



MURC

MULTIDISCIPLINARY UNDERGRADUATE RESEARCH CONFERENCE

Program Guide

Saturday March 22nd, 2014

9.30am-4pm

UBC Vancouver

murc.ubc.ca

#UBCMURC



a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA
Centre for Student Involvement and Careers

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Be Social

We are excited to be live-streaming any digital conversations that take place throughout the day during the opening and closing keynote sessions. If you want to join the conversation online, use #UBCMURC.

Share the highlight of your day, something new you learned, or even share photos!

Prizes

We have some great door prizes this year for anyone registered at MURC. We have a range of gift cards and even a brand new mini iPad to give away.

In your nametag is a raffle number. During the closing keynote session numbers will be drawn and the winners will be selected. Please be advised that you must be in attendance to win the raffle.



Schedule

Get an overview of the day.

9:30 am -10:00 am	Registration & Check-In	<i>Old Auditorium – 6344 Memorial Road</i>
10:00 am -10:45 am	Opening Session	<i>Old Auditorium</i>
11:00am -12:00 pm	Morning Oral Presentation (Session 1)	<i>Buchanan Building - 1866 Main Mall & IKBLC - 1961 East Mall (See Presentations List)</i>
12:00 pm - 1: 00 pm	Lunchtime	<i>IKBLC 302 (Dodson Room)</i>
12:30 pm - 1:45 pm	Poster Display Presentations	<i>IKBLC Main Foyer</i>
2:00 pm - 3:00 pm	Afternoon Oral Presentation (Session 2)	<i>Buchanan Building & IKBLC (See Presentations Lists)</i>
3:15 pm - 4:00 pm	Closing Session	<i>Old Auditorium</i>



What is MURC?

Celebrating exciting and innovative undergraduate research at UBC.

MURC 2014

The Multidisciplinary Undergraduate Research Conference is an annual celebration of undergraduate research happening at the UBC-Vancouver and the UBC-Okanagan campuses. Student researchers showcase their research in either oral presentation or poster presentation format.

MURC presenters are any UBC undergraduate student who is participating in, or has completed, their own Faculty-supervised research project. All Faculties and Schools are welcome. This year's Conference features 150 research projects hosted by over 200 presenters.

MURC finalists have the opportunity to apply to present at the annual Universitas 21 Conference, taking place in Shanghai in the summer of 2014.



Opening Keynote

Hear what a previous MURC winner has to say.

Andrew Hughes

Andrew Hughes is originally from Bismarck, North Dakota. He moved to Kelowna, BC after high school to attend the University of British Columbia, Okanagan. After being fascinated by an introductory psychology course in his second year, Andrew decided to pursue a BSc in Psychology. In his third year he applied for and received an Irving K. Barber Undergraduate Research Award. This unique opportunity allowed Andrew to develop and carry out his own original research project with Dr. Barbara Rutherford. His project, inspired by Dr. Rutherford's research into brain laterality, investigated the dynamic relationship between the two halves of the brain when processing emotion. This award set the stage for 6 more projects, a publication, a number of presentations, and a life long passion for the research process. Andrew is currently studying medicine in his second year at the University of North Dakota School of Medicine and Health Sciences.



Closing Keynote

Three Minute Thesis

Stephanie Harvard (Winner)

Does Quality of Spondyloarthritis Care Affect Costs and Outcomes?

Stephanie Harvard is a PhD candidate in a joint program between UBC's School of Population and Public Health and the Université Pierre et Marie Curie in Paris, France. She holds a Master's degree in Community Health Sciences from the University Manitoba and is a graduate of the Western Regional Training Program in Health Services Research. Stephanie has worked as a researcher and writer in UBC's Faculty Pharmaceutical Sciences and School of Population and Public Health, the BC Centre for Disease Control, the Manitoba Centre for Health Policy, and URC-Eco (Unité de Recherche Clinique en Economie de la Santé) in Paris. Her primary interests are in health services research, pharmaceutical pricing policies, and medical writing. Her PhD studies are supported by the Canadian Institutes for Health Research and the French Embassy in Canada and she divides her time between the equally-beautiful Vancouver and Paris.

Nathan Evetts (Finalist)

Making Anti-Matter

Nathan is a masters student in the physics and astronomy department at UBC. He did his undergraduate degree at UBC in physics from 2008 - 2010 and has worked on cooling "normal" atoms both during his bachelor thesis and later as a guest scientist at the max-plank institute for quantum optics. This work lead him to his current role cooling anti-atoms for the antimatter experiment ALPHA at CERN in Geneva. In his spare time he likes jumping off of high cliffs.



Lunchtime Booths

Informative booths happening during the lunchtime session

UBC Library

Do you have an opinion about study space on campus? Want to share your ideas about how to make things better? Come visit the Library booth, and write your ideas on our feedback board. Inspired to start a big research project? With more than a dozen branches in Vancouver and in the Okanagan, UBC Library offers a vast array of research and collections resources. Come talk to a Librarian about how to tackle your next research project, and make the most of the resources available to you.

Undergraduate Research Opportunities

Undergraduate Research Opportunities – Enquire. Equip. Engage. Empower.

This AMS student run club is at the leading edge of undergraduate research at UBC.

Events: hold information booths at a wide array of events.

Workshops: invite and coordinating with UBC Faculty as guest speakers that are specialists in the subject matter of the workshop.

Programs: URO's flagship program - the Research EXperience (REX) - is the largest undergraduate research program at UBC.

MUCH MUCH More: inquire at the lunch booth.

Undergraduate Research Opportunities – Enquire. Equip. Engage. Empower.

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Canadian Young Scientist Journal

Started in 2008, the Canadian Young Scientist Journal is a non-profit, peer-reviewed scientific publication dedicated entirely to original high school and undergraduate research. The journal receives submissions internationally and publishes both digital and hard copies bi-annually.

Our Mission

- To promote inquiry-based education in Canada
- To offer young people a unique platform to discuss ideas with the national and international academic communities



Go Global

Go away, and make it count! UBC students have the opportunity to take courses and do research at over 180 partner universities around the world. Learn more about Go Global exchange, summer study and undergraduate research abroad opportunities at <http://students.ubc.ca/career/international-experiences>. Eligible students can receive up to \$1500 per term in funding for programs abroad. See a Go Global advisor soon, or stay tuned for our Global Experiences Fair coming in October 2014

Arts Studies in Research and Writing

At a research-intensive university like UBC, students have the opportunity to learn how new knowledge is being discovered, disseminated, and applied in and across the many disciplines that constitute our community. Through its integrated components spanning the four years of undergraduate study, the Writing and Research Requirement in the Faculty of Arts invites students into the Arts community, supports their entrance into the disciplines of their majors and enables them to engage in research activity of their own before they complete their undergraduate education. Our goal is to support academic literacy development by offering and facilitating introductory courses to disciplinary discourses such as ASTU 150, by assisting and supporting faculty in mounting writing for research courses in Arts disciplines, and by encouraging and supporting undergraduate student participation in a variety of scholarly activities such as organizing conferences and workshops, presenting papers and posters, and reviewing and responding to the work of peers for publication in student journals.



Acknowledgements

A big thank-you

Thank-you to all those below for your support in organizing MURC 2014. We appreciate your time and dedication in making the celebration of undergraduate research at UBC a success. Special thanks to the following faculty members from Arts Studies in Research and Writing for their assistance with proposal preparation and submission review: Dr. Rick Gooding, Dr. Katharine Patterson, Dr. Jaclyn Rea, and Dr. Katja Thieme.

Adjudicators

Brook Moyers
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Chendi Wang
Chuan He
Connie Leung
Dr. Subrata Deb
Emily Gallagher
Eric Zhao
Farshad Pourmalek
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Gregory Ross
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Jiangyuan Gao
Joanne Trinh
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Natalie Marshall
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Roxana Jayo
Sahar Mahmoud
Sara Moukarzel
Shayan Shakeraneh
Sonia Lin
Tom Cheng
Victor Ngo
Xiaoou (Oliver) Dong

Yaa Nimako
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Dr. Rick Gooding

Workshops & Speakers

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Dr. Katharine Patterson
Dr. Rick Gooding

Volunteers

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Ana Castillo
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Jacques Martiquet
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Jiaxin Gu
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Jude Crasta
Julius Landas
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Erick Carreras
Gagandeep Gill
Gillian Corbo
Jerold Chu
Lisa Hsu
Melody Lu
Michael Lisonbee
Mike Carr
Teri Grant



Morning Oral Presentation List

11:00am-12:00pm

[Animal Biology - IKBLC 155](#)

Song Divergence: In the case of Wilson Warblers (*Cardellina Pusilla*)

Presenter: Chen, Michelle

Behavioural plasticity in the heteromyid rodent Stephen's kangaroo rat (*Dipodomys stephensi*)

Presenter: Davis, Sarah

Access to Food Drives Movement in the Arctic Woolly Bear Caterpillar

Presenter: Greyson-Gaito, Christopher

Mapping neural connections in the fruit fly brain

Presenter: Koch, Ellen

[Animal Welfare - IKBLC 301](#)

Influence of milk production on hair cortisol level in dairy cows

Presenter: Jia, Jasper(Pu)

Public Trust in Animal Research Practices

Presenter: Kim, Young Wook

[Behaviors & Medicine - BUCH B213](#)

The effects of conspecific presence on the post-operative behaviours of individually-caged female laboratory rabbits

Presenter: Focken, Alexandra

Happiness and life satisfaction in people with an acquired brain injury: The links between social support, symptom severity, and location of injury with well-being

Presenter: Geddes, Alexa

Effects of Prenatal Alcohol Exposure on Social Interaction Behaviour in Periadolescent Male and Female Rats

Presenter: Haghighat, Sepehr; Mukhi, Naureen & Takeuchi, Lily



Cancer & Transplant in Medicine - BUCH A102

Ultrastructure analysis of subepithelial collagen rearrangement in asthma

Presenter: Li, Wei-Xian

Characterizing the interplay between three bacterial proteins in human mitochondria during pathogenic E. Coli infection

Presenter: Thejomayen, Michael

Identification of MHC binding peptides on tumor-antigen-presenting dendritic cells by mass spectrometric analysis

Presenter: Tsai, Meng-Chi; Williams-Yuen, Jordan & Yeung, Clarence

Clinical Psychology - BUCH B208

Postpartum psychosis in mothers with a history of major depressive disorder

Presenter: Mighton, Chloe

Effects of disrupted lactation on depressive-like behaviour: Implications for postpartum depression

Presenter: Solomon, Sophia

The Relationship between Cannabis-Induced Subjective Experiences, Schizotypy and Social Functioning in a Non-Clinical Sample

Presenter: Ulloa, Ana Cecilia

Schizotypy and Perceptual Aberration: Model of Hallucinatory Behavior

Presenter: Wang, Nena

Culture & Ethnicity - BUCH B215

How Consumers Experience Asian Malls

Presenter: Chung, Matthew & Leo, Cherie-Nicole

The Effect of Ethnic Diversity on the Provision of Municipal Services in Canada

Presenter: Kim, Sophia

French in the Magdalen Islands: Promoting Dialects with Social Media

Presenter: Lacho, David

Perceptual identification of talker ethnicity in Vancouver

Presenter: Wong, Phoebe



Education & Learning - BUCH B210

The MURC-y Waters Of Math Education

Presenter: Av-Shalom, Na'ama

Engaging Higher Order Thinking Skills: A Personalized Tutoring System

Presenter: Bojey, Matthew

Outdoor Education: Children's Personal Perceptions of Experiential- Based Outdoor Education in the Context of Social Inclusion

Presenter: McKeown, Aileen

Particles, Protons & Physics - IKBLC 158

Analysis of the Effect of Plastic Deformation On the Through Plane Conductivity of Porous Transport Layers in Proton Exchange Membrane Fuel Cells

Presenter: Bennett, Scott

Simplified Model for the decay of quarks

Presenter: Bhoonah, Amit

Shielding Analysis for the ARIEL Tunnel and Maze at TRIUMF

Presenter: Dunning, Chelsea

Social Programs & Wellbeing - BUCH B209

The More, the Merrier: The Relationship between Socioeconomic Status, Well-being, and Friendship

Presenter: Bi, Shirley

What We IMPart: drop-in art and empowerment

Presenter: Sui, Tianru; Lamarche, Michelle & Ross, Lisa Michelle

Identifying HCV treatment barriers amongst high risk population of Vancouver Downtown Eastside

Presenter: Tahmasebi, Sahand



Technical Medicine - BUCH A101

Hyaluronan binding identifies a macrophage-like cell in bone marrow derived dendritic cell cultures

Presenter: Arif, Arif

Evaluating the Predictive Values of Perioperative Parameters in the Prognosis of Pediatric Renal Transplantation Patients

Presenter: Carreras, Erick

Cathepsin B Enzymatic Assay Design

Presenter: D'Ovidio, Adamo

The Brain is Fascinating - BUCH B211

Measures of Perceived Relatedness

Presenter: Allen, Claire & Fairburn, Tess

Lookout: the effect of meaning threats on vigilance

Presenter: Kim, Hee Jin

Examining the Representation of Mental Flexibility Through Image Transitions

Presenter: Min, Hae Jung & Wilkieson, Kelly



Morning Oral Presentation Abstracts

11:00am-12:00pm

Animal Biology

Song Divergence: In the case of Wilson Warblers (*Cardellina Pusilla*)

Presenter: Chen, Michelle

Faculty Sponsor: Darren Irwin

Divergence in mating signal and species recognition system is an important factor in biological speciation. Used mainly by males to advertise and attract potential conspecific female mates, bird song functions as a pre-mating reproductive barrier and plays an important role in avian mate choice. Two geographically adjunct breeding groups of Wilson's warblers (*Cardellina pusilla*) have been demonstrated to differ genetically in both mitochondrial and nuclear DNA despite similarity in morphology, suggesting their existence as a cryptic species pair. My research uses songs to examine the potential divergence between these two breeding population, in correspondence to patterns of previously observed genetic differentiation. The breeding range of Wilson's warblers extends through much of Canada and the United States, with the eastern (subspecies *C. p. pusilla*) and western (subspecies *C. p. pileolata* and *C. p. chryseola*) breeding populations coming close to contact just east of the Rocky Mountains. No zone of contact has been identified between the eastern and western populations in either their

breeding distributions, although these two groups may come in contact further north in the Yukon or North West Territories.

Here, I use a sound analysis software to determine if there is a difference between the songs sung by the two genetically distinct populations. Song recordings was obtained from the Cornell University Macaulay Library and UBC Zoology professor Darren Irwin, and set temporal and frequency variables were quantitatively measured. My research aims to answer the question: has song divergence occurred between the eastern and western breeding populations of Wilson's warblers? If this is the case, song divergence would further support the notion that the two breeding groups of Wilson's warblers are distinct from one another, both genetically and behaviorally. This work may also narrow down the possible contact zone between eastern and western populations, and further clarify if the two groups hybridize upon secondary contact. As Wilson's warblers exist as one of the oldest diverging boreal avian species, this system provides an excellent living model for studying the process of biological speciation in cryptic species pairs. Regional declines in breeding populations puts further emphasis on elucidating the potential speciation within Wilson's warblers, as a carefully described taxonomy is valuable in formulating future regulatory and conservation approaches.



Animal Biology

Behavioural plasticity in the heteromyid rodent Stephen's kangaroo rat (*Dipodomys stephensi*)

Presenter: Davis, Sarah

Faculty Sponsor: Liv Baker

"Behavioural plasticity" refers to the ability of an individual to alter its behaviours depending on environmental contexts. This concept is of interest to behavioural ecologists due to evidence that differences in behavioural plasticity may affect animals' responses to novel situations generated by human-induced rapid environmental change (HIREC). Lack of behavioural plasticity may be a risk factor for coping with HIREC, as the rate of current environmental change exceeds the evolutionary response rate of many populations. Using video footage previously collected for the Ph.D. research of Liv Baker, this research project looks at behavioural plasticity in the heteromyid rodent Stephen's kangaroo rat (SKR), *Dipodomys stephensi*, in two social contexts: predator (fox urine) and conspecific (mirror image) simulation tests. SKR is an endangered species who has exhibited maladaptive responses to HIREC and translocation (the capture, transport, and release of wildlife from one location to another). For translocation, SKR were captured from two distinct geographic populations in Riverside County,

California. Trials were filmed and behavioural responses in both acclimation and active periods of each trial are being sampled and frequencies of all observable types of behaviours recorded continuously. Data will be analyzed for within-individual, within-population, and between-population variations in plasticity. It is predicted that variations in plasticity may be correlated with previously collected translocation success data, such that the more plastic individuals are better able to cope in novel situations. An understanding of behavioural plasticity is essential to improving the methodology and success of conservation protocols used to help mitigate SKR population decline.



Animal Biology

Access to Food Drives Movement in the Arctic
Woolly Bear Caterpillar

Presenter: Greyson-Gaito, Christopher

Faculty Sponsor: Greg Henry

Acquiring a high quantity and quality of food is integral to the fitness, reproductive output, and development of all organisms. One strategy herbivores employ to optimize food quality is diet-mixing, i.e. mixing intake from different plant sources. Generalist herbivores necessarily diet-mix as they consume different plant species. When provided with a mixed diet, generalists have been found to perform better compared to a limited diet. Possible mechanisms behind these fitness benefits include 1) obtaining a complementary diet, 2) diluting toxins, and 3) avoiding natural enemies. It is relatively unknown, however, whether specialist herbivores gain fitness benefits from diet-mixing and what the underlying mechanisms for these benefits would be. *Gynaephora groenlandica* (Lepidoptera: Lymantriidae) is a little researched Arctic specialist herbivore, with which we can explore these questions. I manipulated the number of host plant individuals the larvae were allowed to consume, measured several ecologically important plant traits, and obtained abundances

of *G. groenlandica*'s parasitoids near to and far from *G. groenlandica* individuals. Counter to previous specialist diet-mixing research, no fitness benefits were found for diet-mixing in terms of relative growth rate, survival and length of activity. Instead, *G. groenlandica* may diet-mix in order to avoid their parasitoids. Comparing this Arctic system to temperate and equatorial systems, where specialist diet-mixing has been previously researched, can provide new insights into present hypotheses of plant-herbivore interactions.



Animal Biology

Mapping neural connections in the fruit fly brain

Presenter: Koch, Ellen

Faculty Sponsor: Michael Gordon

The intricate connections that make up a nervous system are crucial for the proper functioning of an animal. The gustatory, or taste, system, allows animals to determine whether foods are edible or toxic. In the gustatory circuit of the fruit fly *Drosophila melanogaster*, the primary sensory neurons and the motor neurons have been well studied. However, the neurons connecting them are not well understood, and these interneurons are likely where the processing and integration of information and decision-making occurs. In the gustatory system of the fruit fly brain, I investigated the connections primary sensory neurons make with other neurons. I did this with flies that genetically express green fluorescent protein (GFP), a cell marker, in taste neurons. To determine whether groups of neurons are connected, a special form of GFP called GFP reconstitution across synaptic partners (GRASP) was used to specifically label connections between neurons. I identified neurons that connect to both sweet-sensing and bitter-sensing neurons, as well as neurons that are specifically connected

to bitter neurons. The next step will be to further characterize the neurons that I have identified, through anatomical, behavioural and physiological techniques. This research gives us information about the connectivity of the gustatory system in *Drosophila* specifically, and can be applied to understanding other gustatory systems and nervous systems in general.



Animal Welfare

Influence of milk production on hair cortisol level in dairy cows

Presenter: Jia, Jasper(Pu)

Faculty Sponsor: Tracy Burnett

Cortisol is an indicator of stress. It provides an insight of improving animal welfare. Our objective was to determine the influence of milk production and lactation stage on hair cortisol concentrations of dairy cows. This study was conducted between May 2011 - March 2012 and samples were taken every 21 \pm 3 d from calving until 126 \pm 3 days. Only white hairs from the tail were collected and samples were cleaned of dirt and dander, washed in water then with isopropanol, dried and then ground in a ball mill. Data was analyzed by ANOVA using SAS (significant if $p < 0.05$). We found that the concentration of cortisol is significantly effected by days in milk (DIM), parity and the amount of milk produced during that period (all $p < 0.05$). As DIM increases, cortisol significantly decreases; as parity increase, cortisol significantly increases. Cows with 1-3 lactations have significantly lower cortisol than cows with 4 lactations or greater (7.9 pg/mg vs 10.7 pg/mg respectively); as milk production (within sampling period) increases, cortisol decreases.

Animals producing less than 33 kg/d during this period have higher cortisol than animals producing more than 45 kg/d (10.6 pg/mg vs 8.3 pg/mg). Optimizing farm management and improving genetics of cows could fulfill the reduction of cortisol concentration. Consequently, the fitness of cows could be increased, which will lead to more milk production.



Animal Welfare

Public Trust in Animal Research Practices

Presenter: Kim, Young Wook

Faculty Sponsor: Elisabeth Ormandy

The use of animals in research is a controversial issue that promotes diverse and often polarized societal values. Public trust in animal-based research is important: the public funds the majority of animal research through government tax dollars, and are often named as the beneficiaries of animal research. However, the public's trust, and the ability for public discussion about animal research might be highly influenced by how open the research community is to the public (Resnik 2011). The objective of this study was to assess whether the public is willing to support the use of animals in research under different university systems that vary in their level of openness and ability to provide opportunity for public feedback. To meet this objective an online survey called Fluid Survey was conducted. In the survey, four different options for the governance of animal research at universities were described: status quo, some information made publicly available, detailed information made available for public comment, and detailed information made available for both public comment and animal

facility inspections. Participants (n=175), recruited through Amazon Mechanical Turk, were asked to rate and explain their willingness to support animal research under the different governance systems. We predict that participants will be more willing to support animal research under systems that have higher levels of openness, and that have opportunities for public feedback. Data collection is currently underway. The results will be used to inform animal research policy at the university level.



Behaviours & Medicine

The effects of conspecific presence on the post-operative behaviours of individually-caged female laboratory rabbits

Presenter: Focken, Alexandra

Faculty Sponsor: Cathy Schuppli

Due to the gregarious nature of laboratory rabbits, there has arisen a general consensus on the importance of female rabbits being housed in stable social groups to improve welfare; however this is not always possible due to experimental variables and costs. Furthermore, research regarding the reduction of pain behaviour frequency has been demonstrated in other gregarious species while in the presence of a conspecific. We will be monitoring the behaviour of four rabbits following and unrelated thoracic surgery: two who are exposed to one another through cage bars limiting the ability to display aggression, and two who are completely isolated from all conspecific-related stimuli. Maintenance, abnormal, locomotor, resting, social, agonistic, and pain behaviours will be compared between the control rabbits (isolated rabbits) and socially-housed rabbits to determine potential differences in behaviour after surgery. Based on research on rabbits and other equally gregarious species,

it is predicted that socially-housed rabbits will demonstrate a reduced frequency of all abnormal (stereotypic) and pain behaviours due to the companionship of a conspecific. This method of partial group housing has the potential to provide female laboratory rabbits with social enrichment resulting in a reduction of abnormal behaviours and pain behaviours when social housing is not possible.



Behaviours & Medicine

Happiness and life satisfaction in people with an acquired brain injury: The links between social support, symptom severity, and location of injury with well-being

Presenter: Geddes, Alexa

Faculty Sponsor: Mark Holder

An acquired brain injury (ABI) is a common neurological impairment that occurs after birth as a result of a variety of medical incidents and trauma, including stroke, anoxia, and motor-vehicle accidents (Jones et al., 2011). The consequences of ABI are generally associated with physical, emotional, social, and cognitive impairments (Green et al., 2008). For the general population, social support – the experience of feeling loved and cared for by others, and being part of a social network – is correlated with subjective well-being (SWB), which is the cognitive and emotional evaluation of one's life (Diener, 1984; Taylor, 2007). Although we do know that individuals with ABIs often experience loneliness, rejection by peers, and fewer opportunities to develop close relationships, the role of social relationships in the happiness and life satisfaction of these people has not been fully explored (Kozloff, 1987). As well previous research has found that symptom

severity may be a negative predictor of SWB and individuals may experience different SWB levels depending on the brain injury location (Jones et al., 2011; Starkstein & Robinson, 1994). To help fill this gap in our understanding, we conducted one-to-one interviews with 81 individuals with ABIs in order to explore the relations between SWB and social support. Additionally, this research study investigated the relations of symptom severity and location of injury with SWB and social relationships. Close friendships and connectedness to community were found to be significantly correlated with aspects of SWB, which may prove helpful in the context of rehabilitation and community reintegration.



