously published work to use the same techniques. The current taskwas to check these completed simulations in the lab to reproduce previous results and ensure theyworked.The process of doing so was running the old simulations on a high-performance computingcluster and visualizing the new results to see if it differed from old results.Several of the cases weresimulations of turbines or propellers. Some of them represented airflow over hills and other complexterrain. Checking the results of these cases ensured that the procedures for modelling wind turbinesand complex terrain still functioned properly. The cases that were most pertinent involved stratifiedflows, where changes in temperature impact the properties of the air flow.The results were that somesimulations were well documented and were reproduced exactly. Other simulations that were notdocumented well faced issues in reproducibility, especially some of the projects on stratified flows.Thus, ongoing work in stratification is slowed as the foundational simulations are not functioningproperly. In conclusion, good reproducible research practices allow for ongoing work to go smoothly,while issues in reproducibility will hinder it.

Sheridan Coninx

Schulich School of Engineering

Supervised by Alim Mitha

Evaluating bioresorbable stents: endothelialization analysis using optical coherence tomography

Aneurysms, characterized by weakened arterial areas, result from arterial wall degradation due to blood flow stress and inflammation. Aneurysm rupture presents a severe health risk with high morbidity and mortality rates, however stent-based aneurysm treatments face limitations, including recurrence and permanent stent presence. The development of a bioresorbable hybrid polymer-metal flow-diverting stent offers a promising solution to the shortcomings of current aneurysm treatments, promoting endothelialization of the aneurysm neck. This study uses optical coherence tomography (OCT) to obtain high-resolution images of blood vessels, facilitating the analysis of the endothelialization process at various time points post-implantation. OCT images, processed through DICOM files, provide detailed views of the stent's internal structure and the arterial wall. Using MATLAB, these images are analyzed at multiple time points to monitor endothelialization. Nine, equally spaced images are captured from each stent, and 12 normalized light intensity (NLI) points are recorded per image. NLI calculations are made through a marker placed on the stent strut and a corresponding marker placed on the lumen, where the struts appear darker and the lumen brighter. Changes in brightness over time, indicated by NLI, reflect the healing process. While the study is still ongoing, early analysis reveals that later time points exhibit higher NLI values compared to earlier ones. There is a 47% increase in NLI between Day 0- and 42-month timepoints in the early analysis of the study. This indicates endothelialization of the stent struts into the vessel wall over time. This research is crucial for understanding the endothelialization and long-term viability of bioresorbable stents, which gradually dissolve and minimize long-term complications. Detailed OCT image analysis provides insights into the design and performance of bioresorbable stents, advancing scientific knowledge and informing on the long term outcomes and biocompatibility of future stent technologies.

Isabel Conklin

Schulich School of Engineering

Supervised by Hossein Hejazi

Advanced Bacterial Purification with Microfluidic Systems

This project explores the potential of using inertial microfluidics for bacterial purification, an essential step in sample preparation. While current bacterial purification methods are effective, the proposed platform aims to enhance efficiency and speed by leveraging flow and inertial separation. Passive flow preserves bacterial viability and functionality, while inertial separation eliminates the need for filter-media or external forces. Microfluidics with spiral designs, which are known to generate strong secondary flows, were fabricated and tested for separating small bacteria from larger particles. However, none of the designs succeeded because the fluid flow, driven solely by passive pressure, did not reach the high velocities required for effective particle separation. These results suggest that while passive inertial microfluidics shows potential, additional mechanisms to boost flow velocity may be necessary for successful implementation in bacteria purification.

Amir El Kaassamani

Schulich School of Engineering

Supervised by Fadhel Ghannouchi

Active Antenna Arrays and Radio Frequencies

This study aimed to explore how devices using radio frequencies for communication are tested by reviewing key research papers and examining related code bases. The research focused on understanding current methods and coding frameworks to help us contribute to new developments. It highlighted key challenges in comprehending complex code and underscored the importance of a solid foundational understanding in this field. Building on this, the research further aimed to improve signal reception and amplification using active antenna arrays. Wireless communication systems often face issues like signal variability and interference, which affect signal quality. This project focused on developing a programmable antenna array system that can dynamically adjust its orientation to optimize signal reception. Key objectives included creating algorithms for real-time signal analysis and conducting performance evaluations under various environmental conditions. The study can be conducted by developing simple, real-time algorithms and testing them in controlled settings, with plans to integrate the system into existing networks for broader applications.

This summer, I researched AI's applications in educational environments, deepening my understanding of how technology can enhance learning experiences.