Behaviours & Medicine

Effects of Prenatal Alcohol Exposure on Social Interaction Behaviour in Periadolescent Male and Female Rats

Presenter: Haghighat, Sepehr; Mukhi, Naureen & Takeuchi, Lily

Faculty Sponsor: Joanne Weinberg

Fetal Alcohol Spectrum Disorder (FASD) refers to the spectrum of adverse conditions resulting from prenatal alcohol exposure (PAE), including changes in physical, behavioural and neurological parameters. Particularly, social behaviour deficits can serve as a common feature of FASD. Animal models of PAE have been very useful in demonstrating neurobehavioural social deficits, however, more studies are needed to investigate if social behaviour deficits observed in these individuals is related to their motivation for social interactions.

Here, we tested social motivation in an animal model of PAE. Pregnant rats received either 1) liquid ethanol diet (PAE Group), 2) control diet given in the amount consumed by a PAE partner to account for reduced food intake of ethanol moms (Pair Fed Group), or 3) control diet (Control Group). Female and male offspring were tested during early or late adolescence using a

2-chamber social interaction test. After 5-minutes of acclimatization, experimental rats were placed in the apparatus; one chamber was empty (Non-Social) and the other contained a social stimulus rat within a clear partition (Social). Behaviour was recorded using a camera. Our role was to score behaviour using video tracking software (Noldus Ethovision) to quantify duration spent in each chamber, distance travelled, duration in proximity to the social stimulus, and latency to enter the social chamber. Our data revealed that PAE animals do not differ from controls on any of the measures assessed. These results suggest that PAE animals' social motivation appears not to play a role in the social behaviour deficits following PAE.



Cancer & Transplant in Medicine

Ultrastructure analysis of subepithelial collagen rearrangement in asthma

Presenter: Li, Wei-Xian

Faculty Sponsor: Tillie-Louise Hackett

Introduction: Asthma is defined as a chronic inflammatory disease of the airways. Many cycles of injury, inflammation and repair overtime cause changes in the airways - these characteristic changes are called airway remodeling. Airway remodeling is associated with disease severity and is present in asthmatics despite current treatments. Therefore new drugs are needed. The idea is to better understand airway remodeling in order to design new drugs for asthma. One of the characteristics of airway remodeling is an increase in collagen. What is not known, is the state of this collagen - is it ordered or disordered? I am part of a research team that uses different types of microscopy to view collagen. My colleagues used different types of light microscopy and I used electron microscopy.

Methods: Tissue samples from non-asthmatics and asthmatics were examined. In each patient sample, 3 areas of collagen were examined (approximately 30 um apart) starting from the edge of the tissue block.

Results: Electron microscope images were examined with image processing software. Collagen particles were assigned an index of circularity, based on how close the particle was to a perfect circle (0=line and 1=circle). A histogram of this index for all the collagen particles within an image was generated and the shape distribution for non-asthmatics and asthmatics was compared. An even distribution of particle shapes is indicative of collagen orientation. The preliminary results show a difference of collagen orientation between asthmatics and controls. However, further analysis is in progress with a larger sample size.



Cancer & Transplant in Medicine

Characterizing the interplay between three bacterial proteins in human mitochondria during pathogenic E. Coli infection

Presenter: Thejomayen, Michael

Faculty Sponsor: Brett Finlay

Enterohemorrhagic and enteropathogenic *Escherichia coli* (EHEC; EPEC) are human pathogens that cause severe diarrhea worldwide, including recent outbreaks in Canada from contaminated water, beef, and gouda cheese. EHEC & EPEC use a “molecular syringe” called the type III secretion system (T3SS) to inject dozens of unique effector proteins directly into human cells. These effectors subvert human cellular processes to cause disease. The T3SS-injected effectors EspF, EspZ, and Map target human cell mitochondria, cell compartments that control cell death. EspF and Map are highly toxic and cause cell death, whereas EspZ interacts with a mitochondrial import regulator and counters EspF- and Map- induced cell death, thus protecting the infected human cell. My research hypothesis is that EspZ counters the toxicity of EspF and Map by decreasing their import into mitochondria. Cultured human cells were infected with EPEC strains with and without EspZ, and intact

mitochondria were harvested after 1.5 hours. Using Western blotting, I have confirmed that these bacterial effectors localize to mitochondria during infection and are imported into the innermost mitochondrial compartment, the matrix. Mitochondria from each condition have been submitted for quantitative proteomics comparison to examine how the contents of mitochondria are altered by the presence vs. absence of EspZ. The ultimate goal of this project is to characterize the mechanism by which EspZ protects human cells, to design effective therapeutics.



Cancer & Transplant in Medicine

Identification of MHC binding peptides on tumor-antigen-presenting dendritic cells by mass spectrometric analysis

Presenter: Tsai, Meng-Chi; Williams-Yuen, Jordan & Yeung, Clarence

Faculty Sponsor: Leonard Foster

of the mixture, and furthermore, to afford the amino acid sequence of each component. Finally, the identified peptides are compared to those in existing databases. Any newly discovered peptides may be used towards the further development of dendritic cell-based prostate cancer vaccines.

Dendritic cells are a crucial part of anti-tumor immunology: they are professional antigen presenting cells (APC) that capture and process the tumor antigen and then present the processed antigen to cytotoxic T-cells and trigger them, allowing the T cells to selectively destroy tumor cells without harming healthy cells . The FDA-approved vaccine sipuleucel-T, which allows dendritic cells (DC) to recognize a specific prostate cancer antigen, has been proven to prolong the median patient survival time by 4.1 months . The most advanced research today aims to identify antigens from APC that will trigger responses to the immune system through T-cells. This experiment extract DC from the patients with prostate cancer, and these antigens are then isolated as a mixture, and the mixture is analyzed with liquid chromatography-mass spectrometry (LC-MS). Using LC-MS makes it possible to separately analyze each component



Clinical Psychology

Postpartum psychosis in mothers with a history of major depressive disorder

Presenter: Mighton, Chloe

Faculty Sponsor: Jehannine Austin

Background: Postpartum psychosis (PPP) is a medical emergency and the most serious of postpartum mental health problems. While women with a history of major depressive disorder (MDD) have higher chances for depressive and manic episodes in the postpartum, little is known about the chance for PPP. Further, some research suggests that risk for PPP may be influenced by the sex of baby, but data are inconsistent.

Objectives: Among women with a history of MDD, to determine a) the frequency of PPP, and b) whether the sex of the baby affects the chance of PPP.

Methods: Primiparous women with singleton pregnancies and a history of MDD only (confirmed by structured clinical interview) completed the Positive and Negative Syndrome Scale (PANSS) once during pregnancy and at 1 week, 1 month, and 3 months postpartum. A psychotic episode was operationalized as a score above threshold in one of five key psychotic symptoms on the PANSS. To

determine the impact of sex of baby on frequency of PPP, we used a Fisher's exact test.

Results: Of 60 participants 18.3% ($n = 11$) experienced PPP, with postpartum onset for 6/11. Sex of the baby had no significant impact on the frequency of PPP ($p = 0.073$).

Conclusions: Our data suggest that it may be beneficial to monitor women with a history of MDD for symptoms of psychosis during the perinatal period, but that sex of the baby did not influence risk for PPP.



Clinical Psychology

Effects of disrupted lactation on depressive-like behaviour: Implications for postpartum depression

Presenter: Solomon, Sophia

Faculty Sponsor: Liisa Galea

Postpartum depression (PPD) is a debilitating mental illness that affects 15% of mothers. PPD etiology is unknown but patients have found to be significantly more likely to discontinue breastfeeding. The cause of this relationship is unknown but animal studies can investigate the relationship between these two inversely correlated variables in humans (i.e. PPD and nursing). Mother rats (dams) that are not exposed to their pups (and therefore not nursing) have more depressive-like behaviour compared to dams that are exposed and nursing their pups (Pawluski, Lieblich, & Galea, 2009). This shows that pup exposure attenuates depressive-like behaviour, however, it is still not clear whether it was due to pup exposure or lactation. This study investigates whether disrupted lactation, while maintaining pup exposure, during the postpartum period induces depressive-like behaviour. Dams were divided into two conditions: thelectomy (surgery disrupting lactation) and sham surgery (similar surgery yet dams are still able to nurse). Pup rotations

occurred between thelectomized and sham surgery dams every 12 hours in order to feed pups born to thelectomized dams. The Forced Swim Test (FST), a measure of behavioural despair often used in rat models of depression, was administered on 4 different days postpartum. Dams unable to lactate displayed more depressive-like behaviour on FST day 4 compared to lactating dams. This supports the idea that lactation may attenuate the depressive phenotype, not simply offspring exposure.



Clinical Psychology

The Relationship between Cannabis-Induced Subjective Experiences, Schizotypy and Social Functioning in a Non-Clinical Sample

Presenter: Ulloa, Ana Cecilia

Faculty Sponsor: Colleen Brenner

Being able to identify risk factors for the development of psychiatric disorders is key for minimizing their onset. Evidence suggests a relationship between cannabis-induced and long-term psychosis, however, the exact nature of this relationship is unclear. Previous researchers have investigated subjective experiences during cannabis use in individuals with schizotypal traits and found that in particular, subjective reports of psychosis-like experiences during cannabis use and negative after-effects have been correlated with higher schizotypal traits (Barkus et al., 2006); these studies have been conducted in European samples, however, similar studies have not been conducted in North America. In the current study we investigate whether these results will replicate in a larger, Canadian sample as well as whether these relationships will be associated with objective measures of cannabis use (i.e. age of first use and frequency of use). The current study also examines the importance of these

relationships with regards to social functioning. The Schizotypal Personality Questionnaire (SPQ), the Cannabis Experiences Questionnaire (CEQ), and the Social Adjustment Scale Self-report (SAS-SR) were administered to a large sample of undergraduate university students (N = 464). Results indicate that higher reported schizotypal traits are associated with higher scores on subjective measures of cannabis use. These findings suggests that those with higher schizotypal traits may have subjective experiences more closely related to psychosis while using cannabis, as well as more after effects. These results are important when considering that in the current study, higher schizotypal traits were also found to be indicative of higher impairments in social functioning.



Clinical Psychology

Schizotypy and Perceptual Aberration: Model of Hallucinatory Behavior

Presenter: Wang, Nena

Faculty Sponsor: Colleen Brenner

within the high schizotypy group, and additional analyses are needed to evaluate whether there were differences between high and low schizotypy groups.

Hallucination is one of the most striking hallmarks of schizophrenia, but the neural processes underlying hallucinations are unclear. The presence of unusual brainwave activity in people having schizophrenia-like characteristics suggests that there are also differences in the brainwave patterns of the schizophrenia population, contributing to psychopathology. This study examined whether being high or low in schizotypy, a construct similar to schizophrenia, influenced brainwave activity when people see highly ambiguous stimuli, in a paradigm mimicking visual hallucination. Using a mixed between-within subjects design, undergraduate students scoring high or low on schizotypy were shown images of faces embedded in varying amounts of visual noise, and some images of only noise. Differences in their N170 event-related potential, which is a brainwave associated with seeing faces, was assessed using electroencephalography to determine whether schizotypal traits affected the expression of the N170. There were no differences



Culture & Ethnicity

How Consumers Experience Asian Malls

Presenter: Chung, Matthew & Leo, Cherie-Nicole

Faculty Sponsor: Elizabeth Lee

Our study examines consumer experiences of the “Asian malls” of Aberdeen Centre and Parker Place in Richmond, B.C.. While previous research on consumption has often ignored ethnic dimensions, the increasing number and diversity of immigrants and the development of numerous “ethnoburbs” – suburbs inhabited by ethnically diverse populations –such as Richmond, warrants further investigation into ethnic consumption patterns. We hypothesize that ethnic dimensions play an important role in consumer experience. Data were gathered through participant observation, surveys, and semi-structured interviews, from which our analysis focused on the two major ethnic groups identified: Chinese and White. We argue that the ethnic and linguistic characteristics of consumers’ influence their experience of Asian theme malls, (re)producing a particular geography of inclusion and exclusion. Moreover, we found a discrepancy between the perceptions of these malls as exclusively Chinese linguistic spaces, and the actual linguistic geography of these malls

as bilingual Chinese and English spaces. We thus conclude that Asian theme malls function not only as sites of economic exchange but also as significant spaces where complex cultural interactions take place.

Etiam ac fermentum libero. Vestibulum venenatis imperdiet ante, id iaculis tellus sollicitudin et.



Culture & Ethnicity

The Effect of Ethnic Diversity on the Provision of Municipal Services in Canada

Presenter: Kim, Sophia

Faculty Sponsor: Kevin Milligan

Alesina, et al. (1999) have shown that U.S. cities with higher levels of ethnic diversity provide significantly lower levels of local government services, including necessary basics such as waste disposal and road work. The authors suggest this may have occurred because highly racially polarized populations vote to provide lower levels of services which they perceive as mostly benefiting other groups.

While ethnic diversity seems to be an important factor in the amount of public services provided by governments, little research has been conducted on Canadian cities. Since Canada and the U.S. have widely differing colonial histories, ethnic diversity may play a vastly different role in Canada. Yet, as ethnic diversity is set to increase in most Canadian cities for the foreseeable future, studying the effects of ethnic diversity may help to stem potential inequalities in the level of government services between homogenous and diverse cities.

To study if ethnic diversity does affect

the provision of public goods in Canadian municipalities, I have compiled a database of the expenditures of the 327 largest municipalities in Ontario, Quebec, Alberta, and B.C. Using the 2006 Canadian Census, I have created an index measuring the level of ethnic diversity in each municipality to see how diversity affects different kinds of municipal spending.

The preliminary results suggest that Canadian municipalities with higher levels of ethnic diversity also spend less per capita on providing protective services (such as police and fire), waste disposal services, and transportation services, as well as on total government expenditure.



Culture & Ethnicity

French in the Magdalen Islands: Promoting Dialects with Social Media

Presenter: Lacho, David

Faculty Sponsor: Christine Schreyer

The dialects of French spoken in the Magdalen Islands, Quebec are endangered. Their potential loss parallels the potential loss of cultural knowledge, as each French community of the islands has retained older forms of French, and have distinct linguistic features related to maritime life (Geistdoerfer 1987; Marie-Victorin 1921). The islands are located in the Gulf of Saint Lawrence, Canada. The total population is 12,781, and French is the mother tongue of 93% of the population. Compared to Quebecois French, the dialects of the islands are in a minority position in both number of speakers and in attitudes concerning what is a “better” variety of French.

My research looked at ways in which social media can be used to promote endangered dialects. Following six weeks of fieldwork, including participant observation and interviews, I developed a website and social media tools to help promote and maintain the dialects. This research involved micro-level language planning, so that the community had a voice in shaping the direction of

the research to incorporate their sense of identity, personhood, pride, and culture. (Tulloch 2010). This research is innovative, as it responded to community concerns regarding the potential loss of their dialects, and it uses developing techniques (i.e. social media) to help promote and maintain the dialects.

In this presentation, I describe how I responded to suggestions from community members regarding the promotion of their dialects using social media. I also review the level of success of the tools in regards to engaging community members.



Culture & Ethnicity

Perceptual identification of talker ethnicity in Vancouver

Presenter: Wong, Phoebe

Faculty Sponsor: Molly Babel

The Lower Mainland is a highly multicultural urban area. For example, for over 200 years, people from the regions of Punjab in India and Guangdong in China have been immigrating to the region. One of the cultural traits these groups bring with them is language. Thus, English in the Lower Mainland has been in close contact with Punjabi and Cantonese for years. Some researchers have hypothesized that such extensive periods of language contact can lead to language change and the emergence of ethnolinguistically associated features through the establishment of ethnolinguistic communities. The persistent ongoing pattern of language contact in Vancouver is the impetus for the present study, which examines whether listeners can identify the self-identified ethnicities of 30 speakers. Specifically, this work seeks to determine whether the varieties of English spoken by white Canadians, Punjabi-Canadians and Cantonese-Canadians in Vancouver are perceptually distinct from each other. Semi-spontaneous speech from 10 members of each of these three groups

was recorded. Individual sentences from these recordings were presented to listeners, who were instructed to choose the ethnicity of the speaker from a list of three choices: East Indian, Chinese, or White. While data are still being collected, preliminary results suggest that listeners are able to assess speakers' self-identified ethnic backgrounds at better than chance levels, and that listeners who interact more with a given ethnic group are better at accurately identifying speakers from that group. These results suggest the emergence of salient and ethnolinguistically associated features in Vancouver English and they emphasize the importance of familiarity in identifying ethnolinguistic variants. These results have potential implications for linguistic profiling and establishment of local ethnolinguistic identity.



Education & Learning

The MURC-y Waters Of Math Education

Presenter: Av-Shalom, Na'ama

Faculty Sponsor: Linda Siegel

Math is beautiful and interdisciplinary. It is a wonderful language with which the mind can explore and express the exciting nature of the universe, and helps those who use it to find patterns, think logically and abstractly, and uncover truths. So why isn't it taught that way?

In elementary school, students of varying levels of readiness and backgrounds are required to learn the same curriculum at the same pace and by the same methods. Exacerbating this problem is a big concern, reflected by current research, that hard working teachers often lack the knowledge and resources to teach math well, and many students feel disempowered or anxious about math, making them more resistant to learning and harder to teach.

Addressing this need, I merged research and practice to develop a mathematics curriculum for grade 4 and 5 students centring on a year-long game in which students must support settlers on another planet. In caring for colonists, dealing with problems, and interacting with aliens, they

are encouraged to bridge mathematical ideas with other disciplines to help their community – and themselves – flourish. Empowered to think about and use math in new ways, future thinkers are connected through a shared language.

I'll be discussing the development and implementation of this curriculum, results from the overarching project which spurred it, the difficulties of measuring and interpreting results, and further directions, all within the context of current educational practice and research.

Our world is remarkably colourful, so why do we teach math in black and white?



Education & Learning

Engaging Higher Order Thinking Skills: A Personalized Tutoring System

Presenter: Bojey, Matthew

Faculty Sponsor: Bowen Hui

Recent data shows a lack of student interest and declined enrollment in physics. We designed an intelligent tutoring system used to teach Kirchhoff's Rules, a problematic topic commonly encountered by first year university physics students. While software has been used to provide interactive learning experiences, they are typically limited to delivering questions with generic feedback for incorrect answers. Our system offers four types of activities that enable students to exercise a range of lower (e.g. remembering) and higher (e.g. creating and evaluating) order cognitive skills according to Bloom's Taxonomy. We adopt existing methods in probabilistic user modeling to provide personalized help when the student is stuck. Our system chooses an activity suitable for the student's current level of expertise in order to maximize engagement and minimize frustration. Unlike most intelligent tutoring systems, our work models both domain concepts and user attitudes during the course of their interaction with the software. We

use this information to determine when a student needs assistance, based on their mastery of the concepts, and when this assistance would be most welcomed. We ran simulation experiments to demonstrate that our model is able to estimate a student's expertise in the domain and attitude in using the system. Over the summer, we conducted a pilot study, which showed encouraging results that the system is able to increase user interest and confidence in the domain. Currently we are conducting a large-scale user study involving 356 students and are exploring the use of mobile platforms for longitudinal data collection.



Education & Learning

Outdoor Education: Children's Personal Perceptions of Experiential- Based Outdoor Education in the Context of Social Inclusion

Presenter: McKeown, Aileen

Faculty Sponsor: Neil Guppy

Outdoor education is common within schools, providing an avenue in which to teach important skills to students who struggle in a traditional academic setting. Past research indicates that outdoor education has a positive impact on students in gaining academic and social skills. Yet little research has been conducted on what participants themselves believe they gain from participation in outdoor education. Overall, this study provides exploratory research about personal perceptions of outdoor education, assessing the value of outdoor education as part of a larger socio- cultural learning arena. This study investigates into whether youth themselves feel that adopting outdoor education pedagogies creates a more socially inclusive environment among peers. This study complements extensive quantitative research suggesting a positive impact of outdoor education on the development of individuals.

We assessed a cohort of students at a private

secondary school in Vancouver. Students had qualitative in-depth interviews before and after participation in a school facilitated outdoor education program, investigating whether students perceived engagement with their classmates differently after the program. Results indicate that students felt more inclusive towards classmates after participation in the program, and had a greater appreciation for team building and communication skills amongst peers. This study suggests areas for further research in student perceptions of outdoor education, which may help advise school board policies surrounding the use of outdoor education programs, as well as advise schools themselves in restructuring their outdoor education programs to better reflect desired learning outcomes.



Particles, Protons & Physics

Analysis of the Effect of Plastic Deformation
On the Through Plane Conductivity of Porous
Transport Layers in Proton Exchange Membrane
Fuel Cells

Presenter: Bennett, Scott

Faculty Sponsor: Walter Merida

Proton exchange membrane fuel cells (PEMFC) utilize many thin layers within the cell to facilitate the electrochemical reaction turning hydrogen and oxygen into electricity. One of these thin layers, the porous transport layer (PTL), serves the purpose of being the primary conductor of electrons out of the PEMFC. Hence, the optimization of conductivities in this layer leads to improved PEMFC performance. Recent studies (Escribano et al. and Wilde et al.) described how through plane conductivity improves as compressive stress increases. However, Escribano et al. concluded that compressive stress must be minimized in order to reduce mass transfer loss at high current and low pressure. As part of a larger study it was observed that PTL layers exhibit plastic deformation under compressive stresses and after the sample has been unloaded it will display more favourable conductivity values than the as-received samples. The analysis of

this phenomenon in different PTL materials, its relationship to other material properties, and the preconditioning and optimization of PTL materials in this way has not been studied extensively. Our test apparatus utilizes the four point probe method which gives us a highly accurate conductivity measurement. Our procedure and analysis is designed with the purpose of cancelling-out contact resistances between the probes and the sample. The apparatus is also capable of determining stress-strain data for PTL materials. Preliminary results demonstrate that all PTL materials show some plastic deformation after loading.



Particles, Protons & Physics

Simplified Model for the decay of quarks

Presenter: Bhoonah, Amit

Faculty Sponsor: Ariel Zhitnitsky

There are two main areas of Physics: classical and quantum. Classical Physics describes most everyday experiences such as a moving car or the Earth going around the Sun. Quantum Physics describes atoms, molecules, and other elementary particles. Typically a physical system involves a potential well which can be pictured as throwing a ball in the air. It can only go up to a certain height which depends on how much energy the thrower gave it. This is a Classical picture: particles can only exist in regions of a potential well which depend on how much energy they have. However quantum mechanically this is not true: quantum particles can exist in classically forbidden regions of a potential well (a quantum mechanical ball thrown in the air can go all the way up to Mars). This is called Quantum Tunelling, which we investigated in this project.



Particles, Protons & Physics

Shielding Analysis for the ARIEL Tunnel and Maze at TRIUMF

Presenter: Dunning, Chelsea

Faculty Sponsor: Anne Trudel

The TRIUMF facility located here at UBC is Canada's National Laboratory for Particle and Nuclear Physics, and is home to the world's largest cyclotron. Many physics experiments at TRIUMF make use of the proton beam generated by the cyclotron, capable of up to 500 MeV in energy. TRIUMF has built the new Advanced Rare Isotope Laboratory (ARIEL) facility, which will make use of the electrons that are also produced in the cyclotron. However, a concern of using particle beams is the amount of radiation produced, so various kinds of shielding must be used to protect against any accidents. In order to determine if the shielding in place for the beam line at ARIEL is enough to withstand an accidental full 75 MeV electron beam loss, one must do calculations to evaluate the dose rate contribution from electron braking radiation for different shielding materials, however a computer simulation is also required for a particular geometry of interest. Two separate computer simulations of the beam loss for two different locations of interest along the

beam line were carried out using a Monte Carlo program, and the total dose rates were measured in these two locations. The total dose rates are well below the regulation limit of 50 mSv/hr for an accidental full beam loss; in this case there is more than enough shielding. In the future, the same simulations will be used to test the shielding against different beam conditions to ensure safe operation of the electron beam.



Social Programs & Wellbeings

The More, the Merrier: The Relationship between Socioeconomic Status, Well-being, and Friendship

Presenter: Bi, Shirley

Faculty Sponsor: Frances Chen

Although social support from family and friends can buffer the negative effects of stress (Cobb, 1976), buffering the stress of transitioning to university may be more complicated as large lecture halls make it difficult to form friendships (McNeely, Nonnemaker, & Blum, 2002). As students with low socioeconomic status (SES) work more (Karimshah et al., 2013), these students have less time to spend with their peers. Furthermore, Adler et al. (1981) suggests that high SES individuals have less stress due to increased resources. Hence, low SES students may have less social support, in addition to more stress.