Ammar Elzeftawy

Schulich School of Engineering

Supervised by Seyed Pouyan (Yani) Jazayeri

The Impact Of AI Tools On Academic Practices

This study investigates how AI tools, specifically ChatGPT, influence academic practices in higher education. The research aims to evaluate the impact of AI on critical thinking and intellectual development and propose guidelines for integrating AI tools into academic curricula without compromising academic integrity. A mixed-methods approach was employed, combining a comprehensive literature review, surveys, interviews, and case studies. The literature review identified gaps in current research, while surveys and interviews gathered quantitative and qualitative data from educators and students. Preliminary case studies focused on institutions that have integrated AI tools effectively. Preliminary findings suggest that while AI tools like ChatGPT can enhance learning efficiency and accessibility, there are significant concerns regarding their potential to hinder critical thinking and promote academic dishonesty. Educators are generally cautious about AI integration, with many emphasizing the need for clear guidelines to ensure AI enhances rather than detracts from educational outcomes. The research concludes that while AI tools have the potential to revolutionize learning, careful integration is crucial. The study proposes a set of guidelines and curriculum revisions that emphasize the responsible use of AI to support intellectual development while maintaining academic integrity.

Mark Hanna

Schulich School of Engineering

Supervised by Muntasir Billah

Refined shear design for end panels in steel girder

In bridge girders, thin steel plates are often utilized as web plates, with their design primarily dictated by the shear strength of these plates. Current North American design standards permit designers to account for the contribution of tension-field action following web buckling when calculating the ultimate shear strength of interior panels. However, this consideration is not allowed for the end panels. The objective of this research is to numerically investigate the shear behavior steel girders considering the partial tension field action at the end panels towards the shear strength of the girder. The investigation has been performed through an extensive numerical study of validated finite element models of steel girders using ABAQUS. The parametric study was done to understand how different parameters affect the shear strength by creating unique 192 finite element models. It was found that the shear capacity of end panels increases as the thickness of the flanges or bearing stiffeners increases which suggests the formation of the tension field at the end panel. Thus incorporating the findings into the modified design equations could lead to more efficient and economical steel bridge girder designs.

My summer research has taught me to explore innovative solutions at the intersection of technology and economics, deepening my understanding of how these fields influence real-world outcomes.

Tanjim Hossain

Schulich School of Engineering

Supervised by Alexander T. Whalley

Species in Patents: A Data-Driven Approach to Biodiversity's Impact on Innovation

Over the past 50 years, human activities rapidly altered ecosystems, leading to significant and irreversible biodiversity loss. Concurrently, innovation—particularly in pharmaceutical development—became increasingly challenging, requiring greater research investment to bring life-saving drugs to market. This project investigated the role of declining biodiversity in stifling pharmaceutical innovation. Natural products have long been central to pharmaceutical breakthroughs, including statins, tubulin-binding anticancer drugs, and immunosuppressants. However, the extent to which recent biodiversity loss correlated with the slowdown in innovation was poorly understood. This research successfully created a novel dataset derived from the patent system, providing a unique resource to explore the drivers of innovation at the intersection of biological diversity. We assessed the involvement of species in innovation processes, quantified the proportion of species contributing to research, and identified the areas of innovation reliant on diverse species. By utilizing text mining, we analyzed 11 million patent documents for references to 6 million Latin species names from the Global Names Index (GNI) and related biodiversity databases. The outcome was a pioneering database linking biodiversity to innovation, offering critical insights into how biodiversity loss impacts medical innovation and whether this trend is accelerating. This research laid the groundwork for further investigation into biodiversity's role in sustaining innovation.

Shahed Issa

Schulich School of Engineering

Supervised by Ahmad Abdellatif

Beyond Text Generation: Assessing LLMs for Code and Test Understanding

Code summarization generates concise, informative code descriptions to enhance understanding, maintainability, and collaboration among developers. It improves code readability and facilitates software project management. The rise of large language models (LLMs) has advanced automated coding tasks, including code summarization. This study evaluates the effectiveness of 10 LLMs—T5, CodeT5, Gemini, CodeLlama, Llama 3, Falcon, StarCoder, BERT, CodeBERT, and GPT-4—in generating accurate and relevant code summaries. By analyzing their performance, the research provides insights into how well these models meet developers' needs and contribute to improved software maintenance. Using syntactic and qualitative analyses, 1500 instances from a dataset of 14,000 code samples and summaries were assessed. Results show varying model performance, with Gemini excelling overall. Gemini achieved the highest ROUGE-1 (0.385) and BLEU-1 (0.116) scores, effectively capturing both unigram and longer sequences. However, other models struggled with context dependency and produced incomplete or incorrect outputs. Models with larger parameters, like Gemini and Falcon, performed better with complex code but occasionally generated verbose or irrelevant details. This evaluation highlights the strengths and limitations of LLMs in code summarization. It underscores the potential of these models to enhance automated code documentation and offers insights into fine-tuning or adapting them for more reliable performance in software engineering tasks.

It was an amazing summer doing the research. The photo is from when my prof and I went to Barcelona for an international research conference.