While the relationship between SES and well-being is commonly studied, the effects of SES on well-being were found to vary based on sex, ethnicity, and stage in life, preventing generalization of the results (Braveman et al., 2005). Furthermore, the relationship between friendship, SES, and well-being on university students has yet to be examined. Therefore, we are investigating whether low SES students have fewer friends

and lower subjective well-being than high SES students, specifically first year students from the University of British Columbia. The students were asked about their objective SES, subjective well-being and number of friends. We predict that low SES students will have fewer friends and lower subjective well-being compared to high SES students, suggesting that social support may be lacking for low SES students. More research is required but this may act as a stepping stone towards interventions aimed at helping low SES students.



Social Programs & Wellbeings

What We IMPart: drop-in art and empowerment

Presenter: Sui, Tianru; Lamarche, Michelle & Ross, Lisa Michelle

Faculty Sponsor: Marjon Blouw

For the past three years, UBC Island Medical Program (IMP) students have lead a drop-in waiting room art program, IMPart, at Victoria's downtown Access Health Centre (AHC), a primary health facility serving those afflicted by poverty, addiction, chronic and mental health illnesses. IMPart's goal is to empower AHC clients in a culturally safe environment while promoting self-acceptance through artistic expression, calm self-reflection, pride in one's work, and community-building. IMPart sessions are run several times a week and provide AHC clients with art supplies, snacks, conversation and an open environment.

IMPart has never received formal evaluation, and the aim of this study is to evaluate and assess whether the program's intended outcomes are being achieved, and to determine sustainable methods for future expansion and improvement. Surveys are administered to consenting clients and staff (physicians, nurses, pharmacists, acupuncturists, MOAs) to explore their perceptions of the program's impact on

clients (value, emotion, wellbeing, etc...), client-staff interactions, and clinic atmosphere. Our hypothesis based on anecdotes from clients and staff, and the many returning clients, is that IMPart positively influences interactions between client and staff; improves clients' overall wellbeing and mental health; and promotes a sense of community and inclusivity amongst clients. Ethics was obtained through UBC; data collection is currently in progress and analysis (qualitative and quantitative/statistical) will be completed March 2014.

Study results will identify the positive and negative aspects of the program, focusing on areas requiring improvement; these findings will be disseminated to clients, community, and health-care providers through publications and presentations with the intent to promote similar community empowerment projects and to make improvements to the existing program.



Social Programs & Wellbeings

Identifying HCV treatment barriers amongst high risk population of Vancouver Downtown Eastside.

Presenter: Tahmasebi, Sahand

Faculty Sponsor: Harout Tossonian

Currently there is little information on what is preventing high risk vulnerable populations from engaging in Hepatitis C Virus (HCV) diagnosis and treatment. The aim of this study is to survey this population using a targeted questionnaire and to identify barriers to HCV care. This was administered during Portable Pop-up Clinics at specific locations frequented by people who inject drugs (PWID) where participants have the opportunity to access point-of-care testing. Participants were recruited at pop-up clinics held at two different community-based centers in Vancouver's Downtown East Side. During these clinics OraQuick HCV Rapid Antibody point of care testing was offered. Participants who were tested were then offered to complete a questionnaire while they waited for test results.

During January 2014, 43 individuals completed the questionnaire. The questionnaire included demographic questions and also questions regarding subjects' medical history and HCV related background. With regards to HCV

treatment, they were asked about the barriers to start proper treatment. Despite awareness of their HCV infection, and their desire to get treated PWID do not routinely seek medical care. Barriers such as inaccessible medical care, unfamiliarity with available resources, and concerns regarding treatment side effects have been identified. Organized and targeted community events such as portable pop-up clinics increase likelihood of reaching out to marginalized and high risk inner city populations to address these barriers in a systematic way.



Technical Medicine

Hyaluronan binding identifies a macrophage-like cell in bone marrow derived dendritic cell cultures.

Presenter: Arif, Arif

Faculty Sponsor: Pauline Johnson

Discovery of new culture methods is important in the thorough study of biological phenomena that are difficult to observe in vivo. Alveolar macrophages are an immune cell type that reside in the fragile alveolar sacs in mammalian lungs and phagocytose inhaled particles and pathogens. The location of these cells at such an active interface makes them highly specialized and unique, preventing current macrophage cultures from modeling their behavior. Here, we demonstrate the presence of a subpopulation of the bone marrow derived dendritic cell culture that have many of the same characteristics as alveolar macrophages. Separation and identification of this population by surface markers has been conducted using fluorescent labeled antibodies and analyzed using a flow cytometer. Activation of these macrophages by lipopolysaccharide was compared to dendritic cell activation and their known in vivo cell responses using both flow cytometry and enzyme-linked immunosorbent

assay. Analysis of the surface marker and cytokine expression of this population has revealed that it is phenotypically and functionally similar to alveolar macrophages. This offers an attractive method for relatively simple acquisition of alveolar macrophage-like cells to study. There are also secondary implications due to the widespread use of the bone marrow dendritic cell culture as a source of dendritic cells, assuming a homogeneous culture. The results of this research will be published in a scientific journal.



Technical Medicine

Evaluating the Predictive Values of Perioperative Parameters in the Prognosis of Pediatric Renal Transplantation Patients

Presenter: Carreras, Erick

Faculty Sponsor: Andrew I.M. Campbell

Purpose of Study: Renal transplant remains the gold standard for management of end stage renal disease irrespective of the patient's age. Currently there are no accurate and reliable methods of acquiring a quantitatively based long-term prognosis for a renal transplant recipient immediately after surgery. At B.C. Children's Hospital, we hypothesized that modifiable perioperative factors are associated with kidney graft outcome.

Methods Used: All patients who have undergone a primary renal transplant, or the first of several, between the dates of January 1st, 1992 and May 31st, 2013 were included. There were no exclusion criteria. A total of 150 subjects have been included in our study; however, only 25 are used in the preliminary analyses observed today. A retrospective cohort analysis was conducted on all subjects. There were three primary outcomes as a determinate of renal function: estimated glomerular filtration rate (eGFR) at the times

of discharge, 6 months postoperatively, and 12 months postoperatively. Ten perioperative variables were used a preliminary data analysis that tests for any associations between the outcomes and variables included.

Summary of Preliminary Results: There was a significant a positive association between both perioperative variables, donor living status and total intravenous fluid, and a positive renal graft outcome as measured by an eGFR at 6months. ($p < 0.02$ and $p < 0.015$, respectively). There was also a significantly negative association found between both perioperative variables, intraoperative central venous pressure and warm ischemia time, and a positive renal graft outcome as measured by an eGFR at 6months ($p < 0.017$ and $p < 0.02$, accordingly).



Technical Medicine

Cathepsin B Enzymatic Assay Design

Presenter: D'Ovidio, Adamo

Faculty Sponsor: Andis Klegeris

Alzheimer's disease (AD) is a degenerative disorder of the brain, and is the most common form of dementia. Chronic inflammation of the brain causes immune cells to release molecules that can cause neuronal death. This is a characteristic of AD. The protein cathepsin B (cathB) is one of the molecules released. Cathepsin B can participate in the production of the amyloid- β protein, which plays a key part in AD. Amyloid- β forms plaques in the brain, which lead to neuronal damage. Therefore, compounds that may inhibit this activity of cathB could be useful for treating AD. The purpose of this project was to design an experiment that can measure cathB activity, and to assess gold-containing drugs as inhibitors of cathB. The experiment involved the use of the molecule, Z-Arg-Arg-7-amido-4-methylcoumarin hydrochloride, that, when acted upon by cathB, fluoresces. The fluorescence signal was recorded, and the data obtained was analyzed to determine the activity of cathB. The ability of auranofin (AF), a gold-containing drug, to inhibit cathB was compared to that of E-64, which is

another known inhibitor of cathB. Cathepsin B was mixed together with varying amounts of AF and E-64, and the percentage of remaining cathB activity was calculated. Both AF and E-64 decreased the activity of cathB; however, only E-64 produced statistically significant effects. The cathB activity experiment could be utilized to search for other inhibitors of cathB that may be useful as therapeutic agents for AD in the future.



The Brain is Fascinating

Measures of Perceived Relatedness

Presenter: Allen, Claire & Fairburn, Tess

Faculty Sponsor: Kathleen Hall

Whether regular language users think of words as “related” is important for many areas of linguistic research. It isn’t always an easy task to determine whether two word forms are related. For example, it may seem that there’s a clear relationship between “press” and “pressure”, but what about “press” and “impressionism”? What do speakers know about measures of relatedness, and is there a way to objectively quantify etymological relatedness in a way that’s psychologically real?

This experiment used an AXB discrimination task, in which speakers were asked to make similarity judgements about words. On every trial, participants were presented with three words, and were asked to judge whether the word on the left or the word on the right was more similar to the key word in the middle. Results were compared with independent corpus linguistics analyses that measured similarity in terms of spelling (Khorsi, 2012), pronunciation, and meaning (Han et al., 2013).

So far, our results from a pilot study are closely

in line with our predictions. Words that linguists suggest are etymologically related tend to be judged as most similar, followed by meaning-related, and then by sound-related words. Eventually, the goal is to develop an independent measure of perceived word-relatedness that can be useful for multiple sub-fields of linguistic research.



The Brain is Fascinating

Lookout: the effect of meaning threats on vigilance

Presenter: Kim, Hee Jin

Faculty Sponsor: Steven Heine

The Meaning Maintenance Model suggests that when we encounter something incongruent with our expectations (i.e., a “meaning threat”), we often experience negative arousal which leads to compensatory affirmation (Heine, Proulx, & Vohs, 2006). For example, we may become more punitive towards a prostitute in an attempt to restore a sense of meaning by affirming a cultural worldview (Proulx & Heine, 2006). What is less clear is how we prepare our bodies to deal with the aversive state produced by meaning threats. One possibility is that we increase our vigilance after being exposed to a meaning threat to identify the source of the threat. To test this, I measured participants’ eye movement after a meaning threat condition (playing cards with incongruent colour and suit, e.g., black hearts) or a control condition (playing cards with congruent colour and suit, e.g., red hearts) by using an eye tracker. Preliminary data analyses have shown that no significant difference emerged between two conditions in terms of vigilance measures by eye movements.



The Brain is Fascinating

Examining the Representation of Mental Flexibility
Through Image Transitions

Presenter: Min, Hae Jung & Wilkieson, Kelly

Faculty Sponsor: Ronald Rensink

A mental representation is a theoretical entity believed to be the brain's construction of the outside world. It allows us to interact with objects, store and retrieve memory, and see what we think we see. Mental representations are somewhat flexible, because they must be able to account for changes that may be occurring in the world. This study uses a visual search paradigm (finding a target stimulus among distracters on a display) to find insight into improving the designs of various visual displays—from game apps to airplane cockpits.

Participants will be given three sub-conditions for each version: two flickering sub-conditions and one scaling sub-condition. Flickering conditions are controls where there is no size change. In scaling conditions, stimuli will change their sizes. The huge difference in reaction time across sub-conditions will be interpreted as participants perceiving difficulty when stimuli's sizes changed. Based on previous studies using simple stimuli, people take longer to process larger size changes,

shown through a longer reaction time.

This study aims to see whether the same pattern from the original study is shown even with complex stimuli (hexatri – three hexagons) in order to generalize the result. While this study is currently in progress, if a similar pattern is found, size could be considered as the key factor of the flexibility of mental representation. Furthermore, the project can expand to examine which factors caused the difference – whether it was the complexity or the colors or the shapes of the stimuli.



Poster Session

Map of Posters in Irving K. Barber Learning Centre, Floor 2

Themes

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Biological Sciences

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Engineering,
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Education

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Psychology

10	9	8	7	6	5	4	3	2	1
11	12	13	14	15	16	17	18	19	20
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31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
70	69	68	67	66	65	64	63	62	61
71	72	73	74						



Poster Presentation List

12:30pm-1:35pm

Biological Science

1. The Effects of Global Warming and Ocean Acidification on the Coral Holobiont

Chan Y. & Okamoto N.

2. Effect of Temperature on Performance Limits in Crabs

Chau V., Krishnan S., & Marshall K.

3. Possible Mechanism of Sweet Taste Inhibition by Amiloride in Humans

Chen A., Wong A., & Leung C.

4. Auxin, Gibberellin, and Cytokinin in Relation to Apical Dominance in Bean Plants

Cheng M. & Singh S.

5. Microbial responses to alterations in nitrogen fertilizer composition

Gosselin E., Wang L., & Barker J.

6. The impact of failure of passive transfer of immunity on early growth rate in dairy goat kids

Kaur M. & Zobel G.

7. How does soil affect Plant-Microbial Interactions?

Kumar U., Peng H., & Dong O.

8. Enhanced Lifespans: Regulation of Heat Shock Factor 1 (HSF-1) by Translation Inhibition

Lee C. & Goh G.

9. The Inhibitory Effect of CB1 Receptor Agonist HU-210 on Sexual Behaviour in Male Rats

Lee A., Rigby R., & Dang S.

10. Investigation of the Contributors to the Long-Latency Reflex

Maurer A. & Chua R.

11. Effects of individual, pair, and parental housing on calf behavior during weaning

Ng E. & Costa J.



Biological Science

12. The influence of pH on aquaporin 4 localization and function

Pezarro K., Lam W. & Perronnet C.

13. The role of neurexin and neuroligin in habituation of alcohol-intoxicated *Caenorhabditis elegans*

Soo S.K.Y. & Rankin C.

14. Identification of Viral Biomarkers for Monitoring Water Quality

Webb M. & Tang P.

Engineering, Technology, Chemistry & Physics

15. Hydroelectric Dams: how to make them a true green source of energy

Carreras E., Kassam F., Gill G., Huh S. & Dake G.

16. Ultrafast, All-Optical Switching of Nanoparticle Composites

Krupa J., Geoffroy-Gagnon S. & Holzman J.

17. Data Mining Social Media Feeds for Sentiment Analysis

Lee K., Lau K., & Beschastnikh I.

18. Hybrid timber-steel structures: A review of promising systems

Pieper C. & Tesfamariam T.



Medical Science

- 19. Intrinsic Pathway of Neutrophil Apoptosis in Febrile Episodes of Periodic Fever, Aphthous Stomatitis, Pharyngitis, and Cervical Adenitis (PFAPA) Syndrome**
Al-Attar H., Kahlon M. & Brown K.
- 20. The associations between depressive symptoms, parental attributions, positive illusory biases, and ADHD subtype in children with ADHD**
Botia A. & Johnston C.
- 21. Flying High: Cardiac trabeculae response to hypoxic conditions in bar-headed geese**
Catalano S., Fagen A., Malhi P., Gill H. & Lague S.
- 22. Elimination of Tumour Cells in Mice via Oncolytic Adenoviruses Designed to Selectively Replicate in Tumour Cells**
Chang B., Fogarty E., Law M. & Dong J.
- 23. Regulation of Gliotactin in Polarized Epithelia - A Kinase Screen**
Das S. & Auld V.
- 24. Habituation in *C.elegans* with mutated homologs of human genes linked to Parkinson's disease**
Ebrahimzadeh S. & Rankin C.
- 25. Effect of Heme Oxygenase-1 in the resistance to Gemcitabine in Breast Cancer**
Elizondo P., Berlin M., Ang M. & Kim A.
- 26. Exploring the effects of disconnections between the nucleus accumbens and orbitofrontal cortex on impulsive behaviours in male rats.**
Fortes E., Mitchell S. & Ferland J.M.
- 27. Anti-viral responses are elevated in leukocytes from children with Periodic Fever, Aphthous stomatitis, Pharyngitis, and cervical Adenitis (PFAPA) syndrome**
Guan D., Man A., Guron M. & Brown K.



Medical Science

- 28. Effects of Prenatal Alcohol Exposure on Social Interaction Behaviour in Periadolescent Male and Female Rats**
Haghighat S., Takeuchi L., Mukhi N. & Weinberg J.
- 29. The Arginine Catabolic Mobile Element and resistance of Methicillin-Resistant S. Aureus.**
Hernandez D., Ramgarhia K., & Marchant E.
- 30. Effects of a putative male contraceptive on the ultrastructure of actin filament bundles in the seminiferous and other epithelia**
Hosseini F., Adams A. & Vogl W.
- 31. A Novel Way of Detecting Intrathecal Baclofen Withdrawal in Post-Operative Patients**
Ip A. & Robinson S.
- 32. Emergency Department Management of Pulmonary Embolism: A Significant Opportunity for Standardizing Care**
Ji Y.D., Chen H., & Ghag D.
- 33. Drug Loaded PVA Nanofiber Braided Surgical Sutures**
Kim S. & Ko F.
- 34. Podoplanin is upregulated in subsets of reactive astrocytes**
Kolar K. & Sin W.C.
- 35. Use of medicinal cannabis in cancer pain and symptom management**
Kong C., Nguyen K., & Oja C.
- 36. Bioinformatic Analysis of the Huntingtin Gene**
Kosior N. & Leavitt B.
- 37. Effects of NOTCH1 and NOTCH2 Activation on Global Gene Expression Patterns in Pancreatic Cancer Cell Lines**
Monga P., Gu M., & Pon J.



Medical Science

38. 3D Breast Cancer Cell Culture using Microfluidics for Drug Screening

Ni C. & Cheung K.

39. Tylenol and Task Performance

Olechowski E. & Heine S.

40. Induced differentiation from a pancreatic insulin cell to a functional beta cell via epigenetic changes to the chromatin state

Parapini E. & Hurley P.

41. The Effect of Head Massage Therapy on the Regulation of the Autonomic Nervous System: A Pilot Study

Pourrahmat M. & Fazeli M.S.

42. Biomechanical Evaluation Of Challenges Associated With Turning In People Post-Stroke

Qaiser T. & Lam T.

43. An investigation into the effect of nAChR involvement in hippocampus modulated impulsive choice

Sethi P., Krdzalic E. & Ferland J.M.

44. Differential methylation approach to quantify cell-free fetal DNA in maternal plasma

Singh T.K. & Robinson W.

45. Chimeric Antigen Receptor (CAR)—A novel approach to immunotherapy for Crohn's Disease

Siu J. & Vent-Schmidt J.

46. Characterizing the interplay between three bacterial proteins in human mitochondria during pathogenic E. Coli infection

Thejomayen M. & Finaly B.

47. Genetics and the Progression of Parkinson's Disease (PD)

Wei M., Tang S., Cao K., Chadha A. & Trinh J.



Medical Science

48. Augmentation of gene expression for the IL-17 cytokine in Chronic Experimental Autoimmune Encephalomyelitis and Multiple Sclerosis.

Wilkinson B., Brown C., Xu G. & Wilkinson B.

49. Investigating the Intraluminal Processing of Arylimidamide DB1960 in a Nanoparticle Lipid Formulation using an in vitro Lipolysis Model

Wong C. & Wasan K.

50. Assessing protein interactions in Huntington's Disease using gene expression analysis

Xie R., Yang S., Ma F. & Zhao E.Y.

51. Inherited Epigenetic Differences and Asymmetric Replication in Muscle Stem Cells

Xu P. & Judson R.

52. Unnatural amino acid mutagenesis reveals the critical role of hydrogen bonding for binding of retigabine in the pore of KCNQ channels

Yau M. & Kurata H.T.

53. Father involvement in HIV-related care and antiretroviral (ARV) medication adherence in South Africa

Yeung B., Bal A. & Mercer G.

54. Effects of Bcl-xL and glucolipotoxicity on mitochondria metabolism

Zhao G., Kamma E., Suen I. & Shih A.



Politics, Culture & Education

55. Student and Faculty Perceptions of Student Evaluations of Teaching: A Qualitative Study
Lee J. & Pearson M.

56. Input Effects in the Sensitive Period for Language Acquisition
MacWilliams M. & Kam H.C.

57. Human Rights, Transnational Extraction Corporations and Global Jurisdiction: the case for Canada's Bill C-323
Riva L. & Cirkovic E.

58. Identifying HCV treatment barriers amongst high risk population of Vancouver Downtown Eastside.
Tahmasebi S. & Tossonian H.

59. Perceptual identification of talker ethnicity in Vancouver
Wong P. & Babel M.

Psychology

60. Stress and Visual Attention
Birnbaum T., Lau R., Lam A. & Rensink R.

61. Visual Perception of Correlation with Colour
Chang J. & Rensink R.

62. What's on First?: The effect of ownership on perception
Cowie C. & Todd R.

63. Overcoming Obstacles: Evidence of Obstacle Suppression During Reach-and-Grasp Movements
Grandos-Samayoa J.



Psychology

64. Marital adjustment in stepfamilies: Effects of daily dyadic coping

Herriot H. & DeLongis A.

65. UBC Teddy Bear Clinic: findings from a pediatric population

Jia L., Hao E., Subedi M., Ng N. & Dharamsi S.

66. The Moderating Role of Burnout in the Relationship Between PTSD and Sleep

Kukowski C. & King D.B.

67. From Workaholics to Alcoholics: The Impact of Early Employment on Future Substance Use

Monillas R. & Houshmand M.

68. The Roles of Psychopathy and Victimization History in Rating Potential Intimate Partners

Okano M. & Walsh Z.

69. What and How Do Other Factors Mediate The Relationship Between Money and How Giving We Are?

Patel P. & Whillans A.

70. The effects of Western culture affiliation on sexuality amongst interethnic Asian groups

Peng M. & Gorzalka B.

71. Keep your Friends close, and your Possessions Closer: How Ownership and Motor Movement affect Memory.

Rothwell A. & Handy T.

72. Do listeners' biases affect speech perception?

Russell J. & Babel M.

73. Literacy Capability in Physically Abused Children

Tikhonova J., Fung D., Chawla K., & Flores J.P.

74. Confirming the Findings that slo-1 is Involved in the Alcohol Pathway and Effects Habituation Using the Backcrossing Method

Zhu S.H.O., Kan M. & Rankin C.



Poster Presentation Abstracts

Biological Science

The Effects of Global Warming and Ocean Acidification on the Coral Holobiont

Presenter: Chan, Yuk (Bobby)
Faculty Sponsor: Noriko Okamoto

Climate change's effect on the health of our global reefs has been a pressing issue for many years. Thorough experimentation has shown that the acidification and warming of our ocean has been deleterious to the health of coral reefs.^{1,2,3,4} However, previous experimentation has never been extended to the effects of a multi-stressor regime on the coral holobiont. This is of importance because corals are facing global warming and ocean acidification together, not separately. They are also not a single organism. The coral holobiont is composed of the coral itself and vast communities of bacteria, archaea, protists; each with their own capacity for resilience. The aim of this research is to quantify the effects of these stressors on the health of the coral holobiont and whether their effects are independent or multiplicative when experienced together. Through the use of controlled aquariums, each with different regimes of heat and injection of CO₂, we can observe the effects of these stressors on the health of the microscopic community.

Utilizing techniques including transcriptome surveying and flow cytometry, samples will be taken over time and the number and identify of the inhabitants can be tracked over the duration of the regime. The information garnered by this research could paint a better understanding of the coral holobiont and improve methods being developed to preserve these natural wonders in the face of these growing threats.



Biological Science

Effect of Temperature on Performance Limits in Crabs

Presenter: Chau, Vivian & Krishnan, Sarangadev
Faculty Sponsor: Katie Marshall

Organisms living in the intertidal zone are subjected to temperature fluctuations daily. They can function only within a particular range of body temperatures, in which low temperature causes muscle failure in organisms, but the physiological mechanism so far is unclear. Two competing hypotheses that are currently used to explain why muscles fail at low temperatures are oxygen limitation and ion homeostasis failure (Frederich, 2000). The aim here is to investigate the physiological mechanism behind muscle and performance failure at low temperatures in the green crab *Hemigrapsus oregonensis*. Infrared heart rate monitoring is applied to predict the responses of *Hemigrapsus oregonensis* to low temperatures by measuring the changes in the volume of circulatory structures during a heartbeat. Moreover, atomic absorption spectroscopy is used to see if ion balance is lost at the same temperature as muscle function. T-tests examines whether two samples are different, and are also performed to compare heart rate

and ion balance in *Hemigrapsus oregonensis* at above and below the temperature that causes loss of muscle function. If oxygen limitation causes muscle failure, heart rate would stop at the same temperature as the muscles stopped. If ion imbalance causes muscle failure, ions would be imbalanced at temperatures below where muscle failure occurs, or both of these outcomes could be correct. In summary, if ion balance remains unaffected but heart rate slows, then it is likely oxygen limitation is what causes crabs to lose muscle function at low temperature. Conversely, if heart rate remains unaffected but ion balance decreases, then loss of ion balance is likely the cause.