Thanh Nguyen

Schulich School of Engineering

Supervised by Ronnie De Souza Santos

Unveiling Advantages and Challenges of Prevailing Fairness Software Tools

The increasing integration of artificial intelligence and machine learning into software systems has highlighted the critical importance of ensuring fairness in the technologies. Bias in software can lead to inequitable outcomes, making fairness testing essential. However, the current landscape of fairness testing tools remains underexplored, particularly regarding their practical applicability and usability for software development partitioners. This study aimed to evaluate the practical applicability of existing fairness testing tools software development partitioners, assessing their usability, documentation, and overall effectiveness in real-world industry settings. We identified 41 fairness testing tools from the literature and conducted a heuristic evaluation and documentary analysis of their installation processes, user interfaces, supporting documentation, and update frequencies. Technical analysis focus on identifying strengths and deficiencies to determine their suitability for industry use. Our findings revealed that most fairness testing tools show significant deficiencies, particularly in user-friendliness, detailed documentation, and configurability. These limitations restrict their practical use in industry settings. The tools also lack regular updates and possess a narrow focus on specific datasets, which constrain their versatility and scalability. Despite some strengths, such as cost-effectiveness and compatibility with several environments, the overall landscape of fairness testing tools require substantial improvements to meet industry needs. There is a pressing need to develop fairness testing tools that align more closely with industry requirements, offering enhanced usability, comprehensive documentation, and greater configurability to effectively support software development partitioners.

In their own words

This was my first time receiving a PURE Award and while it was only eight weeks, I did everything I could to make the most it! My project examined the application of fairness in software, specifically in machine learning and artificial intelligence (AI). Given the rapid growth of AI, there are concerns about fairness in software testing, particularly as more applications incorporate machine learning in their decision-making processes, like assessing credit scores, hiring employees, recidivism prediction, etc. Without fairness, these applications can discriminate against minority groups and vulnerable individuals based on sensitive attributes like race, gender, skin colour, nationality etc. I wanted to test the advantages and disadvantages of different fairness testing tools so other researchers, practitioners can choose a reliable tool based on their needs. It's been an intensive project. Every day I spend a few hours reading research papers, then a few hours testing a tool, and then a few more hours comparing the test results with what I found in the research. There have been tough days, but I have told myself never to give up because the work I do today could have big impacts on the work happening in this area tomorrow. Currently there fairness tools are still under study and underexplored, with majority being tested only in research papers. My job is to explore if these tools and assess how they can be applied to real-life scenarios. This is a big deal because such software is informing very real decisions that impact society. As a future software engineer, I hope to be part of finding a solution to this challenge.

Yasmin Mobin

Schulich School of Engineering

Supervised by Philip Egberts

Friction Analysis of Layered Graphene

The main goal of my research was to explore how surface energy and friction properties of graphene are influenced by both the external applied load and the number of graphene layers. To achieve this, I analyzed a substantial amount of stick-slip friction data collected under ultra-high vacuum, using coding and statistical methods to process and extract meaningful insights. I examined more than 50 images, each consisting of matrices of approximately 600x600 data points, and generated histograms to illustrate the variations in surface energy and friction as the applied load increased. My analysis revealed that as the normal force increases, both the slip height—related to the energy barrier ($E0$) in the surface potential PT model—and the slip slope (K)—corresponding to the effective stiffness of the surface—also increase. These findings are valuable to the scientific community, offering new perspectives on the frictional behavior of graphene. This knowledge has significant potential for commercial applications, such as the development of graphene-based lubricants and coatings, and contributes to the broader understanding of friction at the atomic scale, providing avenues for improved material performance in industrial applications.

Participating in this research project deepened my appreciation for how pioneering diagnostic innovations can enhance global health equity, bridging gaps in both accessibility and precision.