Biological Science

Possible Mechanism of Sweet Taste Inhibition by Amiloride in Humans

Presenter: Chen, Annie & Wong, Alex
Faculty Sponsor: N/A

Amiloride, commonly known as Midomor, used in treatment of hypertension, is a compound known to suppress human perception of sweet and salty tastes. Due to its inhibitory effects on taste perception, one of the side effects of taking amiloride is loss of appetite. The pathway by which amiloride inhibits transduction of salty tastes is already known, but the mechanism of sweetness inhibition remains unidentified. In different strains of mice, such as C57BL/6 and BALB/c, various degrees of saltiness inhibition by amiloride have been found. Similarly, it was discovered that taste inhibition levels also vary for gurmarin, a sweetness inhibition protein, between strains of mice. Based on these two observations, it is likely that there is variation in sweetness inhibition by amiloride. If there is deviation between strains, one strain would be inhibited while the other remains largely unaffected. To identify taster and non-taster mice, electrical potentials could be recorded by exposing nerves of the tongue to different amounts of amiloride

and observe corresponding responses. Once taster and non-taster strains are identified, human taste cells, affected by amiloride inhibition, and non-taster mouse taste cells could be used to create cells with taste receptors based on a combination of human and mice genetic material. Various combinations of coding regions of human and mouse taste receptor genes could be assembled and tested for amiloride sensitivity, thus knowing which specific domains are crucial for interactions with the compound. From this process, we expect that changes to the active site of the receptor would be the most critical. Knowing the pathway by which amiloride inhibits sweetness could offer insight for developing methods to counteract the side effects of amiloride in hypertension patients.



Biological Science

Auxin, Gibberellin, and Cytokinin in Relation to Apical Dominance in Bean Plants

Presenter: Cheng, Molly

Faculty Sponsor: Santokh Singh

Plant hormones are growth-regulating chemicals, which are synthesized by plants in low concentrations. The objective of my project is to study how the plant hormones, including cytokinin, auxin, and gibberellin regulate the apical dominance and lateral bud growth in bean plants. I also propose to investigate how different hormone concentration and combination with other phytohormones can show differential effects in the developmental plasticity for bean plants. For instance, in my initial experiments, I applied auxin, cytokinin and gibberellin to three-week-old bean plants with either intact or excised apical buds. After a week of hormonal treatments, I observed that plants showed induced apical dominance in auxin-treated plants. Cytokinin exhibited a concentration-dependent effect on lateral bud growth and internode elongation. At low concentration, cytokinin increased the number of lateral bud outgrowth. In contrast, at high cytokinin concentration, internode elongation is

restricted due to the inhibitive effect of cytokinin on hypocotyl length and root length. The internode elongation was enhanced in gibberellin-treated plants. Although the hormones induced apical dominance is observed in all treatments for both intact and excised plants, it's more conspicuous in plants with excised apical bud to plants with intact apical buds. The effect of these three plant hormones have been studied by a few researchers on certain plants species. However, this study focuses on the interaction of multiple plant hormones which has not been studied before. In the next set of experiments, I am going to study how the different combinations of hormones could influence apical dominance and how they interact to change the developmental pattern of the bean plants. My research findings that plant hormones can induce changes in growth habits, shape and growth of bean plants, have potential positive impact on the agricultural production of beans and other plants. The result will be presented in the form of poster presentation with the aid of photos and diagrams. In addition, I will provide a detailed description of all technical terms in my poster.



Biological Science

Microbial responses to alterations in nitrogen fertilizer composition

Presenter: Gosselin, Emma & Wang, Lawrence
Faculty Sponsor: Jason Barker

Fertilizer use in agriculture is often associated with increased greenhouse gas fluxes due in part to stimulation of nitrogen trace gas emissions. This experiment will explore the responses of soil microbes to nitrogen fertilizer treatments with organic and inorganic chemical compositions. We will use a combination of quantitative genetics techniques and stable isotopes to determine microbial community composition and activity. With our combined approach, we hope to better understand how fertilizers affect microbial communities and greenhouse gas emissions.



Biological Science

The impact of failure of passive transfer of immunity on early growth rate in dairy goat kids

Presenter: Kaur, Manveen

Faculty Sponsor: Gosia Zobel

Goat kids obtain transfer of immunity passively through ingestion of the dam's colostrum after birth. Serum Immunoglobulin G (IgG) levels are an important indicator of degree of success of this transfer. Previous research has shown that kids with lower IgG levels have a higher mortality rate. The aim of this project was to determine whether kids which failed to acquire passive transfer of immunity had poorer early growth rates. A total of 620 kids on 10 Ontario commercial dairy goat farms were enrolled ($n = 62 \pm 28$). Between 1 - 4 days after birth, kids were weighed and a blood sample was obtained to determine serum IgG concentration. A second weight was taken 5 - 7 days after the first sample and average daily gain (ADG) was calculated. Failure of passive transfer (FPT) was defined as serum IgG levels below 12 mg/ml. On average, FPT was $39 \pm 20\%$. ADG was 0.16 ± 0.05 kg/d, however there was a large range between farms (0.06-0.23 kg/d). A weak negative relationship was found between FPT and ADG ($R^2=0.14$). Further comparison of FPT indicated

that this relationship varied on some farms in regards to sex; initial examination indicates that differences in colostrum management practices between male and female kids, at different farms, may be a cause. In conclusion, although a weak relationship existed between high FPT farms and poorer early growth rates, it is apparent that other management practices affect weight gain as well. Further exploration into the data will aim to identify these practices.



Biological Science

How does soil affect Plant-Microbial Interactions?

Presenter: Kumar, Uttara & Peng, Huiru
Faculty Sponsor: Oliver Dong

The symbiosis between plants and microorganisms is important for agricultural crops. Studies have shown that soil conditions can greatly affect the symbiosis and therefore have an affect on the yield of crops. However, the effects of various soil conditions on the symbiotic interaction between soybean and one important symbiotic bacterial species, Rhizobium, remains understudied. In this study, the establishment of the symbiosis between soybean and Rhizobium is evaluated under different soil conditions including different copper contamination degree, water content, nitrogen content, and soil type. The size and amount of nodules, and nodular bacterial population were determined as indicators of the performance of Rhizobium establishment. The results suggest that root microbe was less successful establishing in high Cu concentration soil, but showed similar performance in different soil texture. Soil with optimum amount of water was favorable for microbial establishment, while too much or too little water proportion had a negative impact. A similar trend showed in the nitrogen content. In

future studies, a combination of variables could be manipulated and tested to identify the optimum soil condition for the symbiotic interaction studied. Our study on the environmental effects on symbiosis between soybean and Rhizobium provides us with the potential to increase the productivity of the crop by promoting the symbiosis, which is a natural, environmental-friendly approach.



Biological Science

Enhanced Lifespans: Regulation of Heat Shock Factor 1 (HSF-1) by Translation Inhibition

Presenter: Lee, Chun-Sung (Percy)
Faculty Sponsor: Grace Goh

Age-related diseases are becoming an increasingly serious problem in today's world, despite advances in healthcare. Now, more research is being done to identify genetic factors that regulate aging, which may represent novel drug targets for age-related diseases. In the nematode worm *Caenorhabditis elegans*, decreasing translation by inhibiting the expression of genes coding for ribosomal proteins (RP), or target of rapamycin (TOR) results in decreased translation and, surprisingly, increased lifespan. Interestingly, both mechanisms result in increased heat shock resistance in *C. elegans*, which could contribute to the augmented longevity. The transcription factor heat shock factor 1 (HSF-1) has been found to mediate the longevity effects of translation inhibition in *C. elegans*. Genes regulated by HSF-1 include chaperone proteins, which are required for proper protein folding and may allow the organism to more efficiently handle existing resources under stress. However, the manner in which translation inhibition regulates HSF-1 remains unknown.

Using real-time quantitative polymerase chain reaction (qPCR), I will determine whether the hsf-1 gene is induced upon introduction of a cellular stress like translation inhibition via knockdown of ribosomal proteins or TOR inhibition. Under similar conditions, I will determine whether HSF-1 protein levels are up-regulated when translation is inhibited. Additionally, I will use increasing doses of rapamycin to determine if there is a dose-response relationship between the level of translation inhibition and the activation of HSF-1, whether at the mRNA or protein level. Once complete, I will be able to determine the level at which HSF-1 activity is regulated by translation inhibition.



Biological Science

The Inhibitory Effect of CB1 Receptor Agonist HU-210 on Sexual Behaviour in Male Rats

Presenter: Lee, Amanda & Rigby, Richard
Faculty Sponsor: Silvain Dang

As the consumption of substances containing psychoactive constituents is extensive worldwide, determining the behavioural and functional effects are important for understanding the potential consequences and medical implications of use. Psychoactive substances such as marijuana are known to affect perception, motivation and sexual functioning via the endocannabinoid system and its cannabinoid 1 (CB1) receptors in the central nervous system. These receptors are involved in modulating gonadal hormones and therefore sexual neuroendocrinology and function. Previous literature on CB1 receptor agonists (chemicals that bind to and activate the receptor) in human and animal models has generally concluded inhibition of sexual behaviour via locomotor deficits but inconsistently also reported facilitation of sexual activity due to enhanced motivation. However, the neuroendocrinological mechanism, as well as the dosage response curve of sexual behaviour due to this drug remains unknown. Studies on the selective synthetic CB1 receptor agonist HU-210

have been limited to dosages from 25-100 g/kg. It is important to expand preliminary knowledge of this drug's effects across a range of doses before mechanisms that exert effects on sexual behaviour can be established. The present study investigated the acute effect of HU-210 on sexual behaviour in the male rat via sexual behaviour testing after administration of the drug in various doses including those previously untested. Strong evidence was found that HU-210 decreases sexual behaviour in a dose-dependent manner, implicating these receptors as future research targets. Possible applications include developing pharmaceutical agents that treat human sexual dysfunction by operating on the endocannabinoid system or administering CB1 receptor antagonists.



Biological Science

Investigation of the Contributors to the Long-Latency Reflex

Presenter: Maurer, Annie

Faculty Sponsor: Romeo Chua

The human stretch reflex is a protective mechanism that prevents overstretching of a muscle and enables muscles to have spring-like capabilities. Actively responding to a mechanical perturbation to the upper limb begins with a short-latency reflex (M1), followed by a long-latency reflex (M2), and ends with a voluntary response. There is debate as to whether the modulation of M2 in intentional movements is due to the temporal overlap of the long-latency and voluntary responses or due to changes in the excitability of the reflex pathway contributing to M2. The objective of this study was to investigate modulation of the long-latency reflex in response to voluntary movements with varying target accuracy requirements. Participants either a) responded passively or b) made ballistic wrist flexion movements to a target in response to a mechanical extension perturbation. Target accuracy requirements were increased by decreasing target width. Surface electromyography (EMG) was collected from the right wrist flexor,

flexor carpi radialis (FCR), and extensor, extensor carpi radialis (ECR). Voluntary responses to the mechanical perturbation were delayed and reduced in intensity by increasing target accuracy requirements. This reduced the potential overlap between the voluntary EMG burst and the long-latency response. Nevertheless, a persistent increase in the size of the long-latency reflex response was found. Collectively, these results suggest that the overlap of long-latency and voluntary EMG activity alone cannot account for the observed modulation of the long-latency reflex.



Biological Science

Effects of individual, pair, and parental housing on calf behavior during weaning

Presenter: Ng, Emily

Faculty Sponsor: Joao Costa

Animal welfare is an area of social concern nowadays, with special attention to the animal production industry in North America. Beef and dairy productions contribute over \$26 billion to the Canadian economy, indicating its great significance. One of the common practices in the dairy industry is to wean the calf from the cow, so that the dam's milk can be sold rather than used to feed calves. During the weaning process, it is known that both calves and dams undergo great stress. Abnormal behaviors such as cross-suckling, bawling, and reduced feed intake have been found to occur in the calves as a result of adapting to a solid feed diet at an early age. As successful weaning is key to dairy calf welfare, current methods of calf weaning need to be further developed and improved so that such behaviours can be minimized. Through research in De Paula Vieira's work, it is shown that abnormal behaviours such as reduced feed intake is less prevalent when calves are kept with another calf of similar age or with a pre-weaned cow. The aim of this study is to

assess whether calves kept in individual housing, pair housing, or parental housing will have an effect on calf behavior at the time of weaning. The number of times calves cross-suckle another calf, the number of vocalizations per day per calf, and the weight gain rate will be measured. It is predicted that the abnormal behavior will be reduced when calves are in pair or parental housing.



Biological Science

The influence of pH on aquaporin 4 localization and function

Presenter: Pezarro, Katerina & Lam, Wilford
Faculty Sponsor: Caroline Perronnet

Aquaporin 4 (AQP4) is a water channel protein expressed in non-neuronal cells called astrocytes in the brain. Astrocytes extend long branches that end on blood vessels and it is at the end of these branches, called endfeet, that AQP4 is enriched. AQP4 regulates water content in brain and has been implicated in astrocyte swelling during cerebral edema following brain damages like stroke. Research has shown that in ischemic stroke, anaerobic glycolysis causes accumulation of lactate, which increases AQP4 localization at astrocyte endfeet, causing cytotoxic edema (Zador et al. 2009). In addition, other studies reveal that added volumes of lactic acid increases aquaporin expression on the cell surface of cultured astrocytes (Morishoma et al. 2008). However, no studies have so far examined the effects of lactate on AQP4 localization and function. In this study, different volumes of lactate will be added to primary cultured astrocytes to assess its effect on localization and function of AQP4. First, fluorescence microscopy will then

be used to examine possible changes in AQP4 localization and clustering in astrocytes. Second, we will utilize the calcein-based assay to examine the AQP4-mediated water transport in rat primary astrocyte cultures. In this experiment, a derivative of the fluorescent dye calcein is transported into the cultured cells where it is trapped. With the 2-photon excitation microscopy, we will study the changes in astrocytes volume with different concentration of lactate. We expect to see an increase in AQP4 clustering on the cell-surface of astrocytes, as well as an increase of AQP4-mediated water transport revealed by a dilution of calcein fluorescence. This would suggest that the lactate increase that we can observe during stroke would be responsible for AQP4 relocalization as well as increase of function, and by thus, would be implicated in brain edema formation after stroke. These results would be a good start to develop new therapeutic strategies to prevent brain edema formation after a stroke.



Biological Science

The role of neurexin and neuroligin in habituation of alcohol-intoxicated *Caenorhabditis elegans*

Presenter: Soo, Sonja Kar Yee

Faculty Sponsor: Catharine Rankin

Alcohol intoxication alters learning and memory (Rose and Grant 2010). However, the mechanism through which this occurs is not well understood. Neuroligin-neurexin complex are synaptic proteins that have been shown to play a role in learning and in alcohol dependence (Hishimoto et al. 2007). Our objective is to investigate the interactions between alcohol and specific cellular molecules to have a deeper understanding of how alcohol affects our nervous system. We use a genetic model organism *Caenorhabditis elegans* (roundworm) to study the role of the neuroligin-neurexin complex in a simple form of learning, "habituation". Habituation is defined as a decrease in the behavioral response to repeated stimuli (Rankin et al. 2009) because of its lack of biological relevance. We gave neuroligin (nlg-1) or neurexin (nrx-1) mutants repeated mechanical stimulations (taps) delivered at 10s or 60s intervals on and off alcohol (10sISI, 60sISI respectively). We used the Multi-Worm Tracker to track and analyze the worm's behavioural response

to taps. We found that nlg-1 and one strain of neurexin mutant, nrx-1(ds1), showed slower and shallower habituation at both 10/60s ISI. However, another strain of neurexin mutant, nrx-1(ok1649), showed similar habituation compared to wildtype (control strain). In alcohol-intoxicated condition, only nlg-1 had an effect at 60s ISI. Taken together, our data suggests that neuroligin and neurexin may have a minor role in habituation in sober worms, but only neuroligin plays a minor role in habituation under intoxicated condition.



Biological Science

Identification of Viral Biomarkers for Monitoring Water Quality

Presenter: Webb, Mitchell

Faculty Sponsor: Patrick Tang

Water quality plays a significant role in ecosystem health. However, the current model for monitoring is inherently slow and, with regards to the source of contamination, uninformative. Instead, by targeting genetic markers of contaminating organisms with a molecular assay, a more rapid, accurate, and informative test could be developed. The field of metagenomics - the study of genetic material recovered directly from environmental samples - has begun to characterize a range of different environments including freshwater. Diverse populations of microorganisms have been identified. This project aims to develop a means for determining the quality of a water sample based on the pattern of organisms contained within it. This requires the characterization of different patterns of healthy water and common pollution sources. To accomplish this, water samples were obtained from three watersheds across BC. Each watershed featured a clean sample, a sample from a contamination source, and a sample taken downstream from the source. Filtering techniques,

genetic sequencers, and software tools were used to characterize the microbial communities within each sample. Comparison between different samples revealed that the microbial community composition changed based on the presence of contamination. Although these communities were not identical between clean water samples from different watersheds, this was expected and can be accounted for when determining a range of acceptability. Further work will focus on characterizing the microbial communities of contamination sources and identifying a practical number of genetic markers for targeting in a molecular assay.



Engineering, Technology, Chemistry

Hydroelectric Dams: how to make them a true green source of energy

Presenter: Carreras, Erick; Kassam, Farris; Gill
Gagandeep; Huh, Sean
Faculty Sponsor: Dake, Gregory

Hydroelectricity is viewed by society as a relatively clean form of energy. After examining the literature, it was found that hydroelectricity is not as clean of a source of energy as once believed. Scientific studies have shown that hydroelectric dams release a significant amount of methane gas into the environment. When comparing equal volumes of methane gas produced from hydroelectric dams and carbon dioxide produced from the burning of fossil fuels, it was found that methane has an approximately twenty times stronger effect on global warming. A potential solution to reducing the amount of atmospheric methane produced by hydroelectric dams could be a metal-organic framework. This is a sponge like molecule that contains a metal ion and an organic linker component, which provides a means to adsorb methane in addition to providing an efficient manner for storage and future use. As the global supply of fossil fuels begin to decline, the global community will start to look for an

alternative source of energy to compensate for fossil fuels. Therefore, the use of a metal-organic framework offers the possibility to not only improve hydroelectric dams into a greener energy solution but also increase the efficiency of the energy production by utilizing the methane byproduct for industry.



Engineering, Technology, Chemistry

Ultrafast, All-Optical Switching of Nanoparticle Composites

Presenter: Krupa, Jeffrey & Geoffroy-Gagnon, Simon

Faculty Sponsor: Jonathan Holzman

Ultrafast optical switching offers tremendous benefits to communication technologies by increasing data transfer rates. Semiconductors are known for their optical switching properties, however the bulk (wafer) semiconductor materials have relatively slow (microsecond or nanosecond) relaxation times. These are unfavorable aspects for these materials when applied to ultrafast optical switching, and they ultimately result in slower-than-desired communication data processing rates. This challenge led the researchers to investigate the effects of photoexciting suspended semiconducting nanoparticles—specifically Si and SiC.

Experiments were performed using the technique of pump-probe spectroscopy. The technique uses 100 fs laser pulses, which are split into pump and probe pulse beams. The pump pulse is focused on the sample to photoexcite the bulk or nanoparticle forms of the semiconductor. The material transients are measured as changes on

the probe pulse beam. The time-delay between the pump and probe pulses is used to form a time-resolved scan of the properties on a femtosecond or picosecond timescale.

The results of these experiments have shown that the charge-carrier lifetimes of the nanoparticle semiconductors are approximately one thousand to a million times faster than their bulk material counterparts. Recombination lifetimes of 12 ps and 2.5 ps were measured for Si and SiC nanoparticle samples. This can yield great benefits for future optical switching applications.



Engineering, Technology, Chemistry

Data Mining Social Media Feeds for Sentiment Analysis

Presenter: Lee, Kayla & Lau, Karen
Faculty Sponsor: Ivan Beschastnikh

Social networks have become a valuable tool to corporate decision makers in collecting useful first-person sentiments and judgements towards certain subjects, topics or companies. Social media platforms are important for providing raw data for visualization and analysis. Twitter is a blogging service, which allows users to post and exchange short messages called “tweets” that are 140 characters long. Twitter also allows adding users and following contents of your choice. Twitter is most well-known for the use of hashtags, which allow information to be found more efficiently. Researchers have developed programs and services that provide statistical and quantitative data on key metrics such as the number of tweets and hashtags. Currently, there are no reliable universal methods that perform sentimental analyses using Twitter platform that consider bigram during the classification process to improve accuracy. Bigrams are two words that when together, take on a meaning different from their individual ones. For example, the differing

meaning of “badly” and “so badly”. This project aims to develop a novel tool, Bluebird, that analyzes the content of tweets and recognizes the positive and negative sentiments associated with it and stores data in a file for visualization purposes. If #IBM were to be analyzed, the data could be used to measure market demand and trends to make more informed decisions. The output of our study is of significant interest to product market research.



Engineering, Technology, Chemistry

Hybrid timber-steel structures: A review of promising systems

Presenter: Pieper, Chris

Faculty Sponsor: Solomon Tesfamariam

Improved performance can be realized through implementation of hybrid timber-steel structures. For example, cross laminated timber infill panels can reduce the interstorey drift yet maintain ductility of steel buildings. Optimizing drift and ductility allows smaller, lighter steel members to be used which results in decreased seismic forces being incurred by the structure. The methodology followed was first to develop a database of literature and software available. Next, best connection models and parameters for timber-steel hybrid systems were determined. Existing results were reproduced and new models were explored. A parametric component model was calibrated. Conceptual design of hybrid systems was studied. The future direction is to bring the project from conceptual design to accurate 3D finite element model. This will provide basis for implementation of tall hybrid timber steel structures.



Medical Science

Intrinsic Pathway of Neutrophil Apoptosis in Febrile Episodes of Periodic Fever, Aphthous Stomatitis, Pharyngitis, and Cervical Adenitis (PFAPA) Syndrome

Presenter: Al-Attar, Hamsa & Kahlon, Manjot
Faculty Sponsor: Kelly Brown

PFAPA syndrome is a non-Mendelian, auto-inflammatory syndrome of an unknown cause that primarily affects children before the age of 5, and is followed by periodic attacks of fever typically lasting 4-5 days, within an interval of 2-8 weeks. It has been shown that blood cells called neutrophils have significantly delayed spontaneous cell death during episodes of fever, which may contribute to the pathology of the disease. Therefore, the purpose of this study was to determine the pathway by which spontaneous neutrophil cell death is delayed in children with PFAPA syndrome.

Neutrophils were obtained from children with PFAPA syndrome during a fever episode and from healthy individuals. The cells were incubated ex vivo for 20 hours, and dying cells isolated using a cell sorter. The cells were then lysed and analyzed for the relative expression of factors that controlled cell survival and death using a Human Apoptosis Antibody Array. Western Blotting was

used to validate findings in all samples.

Compared to healthy children, neutrophils obtained from patients experiencing fever due to PFAPA syndrome showed elevated levels of the pro-survival (anti-apoptotic) proteins Bcl-2, Bcl-x(L) and Caspase 9. Therefore, diminished rates of neutrophils cell death in the febrile phase of PFAPA syndrome correlate with changes in intrinsic apoptotic pathway proteins. Follow up studies will evaluate the role of this apoptotic pathway in other inflammatory diseases in which neutrophils apoptosis seems dysregulated.



Medical Science

The associations between depressive symptoms, parental attributions, positive illusory biases, and ADHD subtype in children with ADHD

Presenter: Botia, Alejandra

Faculty Sponsor: Charlotte Johnston

Attention-deficit hyperactivity disorder (ADHD) is one of the most prevalent childhood mental disorders. Children with ADHD tend to experience significant difficulties in academic, social, and behavioral domains (Owens et al. 2007). What is less clear is how the subtypes of ADHD are differently associated with other factors, and how these associations may affect children with ADHD. The current study investigated the associations between depressive symptoms, parental child-responsible attributions, positive illusory biases (PIB), and ADHD subtypes among boys with ADHD. It was hypothesized that boys with ADHD-Inattentive subtype would show lower levels of PIB than the ADHD-Hyperactive-Impulsive/ Combined subtypes. It was also predicted that higher parental child-responsible attributions would be associated with higher levels of depressive symptoms in the ADHD-Inattentive group. Boys participated in an online interaction with three peers programmed by a computer.