Jurjaan Onayza Noim

Schulich School of Engineering

Supervised by Richa Pandey

Dual-Mode Nucleic Acid Detection with MebiQue

This study explores the development of MebiQue-LFA, a dual-mode lateral flow assay (LFA) aimed at enhancing diagnostic accuracy by combining qualitative and quantitative detection capabilities. The research sought to address the limitations of traditional LFAs by integrating methylene blue as both a colorimetric and electrochemical signal tracer, enabling precise analyte quantification alongside visual detection. The study involved the synthesis of nucleic acid probes targeting a conserved sequence of Plasmodium vivax, followed by their integration into the MebiQue-LFA platform. Through rigorous testing, the platform demonstrated a detection limit of 0.07 nM and a dynamic range of 0.1–1000 nM in buffer solutions, with a detection limit of 1 nM achieved in complex biological matrices, including serum, plasma, and 50% diluted blood. The assay showed high specificity, effectively distinguishing between complementary and mismatched sequences. These findings confirm the efficacy of the MebiQue-LFA platform, which represents a significant advancement in LFA technology. By offering dual-mode detection, MebiQue-LFA enhances the versatility and precision of LFAs, making them suitable for a wider range of diagnostic applications that require both qualitative and quantitative analysis.
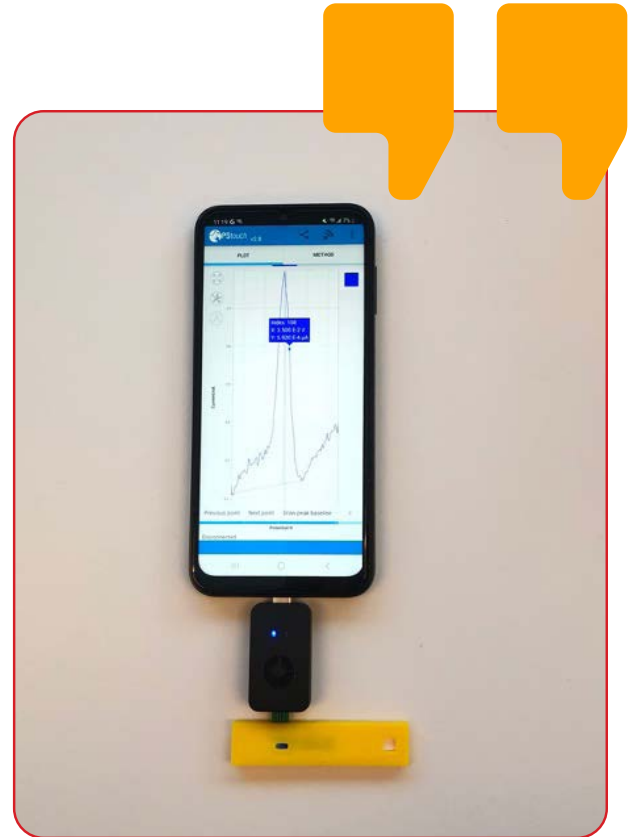
Elias Poitras-Whitecalf

Schulich School of Engineering

Supervised by Emily Marasco

Developing Student Technology Competencies to Reduce Digital Inequity

The first year of a postsecondary engineering program can be challenging for new students, especially if students have faced digital inequities in their education. The fast-paced development and implementation of technologies such as generative AI may further widen this gap. As modern tools incorporate an increasing amount of intelligence, educators will need to prepare undergraduate students for appropriate use and understanding of these tools. The purpose of this study was to create a comprehensive AI literacy module tailored for engineering students, addressing their varied levels of prior AI knowledge and experience. The methodology began with a comprehensive literature review focused on AI literacy. While much of the existing literature targets K-12 education, educational concepts and approaches were useful for reference. Based on this review, six personas representing incoming students with varied experience in AI were created. These personas ranged from individuals with no prior AI exposure to those highly proficient in AI. A Likert scale rubric was developed to support students in self-assessing their AI knowledge across different environments and settings. Subsequently, learning objectives, educational content, and associated activities were developed and integrated into RISE, an online instructional design platform by Articulate. The personas were used to tailor the corresponding units to ensure content was accessible and appropriately challenging for all students, regardless of their starting point. As a result of this work, an online AI literacy pilot was created and shared. We have received early feedback from peers, with the final version set to be tested by the ENDG 233 first-year cohort in Fall 2024. The final module addresses the diverse needs and lived experiences of students, providing a structured yet flexible approach to learning about AI.

Sarah Rensby

Schulich School of Engineering

Supervised by Poornima Jayasinghe

The Reuse Capacity of Lithium-ion Batteries

How many lithium-ion cells are being thrown away before they are out of potential capacity? The goal of the Summer Battery Research was to get the most out of the lifecycle of Li-ion battery packs. Most cells are either Lithium ion (Li-ion) or Lithium Polymer (Li-Po). This research is focused on cylindrical Li-ion cells as they are easier to work with, and more common (our research did not include double A or triple A batteries). To conduct this research, it was necessary to reach out to the local battery recycler in Cochrane Alberta. Two batches of battery packs were picked up by our team, we then had to disassemble each pack to test the cells individually. As we moved forward in the summer term, it was clear that the major fault within the pack systems was based on battery manufactures not implementing cell balancing. Cell balancing is when the pack system works each cell equally, so they deplete at the same time. Because this is absent in most of these packs one cell within the battery depletes faster than the rest (hits 0V) and this causes the rest of the cells to be disabled within the pack as there is a failsafe of sorts on all Li-ion packs. Main take away: 64% of the 94 cells tested are reusable in battery packs that were tossed in the recycling.

My research experience this summer emphasized the value of using mechanical testing to advance the understanding of aneurysm behaviour under stress.

Sukhad Saini

Schulich School of Engineering

Supervised by Taisiya Sigaeva

Biaxial Mechanical Testing of Abdominal Aortic Aneurysms: Understanding Viscoelasticity for Rupture Risk Assessment

An abdominal aortic aneurysm (AAA) is an enlargement of the aorta caused by a mechanical degradation of the vessel wall. If it ruptures, it can cause severe internal bleeding and is often fatal; around 8 out of 10 people with a rupture die either before reaching the hospital or during surgery. This study investigates how the aortic tissue from a patient with an AAA behaves by conducting mechanical tests that mimic physiological conditions. A key focus is on viscoelasticity — a property where the tissue exhibits both solid-like and liquid-like behaviors — to understand how the aneurysm alters aortic wall biomechanics. By analyzing the hysteresis in the stress-strain curve (energy loss), we measured how the tissue responds at different strain rates, and thereby assessing to which extent the tissue is viscoelastic. Results yield a clear viscoelastic response as at faster strain rates the tissue becomes stiffer and dissipates less energy. Additionally, a visual map of the aneurysm revealed variations in energy loss depending on the location within the aorta, suggesting that viscoelastic behaviour can vary regionally within the aneurysm. Understanding aneurysmal biomechanics, particularly its viscoelastic nature,will help to shed the light on mechanisms behind aneurysm progression. Further research is needed to understand how these mechanical factors impact the onset of aneurysmal rupture, potentially contributing towards improvement of clinical assessments and outcomes for patients with AAAs.
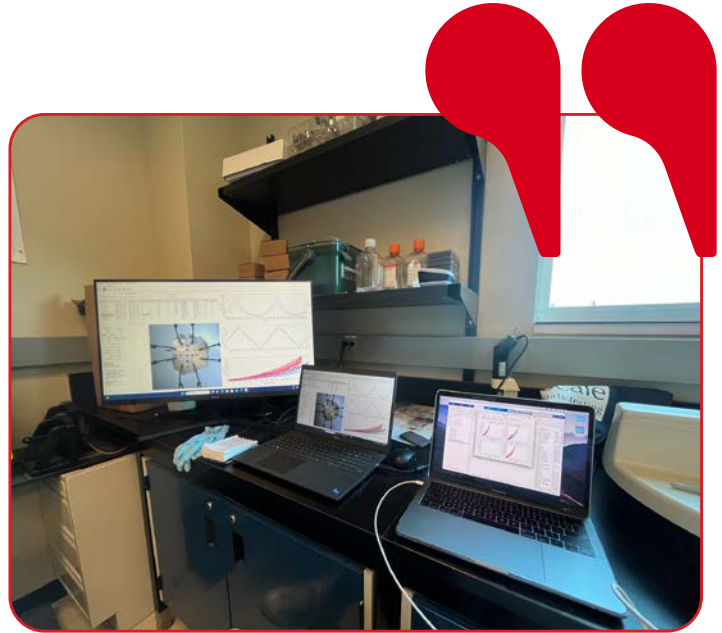
Dawood Sheronick

Schulich School of Engineering

Supervised by Muntasir Billah

Climate Adaptation and Resilience Enhancement (CARE) for Indigenous Housing

The research project examines climate adaptation and resilience in Indigenous housing across Canada. Indigenous communities face unique challenges due to climate change and historical colonial interventions, which have disrupted traditional housing practices and imposed modern structures that are often unsuitable for the local environment. This study aims to explore how traditional Indigenous knowledge can be integrated with modern engineering practices to enhance housing resilience. The research employed a mixed-methods approach, including a literature review and thematic analysis of collective conversations with Elders and community members. The literature highlighted infrastructure gaps and the importance of integrating Indigenous knowledge with modern practices. The conversations revealed the vulnerability of colonial housing structures to climate change, the cultural and spiritual impact of the climate crisis, and the importance of land-based adaptation and intergenerational knowledge transfer. The study concludes that traditional knowledge must be central to developing resilient and culturally appropriate housing solutions. This research underscores the need for collaborative efforts between Indigenous communities, researchers, and policymakers to create housing strategies that are sustainable, culturally sensitive, and responsive to the specific needs of Indigenous communities in the face of climate change.

Ryley Shoemaker-Zuk

Schulich School of Engineering

Supervised by Farnaz Sadaghpour

Impact of Variables Affecting Ultra-Wide Band Real Time Location Systems in Lab Enviroment

Ultra-Wide Band Real-Time Location Systems (UWB RTLS) have caught the interest of researchers in various fields. This technology shows great potential for real time tracking to be used in dynamic environments and this project focused for its use specifically in the construction industry to promote safety and security on sites. Accidents on site occur most commonly when workers are struck by an object and when they have a fall. UWB RTLS can warn workers if they are approaching tagged dangerous or moving equipment, and if they are entering an accident-prone zone. Therefore, to integrate this technology it is essential to understand what the accuracy of these devices is and how can it be impacted. This project aimed to do just that by conducting experiments within a lab environment measuring the impact that isolated variables had on UWB readings. The lab set up required the construction of a precise grid such that experimental and true positions could be compared. Even though these results are few of many required to effectively implement this technology in construction sites, they expand on our past knowledge of this technology and will serve as a foundation for future experiments.