Participants received unclear, negative, and positive feedback during the chat and then rated how well they think they did in getting the peer to like them. Results showed a marginally significant difference between the ADHD-Inattentive subtype and the ADHD-Hyperactive-Impulsive/ Combined subtypes for parental child-responsible attributions. However, there were no significant differences between subtypes of ADHD and depressive symptoms. No significant differences were found between the ADHD-Inattentive subtype and other ADHD subtypes in terms of PIB.



Medical Science

Flying High: Cardiac trabeculae response to hypoxic conditions in bar-headed geese

Presenter: Catalano, Samantha; Fagen, Alyssa; Malhi, Puneet & Gill, Harinder
Faculty Sponsor: Sabine Lague

Bar-headed geese perform an impressive migration over the Himalayas at altitudes exceeding 8000m. Flight is energetically demanding, especially during conditions of low oxygen (hypoxia). Physiological specializations that enable this athletic feat include efficient ventilation, large lungs, high oxygen affinity hemoglobin (Scott and Milsom, 2007), and skeletal muscle with a high capillary and muscle fibre density (Butler, 2010). While these enhancements suggest adequate oxygen supply, little is known about their ability to transport oxygen to the tissues via the cardiovascular system. We would like to investigate if enhancements are present in their cardiac muscle to facilitate oxygen transport during hypoxic conditions. We will use isolated cardiac trabeculae that are resistance loaded while measuring contractility to determine the frequency and maximum force output in varying degrees of hypoxia (Taberner et al., 2011) in bar-headed geese, low altitude greylag geese and lowland

Pekin duck. We predict that bar-headed geese will produce greater force and frequency of cardiac myocyte contractions in lower levels of hypoxia than the other water fowl. Further studies could look at the organization of cardiac muscle cells to determine the cause of the differences in force generated.



Medical Science

Elimination of Tumour Cells in Mice via Oncolytic Adenoviruses Designed to Selectively Replicate in Tumour Cells

Presenter: Chang, Benson; Forgarty, Emily & Law, Matthew

Faculty Sponsor: Jeff Dong

Solid tumours untreatable by conventional therapies require new approaches to be studied and improved in order to be considered as viable treatment for cancers in live hosts. Oncolytic adenoviruses are viruses designed to selectively eliminate tumour cells, and are a popular approach due to the relative ease of manipulating the adenoviral genome and the adenovirus' infectivity of a wide range of mammalian cell types. Adenoviral genetic manipulations can result in conditional replication of viruses only in the tumour microenvironment and also include the addition of a gene expressing cytokines, small proteins that modulate different aspects of the host immune response, to assist in tumour elimination. The approach of this study is to exploit the factors HIF-1, involved in cell maintenance in low-oxygen conditions, and c-Myc, involved in regulation of cell proliferation, which are both overexpressed in tumour cells.

The adenoviral genome is modified by replacing promoter genes that start expression of encoded proteins with promoters that can only start expression in high amounts of HIF-1 and c-Myc. A gene encoding cytokine IL-15 is also inserted under control of the new promoters to promote local accumulation of Natural Killer (NK) immune cells to eliminate tumours. The Chromium Release Assay, measuring cell death by release of chromium-51, confirms viral tumour-killing ability in chromium-51-containing-tumours in mice. NK cell accumulation from IL-15 expression is confirmed by flow cytometry, a technique involving lasers to count and sort cells based on cell surface markers, of mouse tumours injected with the oncolytic adenovirus designed in this experiment.



Medical Science

Regulation of Gliotactin in Polarized Epithelia - A Kinase Screen

Presenter: Das, Samarpita

Faculty Sponsor: Vanessa Auld

Permeability barriers are required for the proper functioning and development of body systems, working to keep out unwanted fluids and maintaining ionic balance within tissues. They are achieved through protein adhesion across cellular membranes, creating impermeable junctions that are necessary to restrict fluid and pathogenic entry. These barriers are highly regulated structures and are conserved (same genetic structure and function) across all animals. Septate junctions fulfil this role in invertebrates, whereas tight junctions are the vertebrate counterpart. In particular, a unique structure in fruit fly epithelia is the tricellular junction. It is formed by the convergence of three septate junctions at the corners of each cell. This junction is special because it forms a plug-like barrier in the corners of neighbouring cells. There are many pathologies related to faulty permeability barriers in humans. Most well-known are pathologies of the blood brain barrier. There are numerous barriers in vertebrates, separating high solute

fluids from delicate tissue systems. Using genetic tools in *Drosophila melanogaster* such as yeast transcription factors and immunofluorescence, we are able to study these barriers with relative ease, and better understand how these barriers may function in all animals. Gliotactin, a serine-esterase like transmembrane protein, is necessary for the proper formation and function of the septate junction and thus is necessary for proper permeability barrier function. Through unknown mechanisms, Gliotactin is highly regulated and localized to the tricellular corner in columnar epithelia. This screen aims to identify kinase(s) required for the regulation and direction of Gliotactin and in turn increase our knowledge of the septate junction.



Medical Science

Habituation in *C.elegans* with mutated homologs of human genes linked to Parkinson's disease

Presenter: Ebrahimzadeh, Sayedomid
Faculty Sponsor: Catharine Rankin

Parkinson's disease (PD) is a neurodegenerative disorder of central nervous system affecting more than 10 millions people globally. This disease has a strong genetic component and about 15% of individuals with PD report a first-degree relative with the disease. Genes such as PARK2, PINK1, and LRRK1 have been linked to familial forms of the disease. These genes are involved in maintenance of mitochondria or in the quality control of the cell via the cell machinery that degrades unneeded proteins. Mutations in these genes affect the function and survival of particular neurons in parts of the brain for normal movement, balance, and coordination. One characteristic of Parkinson disease is abnormal habituation, which is a simple form of learning in which repeated stimulation causes a decremented response over time. By investigating how these PD associated genes are involved in habituation, we hope to better understand the underlying genetic predispositions for this disease. In this study, *Caenorhabditis elegans*, transparent roundworms, were tested in

their ability to habituate to a tap stimulus to the petri plate, which induces a reversal response. It was found that Strains with mutations in homologs of PARK2, PINK, and LRRK2 habituated differently for both reversal distance and reversal probability as compared to wild-type. As abnormal habituation is one of the characteristics of PD, this finding could propose that these genes are possibly involved in Parkinson's disease.



Medical Science

Effect of Heme Oxygenase-1 in the resistance to Gemcitabine in Breast Cancer

Presenter: Elizondo, Pablo; Berlin, Miriam & Ang, Mitchell

Faculty Sponsor: Ada Kim

One in nine Canadian women is expected to develop breast cancer in her lifetime (Canadian Breast Cancer Foundation, 2013). Gemcitabine is a known chemotherapy agent used to treat metastatic breast cancer. There are many factors that affect the intake of such drugs into tumor cells, such as an enzyme called heme oxygenase-1 (HMOX1). HMOX1 degrades pro-oxidant heme into several products with antioxidant properties, which protect cells. There exists conflicting information regarding the effect of HMOX1 on chemoresistance to cancer treatments (Was et al, 2010). For instance, in pancreatic cancer, high expression of HMOX1 is associated with chemoresistance to gemcitabine (Nuhn et al, 2009). However the effect of HMOX1 on chemoresistance in breast cancer is unknown. In this study, the relationship between HMOX1 and chemoresistance in breast cancer will be further explored by inducing or inhibiting the expression of HMOX1 in breast cancer cells and studying the

effect on tumor cell death (apoptosis). HMOX1 will be genetically overexpressed or knocked down in a mouse mammary carcinoma cell line called 4T1 by the use of overexpression vector or short hairpin RNA (shRNA) respectively. The genetically modified cells will be treated with Gemcitabine and the levels of apoptosis will be quantified by Potassium Iodide (PI) staining and analyzed with flow cytometry. Improving our understanding of chemoresistance in tumor cells is crucial to effectively treat breast cancer. This project will assess the importance of HMOX1 in gemcitabine treatment and represents an important step towards successful standard of care for metastatic breast cancer by chemotherapy.



Medical Science

Exploring the effects of disconnections between the nucleus accumbens and orbitofrontal cortex on impulsive behaviours in male rats.

Presenter: Fortes, Ethan & Mitchell, Samuel
Faculty Sponsor: Jacqueline-Marie Ferland

Heightened impulsivity has been implicated in a variety of psychiatric conditions including bipolar disorder, ADHD, and drug addiction (Moeller, Barrat, Dougherty, Schmitz, Swann, 2001; Swann, Dougherty, Pazzaglia, Pham, Moeller, 2004; Winstanley, Eagle, Robbins, 2006) ; therefore, investigating the bases of the different impulsive subtypes can help to elucidate potential treatments for those afflicted with impulse control issues. Researchers have previously found that lesions to the nucleus accumbens (NAc) increase impulsive action and choice in rats while lesions to the orbitofrontal cortex (OFC) decrease said behaviours. However, little research has explored the direct functional connectivity of NAc-OFC involvement in impulsive behaviour. Furthermore, research has not shown how disrupting this pathway will influence the efficacy of methylphenidate on impulsivity levels, a drug commonly prescribed to individuals with ADHD that has been shown to decrease both

impulsive action and impulsive choice in rats and humans. 80 male Long-Evans rats will be trained on the delay discounting (DD) task or 5-choice serial reaction task (5CSRT) to assay impulsive choice by assessing the ability to chose a larger, delayed reward over a smaller immediate one and impulsive action by measuring premature responses respectively. Once stable behaviour has developed, animals will undergo one of the following surgical conditions: sham as a control, lesions of unilateral NAc or OFC, or disconnection lesions between the NAc and OFC. Following recovery, animals will be allowed to re-baseline their behaviour and will be administered methylphenidate to determine the efficacy of the drug in modulating impulsive behaviour. We predict the disconnections NAc and OFC will significantly increase both types of impulsivity and reduce the effects of methylphenidate compared with unilateral lesions and shams.



Medical Science

Anti-viral responses are elevated in leukocytes from children with Periodic Fever, Aphthous stomatitis, Pharyngitis, and cervical Adenitis (PFAPA) syndrome

Presenter: Guan, David; Man, Alexander & Guron, Mike

Faculty Sponsor: Kelly Brown

characterized by recurrent episodes of high fever, sore throat, swollen lymph nodes and canker sores. Observations made by parents and professional caregivers of children with PFAPA seem to suggest that common childhood viral infections occur less frequently in children with PFAPA compared to healthy children. The production of factors relevant to viral defence, however, has not been investigated. Our objective is to compare the anti-viral responsiveness of leukocytes obtained from children with PFAPA syndrome, Familial Mediterranean Fever (FMF; a periodic fever syndrome of monogenic origin) and healthy children. We hypothesize that circulating anti-viral factors are elevated in children with PFAPA syndrome and that these factors are responsible for the apparent resistance to viral infection. Extracted leukocytes were cultured ex vivo for 4 hours in the absence and presence of

Poly I:C, a Toll-like receptor 3 (TLR3) agonist, and 2 microglobulin, the positive control. Anti-viral responses were assessed by a Type I Interferon Response PCR array (SA Biosciences). Using this array, we reported elevated expression levels of various anti-viral factors in the leukocytes of children with PFAPA syndrome. From the results of the array, select genes were further analyzed in children with PFAPA syndrome, FMF, and healthy children using quantitative PCR. Our findings support the observation that children with PFAPA syndrome are less prone to common viral infections. The anti-viral factors found to be elevated will be further investigated with respect to the aetiology of the disease and as potential diagnostic markers.



Medical Science

Effects of Prenatal Alcohol Exposure on Social Interaction Behaviour in Periadolescent Male and Female Rats

Presenter: Haghighat, Sepehr; Takeuchi, Lily & Mukhi, Naureen

Faculty Sponsor: Joanne Weinberg

Fetal Alcohol Spectrum Disorder (FASD) refers to the spectrum of adverse conditions resulting from prenatal alcohol exposure (PAE), including changes in physical, behavioural and neurological parameters. Particularly, social behaviour deficits can serve as a common feature of FASD. Animal models of PAE have been very useful in demonstrating neurobehavioural social deficits, however, more studies are needed to investigate if social behaviour deficits observed in these individuals is related to their motivation for social interactions.

Here, we tested social motivation in an animal model of PAE. Pregnant rats received either 1) liquid ethanol diet (PAE Group), 2) control diet given in the amount consumed by a PAE partner to account for reduced food intake of ethanol moms (Pair Fed Group), or 3) control diet (Control Group). Female and male offspring were tested during early or late adolescence using a

2-chamber social interaction test. After 5-minutes of acclimatization, experimental rats were placed in the apparatus; one chamber was empty (Non-Social) and the other contained a social stimulus rat within a clear partition (Social). Behaviour was recorded using a camera. Our role was to score behaviour using video tracking software (Noldus Ethovision) to quantify duration spent in each chamber, distance travelled, duration in proximity to the social stimulus, and latency to enter the social chamber. Our data revealed that PAE animals do not differ from controls on any of the measures assessed. These results suggest that PAE animals' social motivation appears not to play a role in the social behaviour deficits following PAE.



Medical Science

The Arginine Catabolic Mobile Element and resistance of Methicillin-Resistant *S. Aureus*.

Presenter: Hernandez, Daniel & Ramgarhia, Kanwarpreet

Faculty Sponsor: Elizabeth Marchant

Emergence of antibiotic resistant bacterial infections is increasingly becoming problematic, reaching epidemic proportions in many countries. Community-associated Methicillin-resistant *Staphylococcus aureus* (CA-MRSA) is one of the most common causes of bacterial infections of bloodstream, skin and soft tissue. In the US alone it is reported that 10,800 deaths are caused by MRSA per year, and the vast majority of infections occur in individuals without any risk factors or health care contact. CA-MRSA appears to be the most virulent, in particular the strain USA300 whose epidemic character is poorly understood. Sequence analysis has revealed a genomic island termed arginine catabolic mobile element (ACME), which encodes multiple genes including an arginine deaminase. ACME might explain the success of USA300 as it allows proliferation of bacteria in low oxygen conditions, survive on acidic medium and evade host defenses. However, direct evidence of ACME

contributing to this success has not been found. Similarly studies have been done in models that do not resemble human infections. Isolation of mutants containing deletions of ACME in the USA300 strain and the use of in vitro human skin equivalent (HSE) can be used to test efficiency of this element. Deletion of ACME in the USA300 isolates significantly lowered the pathogenicity of this strain and the use of HSE as a model for infection provided reproducible wounds to study the bacteria. Understanding MRSA virulence factors that influence the prognosis of severe skin infections and unique genetic elements in USA300 can provide better treatments and prognosis of bacterial infections.



Medical Science

Effects of a putative male contraceptive on the ultrastructure of actin filament bundles in the seminiferous and other epithelia

Presenter: Hosseini, Farshad & Adams, Arlo
Faculty Sponsor: Wayne Vogl

H2-Gamendazole is a non-hormonal compound being actively investigated as a male contraceptive. It targets EEF1A, a protein that influences the arrangement of actin filaments. In the testis, the drug causes loss of intercellular adhesion and detachment of developing sperm cells. Ectoplasmic specializations (ESs) are Sertoli cell specific adhesion junctions that consist of a layer of actin filaments sandwiched between the plasma membrane and a cistern of endoplasmic reticulum. The filaments are unipolar in orientation and are packed into hexagonal arrays, like the arrangement of filaments in microvilli. Here, we explore the effects of H2-gamendazole on ESs, and determine if drug-related effects occur in the microvilli of other epithelial cell types. Rats were given a single oral dose of H2-gamendazole (30 mg/Kg). This dose is near the maximum tolerated dose and is 10-20x the expected dose for contraceptive use. It was chosen to maximize any potential effects in off-target tissues. At 6

& 24 hrs after dosing, samples of testis, small intestine, large intestine, and kidney from control and treated animals were processed for electron microscopy. Actin filaments in ESs were disrupted in drug treated animals compared to controls. In addition, microvilli in other tissues were short, developed an irregular shape, and in some cases completely lost their actin cores. Our data are consistent with the conclusion that H2-gamendazole causes premature detachment of spermatogenic cells by targeting the actin cytoskeleton in ESs. Significantly, our results also indicate that the drugs effects at a high dose are not absolutely restricted to the testis.



Medical Science

A Novel Way of Detecting Intrathecal Baclofen Withdrawal in Post-Operative Patients

Presenter: Ip, Alvin

Faculty Sponsor: Shenandoah Robinson

Intrathecal baclofen (ITB) is an effective long-term therapy for patients with spasticity resulting from multiple sclerosis and cerebral palsy. The drug is administered through a pump placed subcutaneously in the abdominal wall with an indwelling spinal catheter. However, issues with the pump can arise. If catheter flow is inadvertently disrupted during a surgical procedure, drug delivery may be interrupted and cause ITB withdrawal syndrome, a life-threatening complication if not diagnosed and treated early. However, no screening tool currently exists. There is a need to improve the detection of ITB withdrawal in patients. The objective of our research is to create and test a screening tool for ITB withdrawal that is useful to a broad range of providers. We consulted the literature and clinicians with expertise in ITB withdrawal. After compiling this knowledge into a scorecard, we achieved consensus from clinicians. The Intrathecal Baclofen Withdrawal Scorecard includes the major signs of withdrawal, including

pruritis, hypotension or hypertension, tachycardia, hyperthermia, agitation, hallucinations, insomnia, clonus, and seizures. Once IRB approval was obtained, we tested the tool on a retrospective cohort of 33 children with increased risk of ITB withdrawal. The median age was 14 years (range 8-21) at the time of surgery, and three (9.1%) had confirmed ITB withdrawal. The scorecard had 100% sensitivity, 87% specificity, 43% positive predictive value, and 100% negative predictive value. We developed a convenient screening tool that may improve the detection of ITB withdrawal in patients, especially when used by providers with minimal experience in diagnosing this condition.



Medical Science

Emergency Department Management of
Pulmonary Embolism: A Significant Opportunity
for Standardizing Care

Presenter: Ji, Yisi Daisy & Chen, Holly
Faculty Sponsor: Daljit Ghag

Pulmonary embolism (PE) is a frequently managed condition in the emergency department (ED). Patients can be managed as outpatients or admitted to hospital. The objective of this study was to determine if patients with PE are being treated appropriately as inpatients or outpatients, in accordance with current guidelines.

This was a retrospective review of medical records at St. Paul's Hospital and Mt. St. Joseph's Hospital Emergency Departments. For each patient, a Pulmonary Embolism Severity Index (PESI) risk score was calculated. A PESI score < 85 indicates a patient is "lower risk" and can be managed as an outpatient; higher scores are "higher risk" and should be admitted to hospital. Patients were categorized into the "outpatient" or "inpatient" group depending on the treatment setting received. We screened 1293 patients between 2008 and 2012. After applying inclusion and exclusion criteria, 77 patients were included in this study. The outpatient group had a mean PESI

score of 62.8 (SD=20.6), whereas those admitted had an average score of 75.2 (SD=25.2) (t-test = 2.4, p=0.02). Of those admitted to hospital, 22/38 (57.9%) had PESI scores < 85 ("inappropriately admitted"); whereas 4/39 (10.3%) discharged had PESI scores > 85 ("inappropriately discharged"). From this cohort, ED physicians made appropriate decisions on admission or discharge with an accuracy of 66.2%. There is opportunity for improvement through standardization of care. Many patients in this cohort could have been safely managed as outpatients, saving significant costs.



Medical Science

Drug Loaded PVA Nanofiber Braided Surgical Sutures

strength and to make the process of producing braided suture with more consistency

Presenter: Kim, Saeromi
Faculty Sponsor: Frank Ko

Nanofibers fabricated by electrospinning has triggered interest from the biomaterials industry for their properties such as customization that are favourable for biomedical applications. Using this method, nanofibers were tested for their suitability in surgical sutures application. The main objective of the investigation was to overcome the limitation of tensile strength of nanofiber sutures by developing a method to control and manipulate its mechanical properties. The study involved the implications of using different number of silk cores in the braided nanofiber suture, post-treatment of braided nanofibers, the effect of fiber alignment as well as the effect of using a nylon core instead of a silk core. From these studies, it was observed that dip-coated braided suture with one silk core had comparable tensile strength to that of a commercial suture. However, the diameter was twice as big as the commercial suture that was compared against. It is recommended to further investigate on reducing the diameter of the braided suture while maintaining the tensile



Medical Science

Podoplanin is upregulated in subsets of reactive astrocytes

Presenter: Kolar, Kushal

Faculty Sponsor: Wun Chey Sin

Reactive gliosis is an inflammatory response in the Central Nervous System (CNS) that is induced by an injury, such as the presence of a cancerous tumor mass or stroke. This response induces certain cell types, such as astrocytes, to become “reactive”. They proliferate and become hypertrophic (increase in volume). At latter stages of the injury a glial scar may form depending on the nature of the original injury. This scar tissue is physically and chemically impenetrable to neurogenesis, thus preventing recovery post-injury. Understanding the intricate players in this process can help us develop novel therapeutics to control reactive gliosis and identify markers for injury in the CNS. Podoplanin (PDPN) is a glycoprotein that has been found to be highly expressed in aggressive brain cancer. Using an intracranial mouse model with GL261 tumor cells that do not express high levels of endogenous PDPN, we found that PDPN is also highly upregulated in normal brain tissue immediately adjacent to the tumor. Furthermore, we show that

PDPN is upregulated in the reactive astrocytes. Interesting, only those GFAP (a standard marker for reactive astrocytes) positive cells closest to the tumor show upregulation of PDPN. It appears to be a stem cell marker due to since it is expressed in Nestin positive astrocytes (Nestin is a marker for stem-cell-like astrocytes). We found this same pattern of PDPN upregulation in reactive astrocytes of other injury models, including ischemic stroke and mechanical stab wound injury, suggesting a universal role for PDPN involvement in gliosis that is not exclusive to cancer.



Medical Science

Use of medicinal cannabis in cancer pain and symptom management

Presenter: Kong, Cynthia & Nguyen, Kevin
Faculty Sponsor: Conrad Oja

Chronic, debilitating cancer pain is a significant comorbidity impacting many cancer patients, and is difficult to manage even with today's advances in pain control. One alternative drug for pain relief is cannabis. Cannabis and cannabinoid-containing medications have continued to grow in use, and their analgesic properties have been confirmed by studies. However, there is a lack of research assessing its use and effectiveness in cancer patient populations. This study examines the experience of cannabinoid use in 114 cancer patients at the Pain and Symptom Management/Palliative Care program (PSMPC) of the BC Cancer Agency. The reported benefits and side effects of different cannabis types and routes of administration were recorded. A wide range of indications were observed, including nausea, vomiting, appetite stimulation, and pain. The majority of patients using cannabinoids reported symptomatic relief, whereas adverse effects were experienced by the minority. Some patients tried several forms of cannabis, and

reported differences in their efficacy. In summary, successful use of cannabinoid products has been increasingly documented as an avenue for relief of pain and other indications. This study provides clinical information on its use in cancer patients, and may help guide future clinical trials to examine best use of the different forms of medicinal cannabis administration.



Medical Science

Bioinformatic Analysis of the Huntingtin Gene

Presenter: Kosior, Natalia

Faculty Sponsor: Blair Leavitt

Huntington's disease is a late onset neurological disorder caused by a tri-nucleotide repeat expansion in the first exon of the Huntingtin gene (HTT). In spite of continuing research, the wild-type function of the HTT has not been clearly defined. Knowledge of HTT regulation at the transcriptional level is one approach in uncovering the gene's wild-type function. Previous studies have focused on small regions of the HTT promoter, omitting a large portion of the promoter as well as the gene itself and downstream regions. The goal of this study is to functionally characterize HTT with respect to its wild-type function and expression through an in silico analysis of the HTT promoter. The UCSC Genome Browser online database was used to rank 1000 base pair sections of the upstream, downstream and HTT regions. The number of processes, including histone modifications and epigenetic markers, occurring in these tracks was quantified and the generated list was used to identify potential regulatory regions. We predict that the regions with high rank numbers will have

important transcription factor binding sites and additional features that can be studied further. As an extension, the bioinformatics analysis of HTT and associated regions will be compared to a list of putative differentially expressed transcription factors in a future collaboration. Further consensus of transcriptionally active regions of the HTT and promoter will focus further in-vitro studies examining the effects of modulating these regions in regulating gene expression. Using data implicating ARNT 1 as a transcription factor important in hypoxia, EMSA studies are currently underway.