Nickolai Yagelniski

Schulich School of Engineering

Supervised by Lina Kattan

Smart Cities in Research and Practice

This study undertakes a systematic literature review to identify and analyze the prevailing trends and research gaps within the domain of smart cities, particularly focusing on sustainability, technology integration, and social equity. Using PRISMA guidelines, 30 key papers were selected for review from an initial pool of 3,114, sourced from Scopus, Web of Science, Google Scholar, and the Transportation Research International Database (TRID). The review reveals a rapid growth in smart city research, predominantly from developed countries, with a significant emphasis on environmental sustainability over social aspects. Key trends identified include the thematic exploration of mobility, environmental sustainability, and governance, alongside the integration of advanced technologies such as AI, IoT, and big data. However, critical research gaps persist, notably the lack of consistent definitions and standardization across the field, insufficient attention to social equity, and a need for more holistic, interdisciplinary approaches. The review highlights the necessity for a more balanced research focus that includes social dimensions to fully realize the potential of smart cities in enhancing the quality of life and ensuring equitable urban development.

Parth Shah

Schulich School of Engineering & Faculty of Science

Supervised by Joanna Wong

Precision Manufacturing of Parabolic Satellite Reflectors

Parabolic reflectors, which are curved surfaces capable of focusing or collecting electromagnetic waves like light, radio, or microwaves, have numerous applications in various fields including astronomy, telecommunications, radar, and weather forecasting. The production of parabolic reflectors has traditionally relied on conventional composite manufacturing techniques such as hand layups, which has some drawbacks. A common issue is with fiber distortion which occurs when fabric is draped over complex geometries resulting in a change of orientation of the tows in the fabric. With fabrics in conventional manufacturing, draping predictions can be modeled, but control over fiber distortions is still difficult. Given the crucial role that reflectors play in a wide range of applications, there is a clear need for innovation in the manufacturing process to ensure precision. With full numerical control over fiber paths, additive manufacturing can address this issue by controlling the deposition of material by layer. This research focuses on developing the ability to apply novel additive manufacturing techniques to fabricate parabolic satellite antenna reflectors and providing the capability to prototype and manufacture these parabolic reflectors. The primary objectives are to design a mold that seamlessly integrates with existing additive manufacturing systems, achieve an excellent surface finish to allow strong adhesion with the deposited material, develop the capability to heat the mold bed in a controlled fashion, and allow for post-processing via high temperature vacuum bagging to optimize the print surface to meet the stringent standards required for application in space.

In their own words

My research term consisted of a lot of overcoming challenges and learning from more experienced engineers. Our lab was dedicated to using a novel process to additively manufacture components using carbon fiber. Typically, carbon fiber components are via hand layups which can lead to fiber distortions when draped over complex geometries. My role in the lab was creating molds for a segmented hexagonal parabolic antenna reflector. The initial design and engineering drawings were created using 3D modelling software. After this was verified, I was able to take the drawings to the machine shop to CNC. I quickly found this was incorrect as the technical staff at Makerspace, especially Jason Steinburg, were extremely useful who gave me both the freedom to explore and the guidance I needed when I was stuck. The research experience taught me that being a good engineer means knowing your engineering discipline well, but being a great engineer means integrating several disciplines and skillsets.

Bhavjit Kailey

Schulich School of Engineering & Haskayne School of Business

Supervised by Simon Park

Multi-Walled Carbon Nanotubes in Auxetic Sensing Structures

The following research experiments with multifunctional 3-D printing, using fused deposition modelling (FDM) printing with a modified dispersion extrusion setup to create strain sensing materials with optimized mechanical properties. The polymer used for experimentation is thermoplastic polyurethane (TPU) reinforced with 10 wt.% multi-walled carbon nanotubes (MWCNTs). The extrusion setup improves the alignment of MWCNTs in the polymer through the ability to control printing direction. The process also allows for improved dispersion of CNTs through the polymer creating greater mechanical and electrical signals within the material. A specific emphasis is placed on auxetic structures – those with negative Poisson's ratios. The geometries of five specific such structures were optimized for stress distribution and tested under compressive and impact states. The auxetic designs were printed using pellet fed 3D printing (PF3DP) with three different printing directions (vertical, horizontal, and parallel to side). The investigation focuses on understanding how different printing direction alignments influence the mechanical and electrical properties of printed structures at different relative densities (20-40%). Various characterization techniques are employed, including resistivity measurements, cyclical compression, tensile, impact and bending tests. All measurements occur with simultaneous electrical response measurement. A drop ball test and model analysis test are also conducted to identify the dynamic behaviour of the auxetic structure under the Joule heating effect. The printing direction is evaluated according to sensitivity and mechanical response stability.

WERKLUND SCHOOL OF EDUCATION

Rebecca Holm

Werklund School of Education

Supervised by Stephen MacGregor

How Alberta Educational System leaders are supporting gender diverse students

As tension in the public and political discourse regarding transgender people and gender diversity in K-12 schools is on the rise, this research explores how educational system leaders in Alberta navigate the development and implementation of policies impacting transgender and gender diverse (TGD) students to create safe and inclusive learning environments. The study aims to understand the decision-making processes of leaders in both public and separate school authorities, focusing on the safety and rights of TGD students in the context of recent legislative efforts aimed at curtailing their rights. This project engages in semi-structured interviews with system leaders from school authorities across urban, suburban, and rural districts, with the goal of capturing diverse perspectives on policy impacting TGD students. Early findings indicate that system leaders are committed to supporting TGD students but face significant challenges in balancing the needs of these students with increased misinformation in the public discourse and a lack of consultation from the ministry. This research provides timely insights into how educational leaders are navigating these complex dynamics, while contributing to ongoing discussions about creating inclusive educational environments for TGS students and offers a foundation for future advocacy and policymaking efforts.