Medical Science

Effects of NOTCH1 and NOTCH2 Activation on Global Gene Expression Patterns in Pancreatic Cancer Cell Lines

Presenter: Monga, Purujeet & Gu, Michelle
Faculty Sponsor: Julia Pon

Background: The NOTCH signalling pathway is a highly conserved pathway that mediates cell-to-cell signalling in mammals. Dysregulated NOTCH signaling has been implicated in multiple cancers, including pancreatic cancer. When a ligand binds to a NOTCH receptor, proteolytic cleavage (breakdown of protein) releases a part of the receptor that then enters the nucleus and participates in gene regulation. However, the target genes of NOTCH receptor proteins have yet to be comprehensively identified in pancreatic cells. Moreover, it remains unclear whether NOTCH proteins act as oncogenes or tumor suppressors in pancreatic cancer.

Proposed Methods: NOTCH activity in the pancreatic cancer cell lines PaCa-2 and BxPC-3 will be stimulated using EGTA (compound that attracts calcium ions). The expression level of the transcriptome—the total of all mRNA expression of the genes, will then be assessed in stimulated and unstimulated cells using RNA microarrays,

which measure the expression level of each gene in the entire RNA sequence. Moreover, we plan to compare the transcriptional effects of NOTCH1 and NOTCH2 by overexpressing NOTCH1 or NOTCH2 in PaCa-2 and BxPC-3, and performing RNA microarrays on both EGTA stimulated and unstimulated NOTCH overexpressing cells. Differentially expressed genes will be screened for known oncogenes and tumor suppressors and analysed for enrichment in functional annotation groups.

Significance: This work will explore global transcriptional impacts of NOTCH1 and 2 in pancreatic cells, which have never before been reported. This work will also enhance our understanding of how NOTCH1 and 2 differ in their impacts on gene expression. Moreover, analysis of NOTCH target genes may allow hypotheses to be made about whether NOTCH proteins act as oncogenes or tumor suppressors in pancreatic cancer.



Medical Science

3D Breast Cancer Cell Culture using Microfluidics for Drug Screening

Presenter: Ni, Cynthia

Faculty Sponsor: Karen Cheung

Traditionally, new cancer drugs are tested on flat layers of cells cultured in petri dishes. This 2D culture does not accurately model a tumor, and results of these drug tests do not reflect a drug's response in the human body, resulting in wasted time and money during drug research; many drugs that go to clinical trial are ineffective once tested in humans. 3D cell cultures more accurately mimic the tumor environment. Performing cancer drug screening on 3D cancer cell cultures yields significantly different cell viability results than tests on 2D cancer cell cultures; this indicates that the 3D environment has an important effect on the cells. The aim of this research is to find the concentration of Manucol LKX alginate for MCF7 cell-laden beads that results in the fastest spheroid formation, in order to save time and cell culture resources between bead formation and when the spheroids are ready for drug screening. In microfluidic chips, a stream of MCF7 breast cancer cells suspended in Manucol LKX alginate (a biocompatible hydrogel) can be pinched off

into beads using flow focusing. Once the alginate gels, the beads give the cancer cells scaffolding to support their 3D growth into tumor spheroids (small models of tumors). 1%, 1.5%, 2% and 3% (wt/vol) Manucol LKX alginate beads were made and the proliferation was quantified by MTS dye assay over 11 days. We found that MCF7 spheroids form fastest in 2% Manucol LKX.



Medical Science

Tylenol and Task Performance

Presenter: Olechowski, Eva

Faculty Sponsor: Steven Heine

Preliminary data shows reduced errors of omission in the acetaminophen group, which may be a product of the dACC's role in deliberative vs automatic responding (Lieberman, et al, 2012).

Acetaminophen (Tylenol) reduces activation of the dorsal anterior cingulate cortex (dACC), a brain region key in perceiving physical and social pain, as well as recognizing error and irregularities (Dewall et al, 2010). Randles et al showed acetaminophen reduced typical effects of incongruent stimuli on social judgements. It was hypothesized this resulted from reduced dACC activation.

This study aims to explore the effects of Tylenol on Conflict Monitoring (the process of monitoring the complexity of stimuli and need for additional cognitive resources) as a potential cognitive mechanism of this effect. Participants received acetaminophen or a placebo and completed several tasks requiring counterintuitive response to stimuli. All tasks were completed immediately after taking pills and again one hour post.

We predicted acetaminophen would reduce performance on these tasks due to a reduced ability to recognize incongruous trials, impairing one's ability to select appropriate strategies.



Medical Science

Induced differentiation from a pancreatic insulin cell to a functional beta cell via epigenetic changes to the chromatin state

Presenter: Parapini, Marina & Wong, Ryan
Faculty Sponsor: Peter Hurley

Regenerative medicine is a relatively new field of study, which has the potential to revolutionize treatment for a host of diseases by offering a cure as opposed to long-term management. One of the appealing aspects of diabetes from a regenerative therapy approach is that only a single cell type, beta cells of the pancreas, are necessary. Currently, researchers have described the differentiation pathway from an embryonic stem cell to an endocrine precursor cell by discovering several key transcription factors and extracellular signaling pathways (Domínguez-Bendala 2009). However, the understanding of the final differentiation steps between an endocrine precursor cell and a fully functional beta cell is not yet complete. This study provides an alternative approach to add to the existing knowledge of beta cell differentiation by utilizing chromatin immunoprecipitation followed by sequencing (ChIP-seq) to compare genome characteristics of in vivo and in vitro endocrine precursor cells and

beta cells. ChIP-seq is useful for studying gene regulation and epigenetic mechanisms by profiling DNA-binding proteins and histone modifications. By comparing the genome profiles of in vitro and in vivo endocrine precursor cells and beta cells, it should be possible to identify key differences. Epigenetic changes can then be induced by histone 3 lysine 4 monomethylation (H3k4me1), histone 3 lysine 4 trimethylation (h3k4me3), histone 3 lysine 26 trimethylation (H3k26me3) and histone 3 lysine 27 acetylation (H3k27ac) in order to remodel the chromatin state of an endocrine precursor cell to that of a fully functional beta cell and consequently induce cellular differentiation.



Medical Science

The Effect of Head Massage Therapy on the Regulation of the Autonomic Nervous System: A Pilot Study

Presenter: Pourrahmat, Masoud
Faculty Sponsor: Mir Sohail Fazeli

The autonomic nervous system (ANS) unconsciously regulates the activities of vital organ systems such as the respiratory, circulatory, and urinary systems. It consists of two major components, the parasympathetic nervous system (PNS) and the sympathetic nervous system (SNS), which together are in charge of keeping our body in homeostasis. Homeostasis is the state of chemical and metabolic balance within an organism; it is disturbed in situations of uncontrolled stress.

Massage therapy has been shown to regulate the activity of the ANS by increasing the activity of the PNS and decreasing the activity of the SNS. However, previous studies were mostly focused on full body massage therapy. The effects of head massage therapy (HMT) on regulating the activity of the ANS have not been studied before. In this pilot study, we propose that by randomizing 10 participants to sessions of HMT and no HMT, and by using a non-invasive method of measuring

the ANS activity (spectral analysis of Heart Rate Variability [HRV]), we will be able to investigate the effects of 10 minutes of HMT in comparison with the period of no HMT administered.

Preliminary analysis on five subjects before and after HMT shows a meaningful difference between HMT and control group with the HMT group having a higher level of balance between the ANS components, and PNS activity peaking up to 10 minutes post-HMT. The final results will be used to plan stress management intervention trials, incorporating HMT to control stress by regulating ANS activity.



Medical Science

Biomechanical Evaluation Of Challenges Associated With Turning In People Post-Stroke

Presenter: Qaiser, Taha

Faculty Sponsor: Tania Lam

Basic household tasks or even walking outdoors require constant need to adjust gait to perform turns around obstacles. Most individuals with stroke have an asymmetric gait pattern due to one side of their body being affected more than the other. This asymmetric pattern causes a greater challenge in controlled turning during walking. Previous studies have indicated that up to 45% of all steps are turns. Therefore, it is essential that turning strategies used by people with stroke be investigated in order to design improved rehabilitation interventions. However, it is surprising that limited research has been done on the turning capacity in individuals with stroke despite the fact that many falls occur while turning. This study aims to evaluate changes in motor control (muscular response to maintain balance) along different curved walking paths in people with stroke. Stroke participants in this study walked 5 times around large and small semi-circular curvature paths that were outlined on the floor, along with a straight path. During

walking, weight bearing on support leg while turning, distribution of foot pressure, and muscle activity changes were measured. Data from both paretic and non-paretic sides were recorded, and compared to an age-matched able-bodied control subject. The degree of sensory and motor impairments in the lower limb and dynamic balance control were additionally evaluated. Collectively, these measurements will demonstrate the effects that stroke has on turning capability. This study will build a foundation for future studies directed at improving the rehabilitation and recovery of mobility for stroke survivors.



Medical Science

An investigation into the effect of nAChR involvement in hippocampus modulated impulsive choice

Presenter: Sethi, Priyanka & Krdzalic, Ena
Faculty Sponsor: Jacqueline-Marie Ferland

Impulsivity, broadly defined as acting or making decisions without foresight, is known to be implicated in a variety of psychiatric disorders including ADHD, bipolar disorder, and drug addiction. Impulsive choice -- the choice of a smaller, immediate reward over a delayed, larger reward -- has been found to predict the severity of these conditions. Nicotinic acetylcholine receptors (nAChRs) are receptors in the brain that are activated by the neurotransmitter acetylcholine (ACh) and have been found to be implicated in learning and memory as well as modulating impulsive choice with previous studies showing that decreased nAChR activity in a variety of brain regions was associated with a preference for larger, delayed rewards, or decreased impulsive decision-making. The proposed study plans to investigate the function of nAChRs in the dorsal hippocampus' (dHPC) involvement in impulsive choice as measured by a rodent delay-discounting (DD) task. Using 32 Male Long-Evans rats, animals

will be trained on the DD task to stability at which point animals will be implanted with intracerebral cannulae in the dHPC CA1 region and will be administered infusions of vehicle, nAChR agonist nicotine, or nAChR antagonist trimethaphan at varying doses. Based on the previous data in the literature, we predict that rats will show an inverse relationship between receptor activity and impulsive choice, namely as antagonist dose increases, choice of the immediate reward will decrease and vice versa with agonist administration. This study will improve our understanding of how dHPC nAChRs modulate impulsive behaviour and will lay the groundwork for investigating the relevance of hippocampal nAChR-dependent activity in disorders implicating high levels of impulsive decision-making.



Medical Science

Differential methylation approach to quantify cell-free fetal DNA in maternal plasma

Presenter: Singh, Tanjot K.

Faculty Sponsor: Wendy Robinson

The development of a prenatal screening tool that has minimal risk to mother and fetus is a major goal of reproductive medicine. Many procedures used to study the fetus from a genetic perspective pose small, yet tangible risks to mother and fetus. The use of cell-free DNA has potential to circumvent these risks. This is DNA found in the blood as a result of cell apoptosis and/or necrosis. Pregnant women carry DNA of their fetus (placental) in their blood in addition to their own. This cell-free fetal DNA (cffDNA) can be used in the detection and/or prediction of different fetal and pregnancy related characteristics such as mutation carrier status, aneuploidy or preeclampsia. While prenatal diagnosis for aneuploidy using cffDNA is in clinical practice, this requires estimation of DNA ratios rather than absolute quantification of cffDNA levels. However, the latter is suggested to be predictive of other pregnancy complications, and more challenging to assess.

Methylation based approaches look at chemical

signatures on the genes rather than the gene sequences themselves. The methylation patterns of maternal cells differ from those in the placenta. Thus, cffDNA can be differentiated from maternal cell-free DNA. In this study, a methylation based approach is used to detect and absolutely quantify cffDNA in pregnancies using assays based on the methylation statuses of the promoter regions of ACTB (unmethylated) and RASSF1A (differentially methylated) genes.

Levels of cffDNA have been quantified in 83 pregnant women (gestational age range 7.10-40.14 weeks) using polymerase chain reaction methods (qRT-PCR and ddPCR). Levels of cffDNA are compared to pregnancy, fetal and maternal characteristics. Once validated, this approach can be tested in a larger series of patients to evaluate positive predictive value of such screening.



Medical Science

Chimeric Antigen Receptor (CAR)—A novel approach to immunotherapy for Crohn's Disease

Presenter: Siu, Jacqueline

Faculty Sponsor: Jens Vent-Schmidt

Inflammatory bowel disease is a group of chronic inflammatory diseases that affect the gastrointestinal tract including Crohn's Disease. Current treatments for Crohn's Disease include immunosuppressive drugs, and anti-inflammatory medications; however, none of these treatments are curative. Normally, a type of white blood cells known as T conventional cells fights off pathogens while another type of white blood cell known as regulatory T cells (Tregs) promotes immune tolerance to bacteria that normally reside in the intestinal tract. While the causes of intestinal inflammation that initiate Crohn's Disease are unknown, evidence suggests that disrupting this delicate balance leads to uncontrolled inflammation.

Our research aims to find ways to restore the function of Tregs in the intestine. We focused on making Tregs specific for flagellin, a protein present in all inflamed intestines. To create flagellin-specific Tregs, we genetically engineered a cell surface protein that can help the Tregs

recognize flagellin. This protein is called a chimeric antigen receptor (CAR) because it consists of an extracellular section that binds to flagellin, an intracellular signalling section that would activate the Treg upon binding of flagellin, and a "transmembrane" spacer. We first tested the function of several flagellin-specific CARs in petri dishes by looking if the CAR was found on the surface of Tregs, and if the Tregs were activated specifically by flagellin. The hypothesis is that if these "designer" flagellin-directed Tregs are injected into a patient, they will recognize flagellin and get activated. Then, these Tregs will suppress activated immune cells in the gut and hopefully cure IBD.



Medical Science

Characterizing the interplay between three bacterial proteins in human mitochondria during pathogenic E. Coli infection

Presenter: Thejomayen, Michael
Faculty Sponsor: Brett Finlay

Enterohemorrhagic and enteropathogenic Escherichia coli (EHEC; EPEC) are human pathogens that cause severe diarrhea worldwide, including recent outbreaks in Canada from contaminated water, beef, and gouda cheese. EHEC & EPEC use a “molecular syringe” called the type III secretion system (T3SS) to inject dozens of unique effector proteins directly into human cells. These effectors subvert human cellular processes to cause disease. The T3SS-injected effectors EspF, EspZ, and Map target human cell mitochondria, cell compartments that control cell death. EspF and Map are highly toxic and cause cell death, whereas EspZ interacts with a mitochondrial import regulator and counters EspF- and Map- induced cell death, thus protecting the infected human cell. My research hypothesis is that EspZ counters the toxicity of EspF and Map by decreasing their import into mitochondria. Cultured human cells were infected with EPEC strains with and without EspZ, and intact

mitochondria were harvested after 1.5 hours. Using Western blotting, I have confirmed that these bacterial effectors localize to mitochondria during infection and are imported into the innermost mitochondrial compartment, the matrix. Mitochondria from each condition have been submitted for quantitative proteomics comparison to examine how the contents of mitochondria are altered by the presence vs. absence of EspZ. The ultimate goal of this project is to characterize the mechanism by which EspZ protects human cells, to design effective therapeutics.



Medical Science

Genetics and the Progression of Parkinson's Disease (PD)

Presenter: Wei, Mimi; Tang, Shannon; Cao, Katheline & Chadha, Aditi
Faculty Sponsor: Joanne Trinh

Parkinson's Disease (PD) is the second most common neurodegenerative disease. It affects approximately 1% of the population at the age of 65, and 3-5% at the age of 85. PD is a multifactorial disease with several genetic factors that have been identified in recent years. Some PD patients progress through the stages of disease more rapidly than others. Clinical features such as first symptom at onset or age at onset has already been shown to affect disease progression. However, the link between genetic factors and symptom progression rate is unclear. This study proposes to identify genetic factors within the homogenous Arab-Berber population of Tunisia using a genome-wide approach to determine if there are genetic factors that can distinguish disease progression. Clinical data were recruited for 215 patients and 321 age-matched controls from the same clinical centre of Tunis. Genotype data on 500,000 single nucleotide polymorphisms (SNPs) across the genome were collected from

the Affymetrix 5.0 SNP array. Regression analysis on patients with variable disease progression and adjustment for covariates such as age and gender will be considered. Since SNCA, LRRK2, MAPT have been robustly implicated in the susceptibility of PD, it is predicted that the same genetic factors can also affect the rate of disease progression. Replications of our genetic findings in other case-control cohorts are crucial for a robust association study. Molecular differences that predict speed of decline in functional mobility is critical for modelling preventative treatments and could be an accurate prognosis for disease.



Medical Science

Augmentation of gene expression for the IL-17 cytokine in Chronic Experimental Autoimmune Encephalomyelitis and Multiple Sclerosis.

Presenter: Wilkinson, Brayden; Brown, Chad & Xu, Gary

Faculty Sponsor: Katerina Othonos

Several particular Interleukins (Proteins linked to immune responses) have been associated with degradation to the myelin sheath of neurons in Multiple Sclerosis (MS) in the attempts of pinpointing a potential cause to the disease, which could ultimately further developmental treatment for patients suffering from the neurodegenerative disease. IL-17 in particular, has been observed in heightened quantities (mRNA and protein form) in brain lesions and isolated mononuclear neural cells in MS patients (Komiyama, 2006). Thus, methods of effectively silencing the expression of IL-17 are highly significant in attempts to provide treatment to MS. This study investigates the heightened expression of the IL-17 protein in mice with induced Chronic Experimental Autoimmune Encephalomyelitis (EAE), simulating the MS disease in humans. A portion of EAE mice and controls will then be dosed with microRNA - used in transcriptional repression (Bartel 2004), altered

to emulate the IL-17 gene strand. By employing the use of a Luciferase Reporter Gene Assay, the transcription levels of IL-17 can be monitored in rodents with induced EAE and those with no neural afflictions, as well as those dosed with augmented microRNA. It is expected that the levels of IL-17 observed in control rodents should be reasonably low, compared to those with induced EAE. Both control and EAE rodents dosed with augmented microRNA are expected to exhibit significantly reduced IL-17 levels, which may provide a resistance to neurodegenerative symptoms in chronic EAE.



Medical Science

Investigating the Intraluminal Processing of Arylimidamide DB1960 in a Nanoparticle Lipid Formulation using an in vitro Lipolysis Model

Presenter: Wong, Carly

Faculty Sponsor: Kishor Wasan

Introduction: DB1960 is a mesylate arylimidamide displaying broad-spectrum anti-parasitic activity. DB1960 demonstrated high in vitro efficacy but poor in vivo efficacy against visceral leishmaniasis, a parasitic disease. The primary target cells of Leishmania are macrophages which mature in lymph. Hence, a lipid formulation of DB1960 was developed to increase its intestinal lymphatic uptake.

Purpose: To assess the intraluminal processing of DB1960 in a lipid formulation (Gelucire® 44/14 and peanut oil) using an in vitro lipolysis model.

Methods: Lipolysis models the intestinal digestion of fats to fatty acids. Lipolysis is initiated by the addition of pancreatic lipase/co-lipase enzyme. The liberation of fatty acids leads to a reduction in pH, and physiological pH (7.4) is restored with NaOH base addition. The volume and rate of NaOH added are indirect measures of the extent of fat hydrolysis in the small intestine.

Post-lipolysis, the digestion medium is separated via centrifugation into aqueous and sediment phases to assess drug distribution. The quantity of DB1960 recovered in each phase is determined.

Results: The lipid formulation led to a distribution of DB1960 from the aqueous to the sediment phase, suggesting that the intestinal absorption pattern of DB1960 was altered. An increase in lipolysis duration with increased doses of lipid formulation was observed due to more lipids that were added from the lipid formulation. An increased volume of NaOH titrated was due to more fatty acids liberated by the lipase enzyme.

Conclusion: The DB1960 lipid formulation led to reduced aqueous solubility and greater distribution to the sediment phase. Modification of the formulation is needed to enhance the lymphatic uptake of DB1960. Different compositions of the formulation are being investigated in an animal model of leishmaniasis.

Acknowledgements: Funding was provided by CIHR, NGDI-UBC, and the Bill & Melinda Gates Foundation.



Medical Science

Assessing protein interactions in Huntington's Disease using gene expression analysis

Presenter: Xie, Ronald; Yang, Sharon & Ma, Felix
Faculty Sponsor: Eric Y. Zhao

Huntington's disease is a common hereditary Mendelian genetic disorder caused by abnormal elongation of the IT15 gene coding for huntingtin protein. Symptoms of Huntington's disease include mood swings, loss of memory and uncontrolled movements. The pathogenesis of Huntington's disease is strongly associated with the interactions of mutated huntingtin protein with other proteins inside of cells. One such interaction disturbs the normal production of Brain Derived Neurotrophic Factor (BDNF), which is an important survival factor for striatal neurons.

To assess the expression of BDNF in Huntington's disease, microarray datasets from eleven studies in the Gene Expression Omnibus are pooled and collectively analyzed. Expression levels of key proteins involved in the BDNF-producing pathway in subjects with Huntington's disease and normal controls are compared for each of the eleven included studies using the student's T-test. A meta-analysis combining the effects of Huntington's disease on gene expression across

studies suggests an 11.7% decrease in BDNF expression ($p = 0.0505$), which fits with the canonical pathway model. There also seems to be a 9.69% increase in expression of the RE1-silencing transcription factor (REST, $p = 0.0003$), a protein that normally suppresses the production of the Brain Derived Neurotrophic Factor.

In addition to this targeted approach, a holistic functional analysis using the Database for Annotation, Visualization, and Integrated Discovery (DAVID) was performed to identify over-representation of dysregulated functional networks. Results reveal that effects related to cell size and cell number regulation, metabolism, innate and adaptive immune responses, histone proteins, and ribosome proteins may play a role in Huntington's disease. The findings of our study inform the study of gene expression in Huntington's disease and appear to verify the canonical model of the REST-BDNF pathway.



Medical Science

Inherited Epigenetic Differences and Asymmetric Replication in Muscle Stem Cells

Presenter: Xu, Peter

Faculty Sponsor: Robert Judson

Autologous transplantation (transplant of cells obtained from the same individual) of muscle stem cells (satellite cells) remains a promising therapeutic strategy for the treatment of degenerative muscle diseases such as muscular dystrophy. However, loss of stem-cell characteristics following removal and in vitro expansion of satellite cells is a major problem, hindering effective engraft after transplantation. It is observed that a subpopulation of satellite cells that express high amounts of the transcription factor, Pax7, segregate original DNA strands away from newly synthesized strands during replication and are more likely to retain stem-cell characteristics; while, the other subpopulation, Pax7 low expressing cells, segregate DNA strands indiscriminately (randomly) and are more likely to lose their stem-cell characteristics. Currently, the mechanism of this phenomenon is not understood. This study proposes that the observed phenomenon is the result of changes in genetic programs caused by differential inheritance of

epigenetic profiles (how DNA is modified), as Pax7-high cells replicate and progress into Pax7-low cells. This study aims to track one aspect of epigenetic inheritance: methylation profile (where on the DNA strand is the chemical -CH₃ added). Methylation profiles of both satellite cell subpopulations will be tracked after each replication. The subpopulations will be isolated using Fluorescence Activated Cell Sorting (FACS) and then confirmed to exhibit both random and asymmetrical DNA segregation with BrdU labeling. Methylation profiles will be tracked using bisulfite treatment and DNA sequencing. Modifying methylation changes in Pax7-low cells using targeted methylation might provide a strategy to induce asymmetric DNA segregation and retain their stem cell characteristics – allowing for more effective expansion and engraftment of satellite cells in transplantation treatments.



Medical Science

Unnatural amino acid mutagenesis reveals the critical role of hydrogen bonding for binding of retigabine in the pore of KCNQ channels

Presenter: Yau, Michael

Faculty Sponsor: Harley T. Kurata

Ion channels are proteins that allow electrical currents to be generated in brain cells. When these proteins malfunction, diseases like epilepsy can occur. We have tested the detailed chemistry that underlies interaction of a recently approved epilepsy drug, retigabine, with a specific ion channel protein called KCNQ3 that conducts potassium ions. The effect of retigabine is to help these channels open more easily, suppressing excessive electrical activity in the brain that occurs during adverse events like epileptic seizures.

We have used a very specialized method called 'unnatural amino acid mutagenesis' that allows us to engineer the structure of the ion channel protein in very precise ways. For example, with this method we are able to change the position of a single atom in the entire protein and test how this alters the effects of retigabine. By subtly altering a particular building block (amino acid) within the protein, we identified certain structural modifications that completely abolish responses

to retigabine while having minimal effects on the normal function of the ion channel. Using a technique known as 'two-electrode voltage clamp', we measured electrical currents through frog oocytes manipulated to produce KCNQ3, and were able to pinpoint a specific interaction known as a 'hydrogen bond' whose existence is crucial for retaining the effects of retigabine. These findings stringently constrain models of retigabine binding to KCNQ channels, and will guide the rational development of improved retigabine derivatives.