Cathrine Keeler

Werklund School of Education

Supervised by Kimberly Lenters

Assessing the impacts of digital media on classroom literacy practices

Since the early 2000s, technology has become a part of our daily lives, especially in education and literacy. In the face of this, researchers have examined the potential effects of reading and learning through digital devices. While much of the research has concluded that reading on a digital device could negatively affect reading comprehension and cognitive behaviours, especially in school-aged children, the scope and uses of digital reading are more complex than initially thought. Our current and future students use various forms of digital reading daily and will require even more digital skills as they enter a job market dominated by technology. Therefore, our educators must ensure that we prepare our students for the digital future. This literature review advocates for including digital literacy practices in grade school curriculum. The evidence shows that our students need computer skills to encounter, engage with, curate, and evaluate digital resources. While researchers and curriculum makers have recognized the need for this type of education, educators have yet to implement it in classrooms fully. This literature review provides resources and frameworks that schools, teachers, parents, and educational digital technology designers can consider when implementing digital literacy practices into their student's education. Careful implementation, including digital literacy practices, will be paramount in preparing our students for their personal and professional futures.

Scott Vrecko

Werklund School of Education

Supervised by Tonya Callaghan

Setting Greece Straight: A Study of the Erasure of Homosexualities from School Textbooks

This study investigated the systematic erasure of homoeroticism and same-sex love from school textbooks covering ancient Greek history. The project aimed to assess the extent of this erasure, understand the historical and institutional forces behind it, and explore its impact on LGBTQ+ individuals and communities. The purpose was to expose and challenge the pervasive heterosexism embedded in the teaching of the history of Western civilization.

Three research methods were used: archival research and textual analysis of homoerotic source materials from Ancient Greece; Critical Discourse Analysis (CDA) of 28 K-12 textbooks on Ancient Greece; and sociohistorical research on the historical, institutional and cultural contexts of queer oppression in which contemporary textbook erasure occurs. Findings Results of the study were that: (1) Homoerotic themes and values are much more central to the poetry, philosophy, literature and arts of Ancient Greece than is often acknowledged by official histories, whether produced by textbook authors and/or expert academics. (2) All 28 school textbooks on ancient history failed to acknowledge the homoerotic dimensions of early Western cultures and misrepresent these cultures in ways that are consistent with heterosexist world views that in fact only appeared after the fall of ancient Greece and Rome and with the advent of Christianity. (3) Contemporary textbook erasure is only one of many strategies that have been deployed to erase queer existence and purge Western societies of sexual diversity (others include censorship, moral denunciation, religious and legal prohibition, punishments including imprisonment, torture and execution, government purges, and a variety of 'treatments/ including chemical castration, lobotomy, and conversion therapies. ConclusionsThe study suggests that queer erasure from school textbooks is near-total and near-universal; this constitutes an ongoing social injustice that perpetuates queer oppression. Contemporary textbook erasure can only be fully and properly understood within the context of centuries of queer oppression by Western cultural and political authorities who held as their goal the total eradication of sexual minority peoples and same sex desire. Political and institutional action is necessary to correct this misrepresentation, which continues the legacy of cultural genocide against sexual minorities.

My summer research allowed me to reflect and build meaningful connection to the land.