Medical Science

Father involvement in HIV-related care and antiretroviral (ARV) medication adherence in South Africa

Presenter: Yeung, Bianca & Bal, Anita
Faculty Sponsor: Gareth Mercer

In 2011, nearly 30,000 children were newly diagnosed with HIV infection in South Africa. Good adherence to antiretroviral (ARV) medications is critical in keeping such children healthy, yet relatively little is known about family characteristic that promote good ARV adherence. We propose to study whether there is a positive correlation between father involvement in HIV-related care for recently diagnosed HIV-infected infants and 1) their adherence to ART therapy, and 2) their HIV-related health outcomes (lower viral loads, higher CD4+ counts). We plan to recruit all infants with HIV infections diagnosed during a one-year time period from a single community health clinic in South Africa. Father involvement and ARV adherence will be assessed at monthly clinic visits, and HIV viral loads and CD4+ cell counts will be measured on enrolment and at the end of one year of follow-up. Using a self-developed questionnaire, we will measure fathers' involvement in activities such as taking

infant to clinics, giving medications, and making health-related decisions. ARV adherence will be measured by medication return and standardized interview. Because men tend to be excluded from prevention of mother-to-child HIV-transmission programs, we anticipate that few fathers will be highly involved in HIV-related child care. However, holding other factors constant, we expect that children whose fathers are highly involved will have better ARV adherence, lower viral loads, and higher CD4 counts than children with less involved fathers. We discuss potential findings of this study and their implications for programs to integrate fathers into the care of HIV-infected children.



Medical Science

Effects of Bcl-xL and glucolipotoxicity on mitochondria metabolism

Presenter: Zhao, Grace; Kamma, Emily & Suen, Imelda

Faculty Sponsor: Alexis Shih

Mitochondria metabolism is important in coupling metabolism with insulin secretion. The combined negative effects of high glucose and free fatty acid presence, which include oxidative stress, beta-cell death, and decreased insulin secretion, is termed glucolipotoxicity (Kim and Yoon 2011).

Bcl-xL is part of the Bcl-2 family proteins that regulates apoptosis – programmed cell death. It has been found that the protein Bcl-xL reduces reactive oxygen species and mitochondria metabolism when overexpressed (Luciani et al. 2013). However, there are no studies detailing the effect of Bcl-xL in protecting against deleterious conditions such as those involved in glucolipotoxicity.

To study the effect of Bcl-xL under glucolipotoxicity in vivo, we will treat Bcl-x overexpressing transgenic mice and wild type mice under a high sugar high fat (HGHF) and normal Chow control diet. Glucose tolerance tests

will be performed periodically on the mice to determine the insulin response to sugar. After 6 months, β -cells are isolated and tested for defects in glucose metabolism in the mitochondria using the Seahorse Mitoc Stress Test kit, and effects on apoptosis were tested by TUNEL assay.

We expect poorer glucose tolerance over time with HGHF Bcl-xL overexpressed mice compared to HGHF wild type mice. Although elevated blood glucose levels are damaging, decreased oxidative stress and beta-cell death could improve pancreatic health over time.



Politics, Culture & Education

Student and Faculty Perceptions of Student Evaluations of Teaching: A Qualitative Study

Presenter: Lee, John

Faculty Sponsor: Marion Pearson

While extensive research has examined the validity and reliability of student evaluations of teaching (SETs) (e.g., Clayson, 2008; Spooren, Brockx, & Mortelmans, 2013), few studies have explored student and faculty perceptions of these surveys. Yet, having a better understanding of key stakeholders' perceptions and beliefs can lead to important insights about SET response rates. In the UBC Faculty of Pharmaceutical Sciences, where response rates to the online surveys have traditionally been low, this project was designed to investigate student- and faculty-perceived drivers and barriers to engagement with SETs. Semi-structured interviews were conducted with faculty (n=12) who previously received SETs in mandatory pharmacy courses and students (n=13) entering years 2-4 of the program who previously received SETs. Students self-identified as either "completers" (n=7), who always/almost always completed SETs, or "non-completers" (n=6), who never/almost never completed SETs. Interview transcripts and hand-written notes

were coded and organized into common themes; attention was paid to negative cases (Mayan, 2009). Faculty and students offered a wide variety of responses. "Completers" were motivated by instructors who recognize and actively respond to feedback. "Non-completers" were discouraged by SETs administration during exam periods and the perception that instructors neglect student feedback. Faculty members expressed concerns regarding the lack of reliability of responses due to low response rates and doubts over students' capacity to provide quality feedback given their lack of experience in pharmacy practice. Findings suggest that no process will satisfy all concerns. However, the project results will be used to guide a review of and possible revisions to the Faculty's current SET process in an effort to enhance the value of SETs.



Politics, Culture & Education

Input Effects in the Sensitive Period for Language Acquisition

Presenter: MacWilliams, Macaela
Faculty Sponsor: Carla Hudson Kam

Adults do not learn language as well as children. This is especially true of morphemes like grammatical gender (e.g., Masc/Fem in French). Why adults are worse is not well understood, though researchers hypothesize maturational, social, or input factors. One difference between adult and child learners is how they encounter language. Infants learn about sounds, and patterns between sounds, before learning meanings. Adults, in contrast, already know that language is communicative and consists of words organized into categories. This knowledge might redirect cognitive resources from implicitly forming sound pattern categories to actively analyzing the input (poorly) to look for meanings, which could hamper acquisition. One currently unexamined difference was whether changing adults' experience with input to inhibit the search for meaning initially improves grammatical pattern learning. We exposed 31 adults to an artificial language (AL) in four 30-minute sessions over four days, and tested them on the fifth day. Control participants

saw videos and heard AL sentences on all four days. Experimental participants heard only audio for the first two days, and then audio and video on days 3 and 4. The participants hearing the language before seeing the videos should mimic children's early exposure in receiving sound before meaning. Participants were tested on vocabulary and grammatical agreement markers (e.g. gender in French). We hypothesized that Experimental participants would perform better on agreement tests, whereas Control participants would perform better on vocabulary tests. Control participants did perform better on vocabulary tests, but Experimental participants did not perform better on agreement tests.



Politics, Culture & Education

Human Rights, Transnational Extraction
Corporations and Global Jurisdiction: the case for
Canada's Bill C-323

Presenter: Riva, Lauren
Faculty Sponsor: Elena Cirkovic

Within the international legal system, it remains a challenging endeavor to hold transnational corporations accountable for human rights abuses. The Canadian context exemplifies this challenge, due to its role as an influential state in the international extraction industry, with a substantial percentage of the industry's major companies incorporating in Canada. Despite being a state heavily invested in the extraction industry, justifying the jurisdiction in Canadian courts for human rights abuses committed internationally by Canadian extraction companies is a rare occurrence. My research paper examines the justification of Canada's proposed Bill C-323 An Act to amend the Federal Courts Act as a legitimate means of protecting human rights through the Canadian courts. Bill C-323 will extend the jurisdiction of Canadian courts to include human rights abuses committed outside of Canada. While the role of state regulation, domestic jurisdiction and industry regulation

continues to evolve, the boundaries of domestic legislation concerning transnational corporations remains largely ambiguous. Previous studies have identified a need for Canada to further develop legal norms pertaining to human rights and Canadian transnational corporations, yet little scholarship exists examining Bill C-323 in the Canadian and international legal context. This study examines current scholarship concerning transnational corporations, reports from the International Law Commission (ILC), extraction industry policies and rulings within the Canadian court system to evaluate the legitimacy of Bill C-323. These findings suggest that there is a strong case for Canada to enact such domestic legislation; Bill C-323 aligns with and further develops already established norms within the international legal system. By enacting such legislation, Canada will promote legal practice of holding transnational corporations accountable for their human rights abuses and providing redress to their victims within the international legal system.



Politics, Culture & Education

Identifying HCV treatment barriers amongst high risk population of Vancouver Downtown Eastside.

Presenter: Tahmasebi, Sahand

Faculty Sponsor: Harout Tossonian

Currently there is little information on what is preventing high risk vulnerable populations from engaging in Hepatitis C Virus (HCV) diagnosis and treatment. The aim of this study is to survey this population using a targeted questionnaire and to identify barriers to HCV care. This was administered during Portable Pop-up Clinics at specific locations frequented by people who inject drugs (PWID) where participants have the opportunity to access point-of-care testing. Participants were recruited at pop-up clinics held at two different community-based centers in Vancouver's Downtown East Side. During these clinics OraQuick HCV Rapid Antibody point of care testing was offered. Participants who were tested were then offered to complete a questionnaire while they waited for test results.

During January 2014, 43 individuals completed the questionnaire. The questionnaire included demographic questions and also questions regarding subjects' medical history and HCV related background. With regards to HCV

treatment, they were asked about the barriers to start proper treatment. Despite awareness of their HCV infection, and their desire to get treated PWID do not routinely seek medical care. Barriers such as inaccessible medical care, unfamiliarity with available resources, and concerns regarding treatment side effects have been identified. Organized and targeted community events such as portable pop-up clinics increase likelihood of reaching out to marginalized and high risk inner city populations to address these barriers in a systematic way.



Politics, Culture & Education

Perceptual identification of talker ethnicity in Vancouver

Presenter: Wong, Phoebe
Faculty Sponsor: Molly Babel

The Lower Mainland is a highly multicultural urban area. For example, for over 200 years, people from the regions of Punjab in India and Guangdong in China have been immigrating to the region. One of the cultural traits these groups bring with them is language. Thus, English in the Lower Mainland has been in close contact with Punjabi and Cantonese for years. Some researchers have hypothesized that such extensive periods of language contact can lead to language change and the emergence of ethnolinguistically associated features through the establishment of ethnolinguistic communities. The persistent ongoing pattern of language contact in Vancouver is the impetus for the present study, which examines whether listeners can identify the self-identified ethnicities of 30 speakers. Specifically, this work seeks to determine whether the varieties of English spoken by white Canadians, Punjabi-Canadians and Cantonese-Canadians in Vancouver are perceptually distinct from each other. Semi-spontaneous speech from 10 members of each of these three groups

was recorded. Individual sentences from these recordings were presented to listeners, who were instructed to choose the ethnicity of the speaker from a list of three choices: East Indian, Chinese, or White. While data are still being collected, preliminary results suggest that listeners are able to assess speakers' self-identified ethnic backgrounds at better than chance levels, and that listeners who interact more with a given ethnic group are better at accurately identifying speakers from that group. These results suggest the emergence of salient and ethnolinguistically associated features in Vancouver English and they emphasize the importance of familiarity in identifying ethnolinguistic variants. These results have potential implications for linguistic profiling and establishment of local ethnolinguistic identity.



Psychology

Stress and Visual Attention

Presenter: Birnbaum, Timothy, Lau, Ricky & Lam, Andre;

Faculty Sponsor: Ronal Rensink

Previous studies have obtained contradictory conclusions regarding the effect of stress on visual attention. Some have reported stress has a narrowing effect on attention (Callaway and Dembo, 1958), while others have found a broadening effect (Braunstein-Bercovitz, 2003). Although a considerable amount of empirical data has been on the effects of stress, little is known about its effects on visual attention. We are currently studying uncertainty and its effect on stress and visual attention. Subjects are told that a debriefing (low-stress) or a videotaped interview (high-stress) is following the experiment. They are then asked to perform either easy or difficult math tasks (dependent on if they are in the high-stress condition or low-stress one) followed by a visual search task. Questionnaires are completed prior to and end of the stress-induction protocol to gauge stress induction effectiveness. Our previous result show a speed-up effect for simple-feature search (target line in visual search task is only either longer or shorter than other lines),

but this effect disappears when the uncertainty factor (when the target could either be longer or shorter) is present. From this, we found that the order in which the simple-feature search and uncertainty conditions were presented mattered; thus, stress may restrict our cognitive flexibility when switching between visual tasks.



Psychology

Visual Perception of Correlation with Colour

Presenter: Chang, Jason

Faculty Sponsor: Ron Rensink

With the increasing amount of data in the world, it is important to explore better ways of effectively representing such data. Previous research by Ronald A. Rensink has focused on evaluating the effectiveness of various scatterplot designs for visualizing correlation, and has determined a generally effective method to assess the precision and accuracy of observers on these scatterplots (Rensink & Baldrige, 2010).

However, scatterplots convey information by using horizontal and vertical position. Researchers have not explored other possible carriers of information, such as colour. The effectiveness of colour as an information carrier was evaluated by determining the accuracy and precision of data visualizations with colour, assessed using the same methods as previous studies used for evaluating scatterplot designs. Accuracy was assessed using a Stevens task, in which participants were given two graphs to look at and had to adjust the correlation level of a third graph to halfway between the two other two. Precision was assessed using a Just Noticeable Difference task, in which participants

would be just able to differentiate between different levels of correlation. Data from pilot conditions suggest that colour may be a generally good carrier of information, but this remains uncertain until a larger sample has been collected. Identifying effective information carriers will give rise to new techniques in the field of visual analytics and develop more efficient ways to visualize data.



Psychology

What's on First?: The effect of ownership on perception

Presenter: Cowie, Cassie

Faculty Sponsor: Rebecca Todd

This study is interested in understanding how ownership affects the way we perceive the world. In previous research, participants judged the order of presentation of emotionally significant and neutral stimuli that were presented simultaneously. Emotionally significant stimuli such as threatening faces received more attention and were thus perceived first compared to neutral stimuli such as expressionless faces (West, Anderson & Pratt, 2009). However, numerous other things can carry emotional significance for an individual. For example, choosing between two equally attractive objects leads to more favorable evaluations of chosen items (Gawronski, Bodenhausen, & Becker, 2007). Furthermore, there is a significant memory advantage for objects that are owned by the self (Cunningham et al., 2008). Therefore, we predicted that one's possessions, which are emotionally salient like threatening faces, would bias attention and be perceived quicker. Participants saw a series of objects that were randomly assigned to an owner and

memorized whether they belonged to themselves or the experimenter. Following this, the effect of object ownership on attention was analyzed using a temporal order judgment task: participants saw two images presented side-by-side, one of which belonged to them and one of which did not, and judged which image in each pair appeared first. Results support our hypothesis that the self-owned object appeared was more likely to be perceived as appearing first even when it was presented second. This study provides evidence that ownership does impact our perceptual processing of the environment, with self-owned objects given preferential attention over objects owned by someone else.



Psychology

Overcoming Obstacles: Evidence of Obstacle Suppression During Reach-and-Grasp Movements

Presenter: Granados-Samayoa, Javier
Faculty Sponsor: Todd C. Handy

Reaching for a coffee mug amid a crowded breakfast table seems easy. However, this superficially simple task is supported by complicated mental operations. For example, when interacting with the environment, the brain can consider several potential targets for action at the same time. Previous research suggests that once a target has been chosen for action, the brain activity associated with it is enhanced (Baldauf & Deubel, 2010). This finding provides a mechanism for how the brain deals with targets in the environment during movement. However, one often overlooked aspect of natural movement is avoiding obstacles – something that occurs very frequently, but we know very little about. To shed light on this issue, we used electroencephalography (EEG) to record participants' brain waves while they planned and then performed reach-and-grasp movements to real objects. The results revealed an enhanced measure of attention at target locations and suggest a suppressed measure of attention at

obstacle locations. Our findings are consistent with a model of visuomotor attention in which potential targets compete for selection and once an action has been selected, the brain activity associated with a target is amplified, while that associated with an obstacle is suppressed.



Psychology

Marital adjustment in stepfamilies: Effects of daily dyadic coping

Presenter: Herriot, Heather

Faculty Sponsor: Anita DeLongis

of both husbands and wives must be considered in tandem to understand the impact of family stressors over time.

Stepfamilies experience both greater amounts and varieties of stress and are at a higher risk of marital distress and divorce than nuclear families. However, the nature of the stress and coping process has not been extensively studied in stepfamilies. This study uses data from 67 stepfamilies to examine the effects of daily dyadic coping to predict change in marital adjustment over 2 years. Coping was assessed at the end of the day, every day for one week. Marital adjustment was assessed at baseline and again 2 years later. Multilevel modeling, specifically the actor-partner interdependence model, was used to examine the effects of coping via confrontation, compromise and withdrawal on marital adjustment over time. It was found that wives who reported higher levels of withdrawal had poorer marital adjustment over time. The impact of wives' confrontation on marital adjustment was moderated by her husband's tendency to use compromise and confrontation. Findings support a dyadic coping model in which the responses



Psychology

UBC Teddy Bear Clinic: findings from a pediatric population

Presenter: Jia, Lingsa; Hao, Elaine; Subedi, Manisha & Ng, Nicole

Faculty Sponsor: Shafik Dharamsi

In a typical visit to the family physician's office, a child may have an otoscope placed into their ear, a tongue depressor placed onto their tongue, or a vaccine injected into their arm. These routine practices can be sources of anxiety and distress for a child and may create an overall negative experience. Therefore, it is important to implement methods to improve the healthcare experiences of young children. One of these methods is to engage the child in medical play in the form of the Teddy Bear clinic (TBC). TBCs are held at preschools and family centers by UBC medical students. The aim is to reduce fears and anxieties associated with healthcare. We invite the child bring in their teddy bear with a "medical complaint". Together with the medical student, the child provides care to their teddy bear using medical equipment commonly used in a primary care clinic. By having the child act as the healthcare provider and familiarizing them with medical equipment, we remove fear of the unknown and allow children to be more

engaged with their health care. The purpose of our research is to investigate how participating in the TBCs shape the behaviours of children aged 2 to 6 during an interaction with a healthcare professional, as reported by caregivers. We provided 23 caregivers with surveys that assess their child's behaviours at an encounter with an HCP that occurred before versus after the child's participation in the TBC. We hope to gain insight into whether the child's behaviors are influenced by their TBC experience.



Psychology

The Moderating Role of Burnout in the Relationship Between PTSD and Sleep

Presenter: Kukowski, Charlotte
Faculty Sponsor: David B. King

Due to the challenging nature of their jobs, paramedics have been identified as a high-risk group for the development of post-traumatic stress disorder (PTSD), trauma-related symptoms, and burnout (Regehr, Goldberg, & Hughes, 2002). Their daily routine includes exposure to a large degree of human suffering and tragedy such as severe injuries and death under their care. Both PTSD and burnout have been found to negatively impact sleep through reduced total sleep time and increased duration of nightly awakenings. Despite the many studies linking PTSD and burnout with poor sleep quality separately, there has been no research linking the three. Building on previous research that has found an association between self-efficacy and sleep, it was hypothesized that burnout would moderate the relationship between PTSD and sleep. In the present study, 87 Canadian paramedics completed a daily measure of sleep-related variables for one week, using a shortened version of the Pittsburgh Sleep Quality Index. One-time measures of burnout and PTSD were

administered after the one-week period. These were derived from the Maslach Burnout Inventory and PTSD Checklist Civilian Version respectively. In accordance with the hypothesis, it was found that PTSD predicts average sleep quality, moderated by burnout, such that higher burnout is exacerbating the effect of PTSD on sleep quality. Looking at the different subscales of the MBI, only personal accomplishment significantly buffered the impact of PTSD on sleep quality; a higher sense of personal accomplishment reduced the impact of PTSD on average sleep quality.



Psychology

From Workaholics to Alcoholics: The Impact of Early Employment on Future Substance Use

future, and vice versa.

Presenter: Monillas, Ronald

Faculty Sponsor: Marjan Houshmand

Theories of human development often cite that early work experience has a negative socioemotional impact, interfering with adequate preparation for adulthood. Some social scientists, however, argue that challenges at work promote resilience and psychological well-being in early adulthood. Using the longitudinal data from the Youth Development Study (YDS) spanning over 20 years, we examine the relationship between adolescents' work conditions and future social outcomes based on substance use. We expect results to imply a positive association due to the increased levels of stress and deleterious effects of work on their mental and emotional health. After preparing the panel data, imputing the missing values, and performing ordinary least-squares regression analysis, we discover that early employment may not significantly affect the future smoking or drinking levels of an individual. Results also suggest that the drinking level maintained by one during his high school days does not necessarily influence his smoking level in the near



Psychology

The Roles of Psychopathy and Victimization History in Rating Potential Intimate Partners

Presenter: Okano, Marisa

Faculty Sponsor: Zach Walsh

Intimate Partner Violence (IPV) is a prevalent public health concern and identifying factors that are associated with risk for IPV is a research priority. Individuals with a history of IPV victimization have been found to be at increased risk of victimization in subsequent relationships (O'Keefe & Treister, 1998). However, the factors that underlie this increased risk are poorly understood, and few studies have examined the extent to which individuals with and without history of IPV differ with regard to the evaluation of potential intimate partners. The present study examines differences between women with and without histories of IPV victimization with regard to attractiveness ratings of real and hypothetical men who vary on traits related to risk for IPV perpetration (i.e. psychopathic personality). Participant history of IPV was assessed using the Conflict Tactics Scales (CTS2; Straus, Hamby, Boney-McCoy, & Sugarman, 1996), a widely used measure of intimate partner violence. Participants rated potential partners

according to attractiveness and willingness to engage in a hypothetical romantic relationship based on two presentation contexts: brief video clips of maximum-security inmates previously evaluated for psychopathy, and two completed questionnaires designed to assess psychopathic personality, one of which was suggestive of high psychopathy and the other was suggestive of low psychopathy. Preliminary results indicate that females with a history of partner violence victimization reported more attraction in general, and men with higher levels of psychopathy were rated to be generally more attractive. The effects of victimization history and psychopathy were independent, not interactive.



Psychology

What and How Do Other Factors Mediate The Relationship Between Money and How Giving We Are?

Presenter: Patel, Pooja

Faculty Sponsor: Ashley Whillans

How do reminders of money (such as images) influence prosocial behavior? Previous research has shown that exposure to money related concepts can decrease prosocial behavior. Our research extends past literature by exploring what factors might influence whether and when money decreases prosocial behavior. More specifically, our study focuses on whether the relationship between money and prosocial behavior is mediated by factors such as socioeconomic status and gender. We hypothesized that those who come from higher income families will report and show lower prosocial behavior. In our study, we had two conditions. In the experimental condition we primed participants to an image of money, while in the control they were shown a neutral image. In each condition participants watched a video about bone marrow donation. We then measured prosocial behavior: through a self-report measure (survey) and by observing whether the participant took a pamphlet concerning bone

marrow donation. We found that there was no difference between the control and experimental group with respect to prosocial behavior. However, we did find evidence supporting our hypothesis; when people in the low socio-economic group were primed with money, they were more likely to self-report donating to a homeless person.



Psychology

The effects of Western culture affiliation on sexuality amongst interethnic Asian groups

Presenter: Peng, Melanie

Faculty Sponsor: Boris Gorzalka

It is evident that sexual beliefs, attitudes, and knowledge have changed over the course of generations. However, differences in sexuality across cultures have also been noted. In previous research, comparisons of different ethnic groups towards sexuality have shown significant differences. Specifically, these differences were most prominent between Asians and Caucasians. On scales which measured multiple aspects of sexuality including, interpersonal sexuality, intrapersonal sexuality and sociosexual restrictiveness, Asians scored to be significantly more conservative than Caucasians. However, researchers of relative studies have always integrated Chinese, Japanese, and Korean individuals into one homogeneous group. This study aims to determine whether it is empirically correct to group the different inter-ethnic Asian cultures through the comparison of their sexual functioning knowledge. Due to great diversity in culture and religiosity, a significant difference among the Asian ethnicity is hypothesized.

Western culture affiliation is also accounted for as a mediating factor of sexuality among Asians. An online questionnaire regarding ones sexuality was administered to students of the University of British Columbia to answer our research question. The results will have implications regarding the reliability of current clinical practices, as practitioners should refine their approach when handling Asian clients if there is a significant difference. If not significant, this study will provide the first empirical evidence for the grouping of Chinese, Japanese, and Koreans as a homogeneous group.



Psychology

Keep your Friends close, and your Possessions Closer: How Ownership and Motor Movement affect Memory.