Tommy Rider

Werklund School of Education & Faculty of Arts

Supervised by David Simmonds

Within Barren Lands: Terra, Fear, and The EcoGothic

My Program for Undergraduate Research Experience (PURE) project, "Within Barren Lands: Terra, Fear, and the EcoGothic" is a research-creation study exploring how photography can help create new understanding of the way identity impacts individuals' relationships to land within a Southern Albertan context. I explored this question by searching the concept of ecoGothic and its subgenres including in the context of Canadian literature, Canadian landscape painting, photography, exhibitions, and the representation of landscape in many film genres focusing on horror and thrillers. Building on this research and focusing on specific areas of Alberta (Mountain and Rocky View County), I created a series of black and white photographs documenting my travels (both by road and hiking), and highlighting how the experience of Canadian landscape, and representations of these landscapes in and through culture, are not inclusive of the diverse identities and experiences of the people who occupy them. Oftentimes these representations were used to promote further marginalization and social discord. In addition to this approach, I also conducted research using trail cams and by foraging of animal bones. I presented the outcome of this research in the form of an exhibition in the Little Gallery. The exhibition is designed to invite viewers to reconsider the meaning of these familiar landscapes by highlighting representations of these environments that are familiar, unnerving, and perhaps alienating.
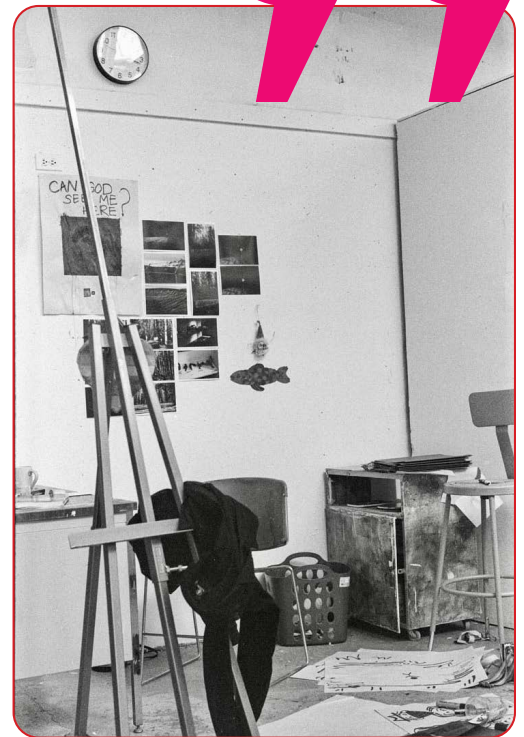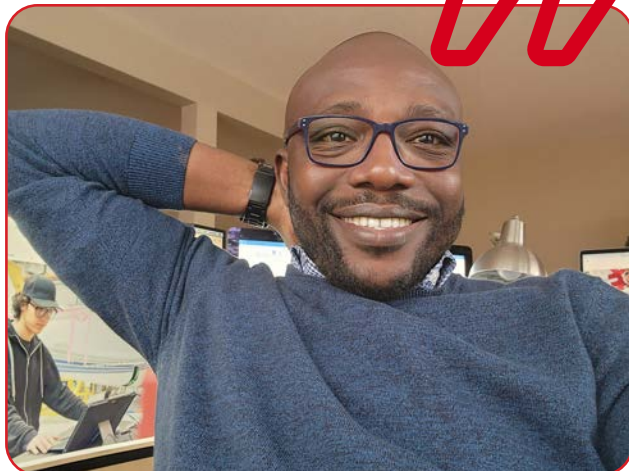
OPEN STUDIES

My research experience allowed me to ask critical questions, acquire new knowledge, manage my time effectively, and challenge existing colonial stereotypes about traditional African religions.
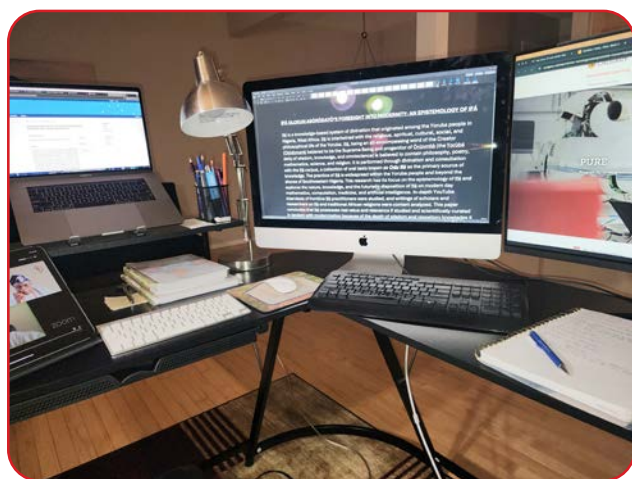
Oluwabamise Onifade

Open Studies

Supervised by Uchechukwu Peter Umezurike

Ifá Olokun Asòròdayò's Foresight Into Modernity: An Epistemology Of Ifá

Ifá is a knowledge-based system of divination that originated among the Yoruba people in Nigeria, West Africa. Ifá is intertwined with the religious, spiritual, cultural, social, and philosophical life of the Yoruba. Ifá, being an all-encompassing word of the Creator (Olódùmarè), believed to be the Supreme Being, and progenitor of Òrúnmìlà (the Yorùbá deity of wisdom, knowledge, and omniscience), is believed to contain philosophy, poetry, mathematics, science, and religion. It is performed through divination and consultation with the Ifá corpus, a collection of oral texts known as Odu Ifá as the primary source of knowledge. The practice of Ifá is widespread within the Yoruba people and beyond the shores of Southwestern Nigeria. This research has its focus on the epistemology of Ifá and explores the nature, knowledge, and futuristic disposition of Ifá on modern-day mathematics, computation, medicine, and artificial intelligence. In-depth YouTube interviews of frontline Ifá practitioners were studied, and the writings of scholars and researchers on Ifá and traditional African religions were content analyzed. This paper concludes that Ifá possesses real value and relevance if studied and scientifically curated in tandem with modernization because of the depth of wisdom and repository knowledge it has, and its usage in traditional epistemology, science, mathematics, philosophy, and medicine.

UNIVERSITY OF CALGARY