Presenter: Rothwell, Austin
Faculty Sponsor: Todd Handy

Does it seem as though objects that belong to you – self-owned objects - are more easily remembered? Interestingly, this may actually be the case, but through what mechanism is this effect moderated? We aimed to discover the mechanism underlying the self-owned bias by determining how motor behavior may influence the self-ownership effect. We predicted objects which are self-owned and moved closer to oneself would be remembered more often than other objects. Using motion tracking technology, participants were asked to sort objects into near or far boxes labeled 'mine' or 'other persons' in an interactive projected computer task. Once they completed this task participants were then asked to complete a memory test where they had to recognise if objects were shown previously in the sorting task, or if objects were not seen as part of the sorting task. As predicted, objects which were self-owned and moved close to the body were recognised more often than objects that

were other-owned or objects that were moved far from the body, which is consistent with previous research (Cunningham et al., 2008; Turk et al., 2011). Although moving objects closer to the body enhanced the self-owned bias resulting in better memory scores, this effect could have been due to physical movement, proximity, or a combination of both. This raised the question: is motor movement necessary for this effect? Using a similar paradigm, a subsequent experiment was conducted where objects were sorted without motor movement. Results suggest that motor behavior is necessary for boosting the self-owned bias and increasing memory.



Psychology

Do listeners' biases affect speech perception?

Presenter: Russell, Jamie

Faculty Sponsor: Molly Babel

Research has highlighted how listeners use speech information to evaluate and categorize individuals. For example, studies have shown that different dialects elicit varying judgements of intelligence, friendliness and attractiveness (e.g. Kinzler & DeJesus, 2012; Preston, 1989). But while we know that our perception of speech can trigger biases, it is important to explore the opposite -- whether our biases affect our perception of speech. In cities such as Richmond or Vancouver where the ethnic majority has shifted over the past few decades, we are presented with an ideal situation to explore this question, as many Canadian-born Asians are growing up either bilingually or with English as their first language. But do listeners expect that an Asian Canadian speaker from Richmond will have a non-native accent? This study investigates whether visual information (e.g. a photo of the speaker) primes such an expectation, thus affecting ratings of accentedness and intelligibility of that speaker. Listeners first completed an intelligibility task where they transcribed sentences embedded in noise; these sentences

were recorded by twelve speakers born and raised in Richmond (six White Canadians and six Asian Canadians). Half of each speaker's sentences were presented as audio-only, and half were presented with a photo of the speaker. Participants also completed an accentedness rating task, measures of explicit and implicit biases, and a social network self-assessment. Analyses examine the proportion of correct words to measure intelligibility, and explore interactions between accent ratings and performance on both measures of ethnic bias. Preliminary results indicate that there is indeed a greater decrease in intelligibility for Asian Canadian voices when accompanied by the speaker's photo. Further, while ratings of accentedness for both White and Asian Canadians are on the low-to-mid side of the scale, Asian Canadians are rated as more accented, regardless of condition. When listeners are more positively biased towards White Canadians, as indicated by scores on our Implicit Association Task (IAT), accentedness ratings increase and intelligibility scores decrease for voices of both ethnicities.



Psychology

Literacy Capability in Physically Abused Children

Presenter: Tikhonova, Julia; Fung, Desmond & Chawla, Khushbu

Faculty Sponsor: Jessica P. Flores

The most recent Canadian figures on child maltreatment highlighted that 46% of substantiated maltreatment investigations included at least one 'child functioning' difficulty. Of the 46%, 23% were an academic difficulty (Trocmé, 2008). Much research has been done on physical abuse in children and its relation to an increase in school absence rates, decreased educational development, and academic performance in the elementary school years (Sheppard 2012). Further studies of adolescents and adults with a history of child physical abuse show that they were more likely to develop social-emotional difficulties as extreme as anti-social personality disorder and non-suicidal self-injury (Klika et al., 2012; Swannell et al., 2012). However, there is limited research on the impact of physical abuse on children's literacy capability across time. We aim to identify the magnitude and variation of such an impact as reported in the literature for physically and non-physically abused children. We propose that by repeated evaluation—using

the standardized FSA test and an oral reading test, along with the Canadian Indidence Study of Reported Abuse and Neglect—we can test the impact of physical abuse of elementary school children on their literacy capability across time, and how their reading development level compares with that of children who are not physically abused. We anticipate that our findings will work to (a) inform school literacy interdisciplinary intervention programs on the importance of providing academic support that is sensitive to the specific needs of physically abused children, and (b) to inform academic support resource allocation practices with a research informed rubric.



Psychology

Confirming the Findings that slo-1 is Involved in the Alcohol Pathway and Effects Habituation Using the Backcrossing Method

Presenter: Zhu, Shi Hui (Oliver) & kan, Michelle
Faculty Sponsor: Catharine Rankin

Alcohol can affect the simplest form of learning, habituation, which is the reduction of a response to a constant stimulus, (Rankin et al, 2009), but the mechanism for this is not well understood. SLO-1, a protein that makes up the Big Conductance voltage gated and calcium sensitive potassium channel located at neuron synapsis, was shown to play a major role in alcohol related behaviors (Wang et al., 2009), and was shown to play a role in alcohol's effects on habituation (unpublished data, Lin, Butterfield, Sa, Menon & Rankin). Using the genetic model organism *Caenorhabditis elegans* our lab found that when wild-type *C. elegans* are exposed to alcohol, faster habituation was observed. However, some *C. elegans* slo-1 mutants showed less or no drunk habituation phenotype. This suggests that while slo-1 may play a major role in drunk habituation, different slo-1 null mutations did not show the same degree of drunk habituation. This difference could be due to additional mutations,

other than in the slo-1 gene, caused by previous mutagenesis methods (background mutations). These background mutations must be reduced prior to confirming that the slo-1 gene has indeed been mutated and is generating the different alcohol habituation patterns observed. This clean-up is accomplished by mating the mutant worms back to the wild-type strain, a technique known as backcrossing. Backcrossed slo-1 mutants should have considerably fewer background mutations compared to original slo-1 mutants. We hypothesize that if the slo-1 mutation is the cause of the difference in the habituation curve, the slo-1 mutant strains after backcrossing should also have a different habituation curve compared to the wild-type *C.elegans*. In contrast, if slo-1 is not causing the change in the habituation curve, the observed habituation curve should resemble wild-type *C.elegans*. If slo-1 is indeed the gene involved in the observed drunk habituation difference, it implies that these highly conserved Big Conductance voltage gated potassium channels are involved in drunk behaviour and alcoholism. Negative results would imply that the difference in habituation is caused by other mutations in the genome, and SLO-1 is not the sole contributor to the difference in habituation curves previously observed.



Afternoon Oral Presentation List

2:00pm-3:00pm

Animal Biology - IKBLC 155

Why Do Individuals Groom? Functionality of Behaviour And Its Effect On Kangaroo Rat Conservation

Presenter: Mills, Katie

Arterial Chemoreception in *Tupinambis merianae*: Evidence for Carotid Body Homology in Lizards

Presenter: Reichert, Michelle

Bar-headed geese and metabolic efficiency in hypoxic flight

Presenter: York, Julia

Animal Welfare - IKBLC 301

Public Openness in Laboratory Research: A Survey Study

Presenter: Kwok, Eugenia

Tank Colour Preference Testing with Coho Salmon in Closed Containment Aquaculture

Presenter: Robertson, Betsy

Validation of data loggers for monitoring dairy goat lying behaviour

Presenter: Tan, Bee Li

Herd Size Impacts Dairy Goat Hoof Length and Claw Overgrowth

Presenter: Tse, Tiffany

Economics & Politics - BUCH B215

The Political Plate: Exploring Food Insecurity in the West End

Presenter: Lao, Aaron

The Economics of Organic Produce

Presenter: Tan, Jenny

Electoral Politics of Local Governments in Developing Countries

Presenter: Wegschaider, Klaudia; Thomas, Jasmin & Fetisova, Alexandra

The Effects of Government Ownership on Investor Behaviour in China: An Analysis of Publicly Listed Companies

Presenter: Zhou, Lance



Education in Medicine - BUCH B213

Mass Gathering Medicine Elective: Education in the Field

Presenter: Earle, Rosie & Guy, Andrew

Student Developed Online Modules for Global Health Pre-Departure Training

Presenter: Fairley, Jillian & Hendren, Elizabeth

Development of an ultrasound curriculum for paramedics: a systematic review of the literature

Presenter: Harris McCallum, Jessica

Gender & Indigenous Studies - BUCH B210

The Roles of Okanagan Women: Shaping Syilx Culture

Presenter: Alexis, Sarah

The Identification of Factors Critical to the Success of Aboriginal Athletes Representing Team Canada in Reaching the Olympic Podium

Presenter: Baker, Erica

Gender Representation in Science Textbooks: A historical comparison

Presenter: Villar, Paz

Literature & Writing - BUCH B211

Linguistic Themes in Argumentation Rhetoric: A Corpus Analysis of Canadian Literary Studies

Presenter: Budd, Alyson

Bridging the gap: an analysis of writings from the classroom to the real world

Presenter: Newton, Josh

Trauma, Memory, the Regulation of Female Behavior and Popular Victorian Novels

Presenter: Singh, Simran

Being "Discriminating" About Oppression

Presenter: Wang, Edward



Medicine in Life - BUCH A102

Impact of Seizures on Brain Development in Infants with Congenital Heart Disease

Presenter: Kwan, Vivian

Beetroot juice does not beet hypoxia

Presenter: Nugen, Sean

Consequences of Stent Placement to Artery Wall Structure

Presenter: Sasitharan, Saaranga

Particles, Protons & Physics - IKBLC 158

Application of PT Symmetric Quantum Theory to Maxwell Electrodynamics on an Euclidean 4-Torus

Presenter: Martin, Kevin

Studying the behaviour of Non-Newtonian fluid displacement flow

Presenter: Shamsuddin, Rehmani & Dong, Steven

Preserving Ecosystems & the Environment - BUCH B208

Use of Camera Traps in Borneo to Study the Effects of the Palm Oil Industry on the Distribution and Diversity of Species

Presenter: Boisvert-Plante, Virginie

Carbon Sequestration Potential of Turfgrass

Presenter: Wu, Yihan

Where the Wild Things Are: Looking for Uncultured Arbuscular Mycorrhizal Fungi

Presenter: Zaitsoff, Dylan

Space & Astronomy - BUCH B209

Carbon Sequestration Potential of TurfgrassLife on Mars? Myth or Reality?

Presenter: Krishnan, Sarangadev

Using electric charge to fight biofilms - in space

Presenter: Mortazavi, Armin

Cataloguing Compact Sources through the SCUBA2 'All-Sky' Survey

Presenter: Nettke, Will



Technical Medicine - BUCH A101

Cytochrome C Alters Central Nervous System Inflammation

Presenter: Gouveia, Ayden

Frosting the Donut: Immunocamouflage with mPEG on RhD Mismatched RBCs using Monocyte Monolayer Assay

Presenter: Kwok, Eunice

Development of Force Control Medical Forceps using Nylon Actuators

Presenter: Pandit, Milind



Afternoon Oral Presentation Abstracts

2:00pm-3:00pm

Animal Biology

Why Do Individuals Groom? Functionality of Behaviour And Its Effect On Kangaroo Rat Conservation

Presenter: Mills, Katie

Faculty Sponsor: Liv Baker

Conservation of endangered species, including the Stephens' Kangaroo rat (SKR), is an important concern due to habitat loss and human interference. Translocation is a key conservation strategy to combat species loss, yet translocation survival rates are very low; likely due to stressors involved (e.g. capture, handling, captivity). Grooming behaviours are displayed for many reasons one of which is stress, thus determining the functionality of grooming behaviours in SKR aid translocation efforts through improved monitoring of stress behaviours. This project attempts to understand the functionality of grooming behaviour in response to two social contexts; it is a continuation of research completed by Dr. Liv Baker, in which sixty SKR individuals from two source populations were translocated. All individuals were exposed to two treatments: 1) a predator stimulus (fox-urine coated rock) and 2) a conspecific stimulus (mirror). Each trial was ten minutes long consisting of 2 five minute periods;

the acclimation period where the individual was placed in the enclosure and the active period when the stimulus was revealed. Treatments were filmed and the footage then used to record frequency and duration of grooming behaviours exhibited by individuals. Preliminary results suggest that there is an increase in grooming behaviours that appear to be out of place in situations of high stress for the animal. This research is important to translocation efforts because it can help better observe and predict the functionality of grooming behaviours as indicators of stress, thus improving translocation survival rates.



Animal Biology

Arterial Chemoreception in *Tupinambis merianae*:
Evidence for Carotid Body Homology in Lizards

Presenter: Reichert, Michelle

Faculty Sponsor: William Milsom

Populations of oxygen sensing cells (called chemoreceptor cells) that sit in or on arteries are important in detecting changes in blood gas composition. The mammalian carotid body is one such population of chemoreceptor cells. While populations of chemoreceptor cells homologous to the carotid body have been found in most vertebrate taxa, it is currently undescribed in Class Reptilia. Observational studies provide indirect evidence for the existence of a chemoreceptor population at the first major bifurcation of the common carotid artery in lizards (Adams 1953), but a chemoreceptive role for this area has not yet been demonstrated. We explored this possibility by measuring cardiorespiratory variables in response to arterial injections of sodium cyanide (NaCN; a chemical that mimics the effects of low oxygen) into the carotid artery of tegu lizards (*Tupinambis merianae*). These injections elicited increases in heart rate and respiratory rate, but not mean arterial blood pressure. These responses were eliminated

by vagal denervation. Similar responses were elicited by injections of the neurotransmitters acetylcholine (ACh) and serotonin (5-HT) but not norepinephrine. Heart rate and respiratory rate increases in response to NaCN could be blocked or reduced by either the antagonist to ACh (atropine) and/or 5-HT (methysergide). Finally, using immunohistochemistry we demonstrated the presence of mammalian-like cells containing ACh and 5-HT in the vessel walls of the carotid bifurcation. These results provide evidence for the existence of carotid artery chemoreceptors in lizards with similar properties to known carotid body homologs, adding to the picture of chemoreceptor evolution in vertebrates.



Animal Biology

Bar-headed geese and metabolic efficiency in hypoxic flight

Presenter: York, Julia

Faculty Sponsor: Bill Milsom

The bar-headed goose (*Anser indicus*) is one of only two bird species that undergo a biannual migration over the Himalayan mountains, regularly sustaining aerobic flight above 7,000 meters in altitude, where the available oxygen is 30-50% of that at sea level. Investigating the physiology of these birds can help us understand how animals can cope with exposure to hypoxia (low oxygen). The body of work done on these extreme altitude fliers has revealed adaptations to hypoxia ranging from the behavioral and anatomical to the physiological and molecular, but has in majority been done on resting or running birds, with only one study collecting measurements on flying geese, and then only at normal oxygen levels (Scott and Milsom, 2007; Ward et al., 2002). The goal of our study was to collect metabolic rate data in flight from imprinted geese trained to fly in a wind tunnel in three levels of oxygen (21%, 10.5%, and 7%). We found no significant relationship between heart rate and metabolic rate, but that the geese actually dropped their

metabolic rate as the amount of available oxygen was lowered. We found no correlation between metabolic rate and heart rate. Indeed for any given metabolic rate, we found a large range in heart rates. We conclude that metabolic rate cannot be inferred from measures of heart rate (as did Ward, et al., 2002) and that the bar-heads increase their metabolic efficiency for flights in hypoxia as compared to flights in normal oxygen levels.



Animal Welfare

Public Openness in Laboratory Research: A Survey Study

Presenter: Kwok, Eugenia

Faculty Sponsor: Elisabeth Ormandy

With increasing societal concern for animal welfare, public support for animal experimentation is transforming. It is therefore important to gain insight on aspects that are changing public attitudes. The objective of this project was to identify factors that affected public acceptance on animals used in certain types of research. Participants (n=300) were recruited through Amazon Mechanical Turk and provided an online survey through the LabViews program. Participants were randomly split into ten different groups, with 30 participants per group. Five different research scenarios were presented. One particular scenario asked whether participants were willing to support the use of pregnant mice to test effects of smoking during pregnancy. They were then asked to provide a reason for their choice or select a choice and reason left by a previous participant. The three most popular comments from each group of each scenario were analyzed. Preliminary data showed that only one third of 300 participants voted yes. In the top three comments across the 10

participant groups (total = 30 comments), many (n=20 comments) believed that this research was non-beneficial. Commentators reasoned that science has adequate pre-existing information regarding the effects of smoking, and that smoking is already known to be detrimental to human health. Other factors affecting participant choices included weighing benefits to humans versus cost to animals, and the overall ethicality of this research. Through this survey, it was possible to identify factors influencing public acceptance of animal use in research and shed light on areas of improvement in animal policy.



Animal Welfare

Tank Colour Preference Testing with Coho Salmon in Closed Containment Aquaculture

Presenter: Robertson, Betsy

Faculty Sponsor: Leigh Gaffney

The Food and Agriculture Organization states that to maintain our per capita consumption of fish, an additional 23 million tonnes of fish need to be produced by 2030. However, while the most common form of aquaculture – open ocean aquaculture – is recognized as detrimental to the environment, there is minimal knowledge of how to maximize fish welfare in the environmentally-friendly form, closed-containment aquaculture. Tank colour is known to affect fish growth, survival, and aggression, a fact all but neglected in the scientific literature. Past research has shown fish aggression, which can have negative health effects, is reduced with black backgrounds. This study looks to use preference testing and behavioural analysis to determine the preferred tank colour of Coho Salmon and the colour that results in the fewest aggressive acts. In preference testing multiple conditions are provided and the choices that the animals make are recorded. We will have ten Coho Salmon in each tank and will perform a series of preference tests where

several combinations of two colours are offered in each tank in order to determine their preference between black, white, and grey. Their colour choice and number of bites, nips, and chases will be analysed on camera for ten minutes three times a day for three days in each series. The result is predicted to be a preference of black with the lowest aggression with black. This study has great potential to enlighten us about how to minimize fish aggression in tanks, thus improving fish welfare in closed-containment aquaculture.



Animal Welfare

Validation of data loggers for monitoring dairy goat lying behaviour

Presenter: Tan, Bee Li

Faculty Sponsor: Gosia Zobel

Lying behaviour is an important indicator of health status in farm animals. Behaviour monitoring becomes time consuming when herd size increases. Data loggers, devices that can measure the orientation of animals' legs and in turn indicate whether the animal is lying down or standing, can automate behaviour monitoring. Data loggers have been proven to be effective for early identification of health issues in cows, but their use is not yet validated in goats. The objective of this study was to determine the feasibility of data loggers to measure goat lying behaviours by comparing information in data loggers to video data. Four Alpine crossbred dairy goats were housed in a single pen (2.8 x 4.0 m²). HOBO data loggers were fitted to their left hind legs. Two cameras recorded three days of continuous video, which was then coded to establish lying time and lying bouts. In the logger data, two axis were used to establish lying time (x-axis) and lying bouts (z-axis). Video data was then compared to logger data. We obtained a strong positive relationship

($R^2 = 0.98216$) between logger and video data for lying time. One goat's logger had rotated during the study, confounding the z-axis data. After removing this goat, a strong positive relationship ($R^2 = 0.9793$) was established between video and logger data for lying bouts. This work indicates that data loggers are useful for automating lying behaviour monitoring, however caution needs to be taken to ensure proper application of data loggers.



Animal Welfare

Herd Size Impacts Dairy Goat Hoof Length and Claw Overgrowth

Presenter: Tse, Tiffany

Faculty Sponsor: Gosia Zobel

Goats require clean housing and routine hoof trimming to prevent hoof overgrowth. This hoof health issue can lead to abnormal behaviour, lameness, and disease. Farmers expanding their herds might focus more on milk production rather than hoof health. The objective of this project was to determine the impact of herd size on hoof overgrowth. Scores were taken on 7 Ontario commercial farms with 100–650 milking does. Mean number of animals sampled on each farm was 61 ± 27 . Hooves were scored in two ways: 1) front left and rear right hoof condition based on toe length and presence or absence of toe curling (4-point scale), and 2) claw overgrowth on rear right hoof based on sidewall growth and sole visibility (3-point scale). Individual doe scores were used to calculate an average hoof and claw score per farm. Regression models were made between herd size and each variable: hoof score and claw score. Mean hoof score was 2.2 ± 0.6 (range: 1.4 to 3.3). Mean claw score was 2.4 ± 0.7 (range: 1.2 to 2.9). Both hoof and claw

scores were impacted by farm size ($R^2 = 0.6$ and $R^2 = 0.9$, respectively). Mean hoof and claw scores increased with herd size; however, the largest farm had low hoof and claw score means, forming a quadratic relationship. Results show that poor hoof health is associated with increasing herd size, but large herd size does not necessarily predetermine hoof health issues. Farmers could help avoid hoof health issues by developing a routine hoof health management plan, particularly when increasing herd size.



Economics & Politics

The Political Plate: Exploring Food Insecurity in the West End

Presenter: Lao, Aaron

Faculty Sponsor: Tom Kemple

in the West End, to an incorrect perception of the West End as a high-end space without poverty.

While a lot of attention is paid to conditions in the Downtown Eastside, typically considered the site of poverty in Vancouver, much less is known about those living in poverty in the West End, which is framed as a high-end space. My research seeks to better understand the day-to-day lived experience of street-entrenched people facing food insecurity in Vancouver's West End. Food insecurity is the state of not having access to reliable, nutritious, healthy food. This knowledge is useful in determining what challenges food insecure individuals in the West End face, and what gaps exist in the services meant for them. My research employs ethnographic, participant-observation research methods, including conducting interviews, visiting food banks, and volunteering at community dinners. It is informed by existing literature on food access in BC (Whittington, 2012), and on institutional ethnography (Smith, 2005). My results reveal various barriers inhibiting food access for street-entrenched people, from health problems, to a lack of visible services



Economics & Politics

The Economics of Organic Produce

Presenter: Tan, Jenny

Faculty Sponsor: Patrick François

Scientific evidence suggests that organic produce offers significantly greater environmental benefits compared to conventional produce. However, the majority of produce bought is not organically grown. This project examines the relationships between the price of organic produce and the amount of consumers' knowledge of organic agriculture.

My model involves three elements in the decision-process of whether consumers purchase organic produce: 'happiness' from making sustainable purchases, acquisition of knowledge about organic agriculture, and social influence on knowledge acquisition of the individual. I posit that the greater a person's knowledge of the problems caused by conventionally grown produce and of the benefits of the organic alternative, the more willing that person will be to adopt the new lifestyle practice of purchasing organic produce.

A key element of my model is social influence on each individual's amount of knowledge of organic agriculture. I posit that if more people in one's

social circle purchase organic produce, one would have more knowledge about organic produce and its benefits. Therefore, the more people in the population know about organic agriculture, the more knowledge each individual person in the population will have of organic agriculture. The more knowledge a person has, the more willing a person will be to buy organic produce.

The goal of this project is to outline the circumstances needed for greater consumption of organic produce which can aid in marketing and creating food policy.



Economics & Politics

Electoral Politics of Local Governments in Developing Countries

Presenter: Wegschaider, Klaudia; Thomas, Jasmin & Fetisova, Alexandra

Faculty Sponsor: Anjali Bohlken

Decentralization means bringing politics closer to the people by having elected local governments with substantial responsibilities and resources, as opposed to concentrated power in centralized national governments. Scholars argue that decentralization facilitates development and makes democracies more responsive to the needs of locals. Nevertheless there is no comprehensive database on subnational governments available. This research provides data on the electoral status of each level of subnational government in 63 developing countries for each year between 1950 and 2010. The time-series approach allows the analysis of trends in reforms (when subnational governments become more democratic) and reversals (when subnational governments become more centralized). The information was gathered by reviewing the constitution and electoral laws of the sample countries, and by consulting scholarly sources to see which laws were actually implemented. The results have

shown that decentralization plans implemented after colonial independence often collapsed after a short time. Decentralization efforts were mostly revived in the 1980s and have been slowly rising since then, with the exception of a major slump in the 1990s. Unlike previously assumed, a great proportion of changes on the subnational level were not explained by national regime changes. The dataset has also shown that countries that were under the control of the same colonial powers have undergone similar decentralization and centralization cycles. In addition, this dataset will be used to further analyze the correlation between decentralization, democratization and development by doing quantitative analysis with other datasets using statistical software.



Economics & Politics

The Effects of Government Ownership on Investor Behaviour in China: An Analysis of Publicly Listed Companies

Presenter: Zhou, Lance

Faculty Sponsor: Kevin Song

State-ownership in the Chinese stock market has been extensively studied in the field of Economics, although conclusions about the state's effect on publicly listed companies have differed depending on the method of testing and the range of data. This study investigates how institutional and private investors on the Shanghai and Shenzhen Stock Exchanges evaluate companies when buying stocks. In particular, this study focuses on whether government ownership is perceived as a positive asset or a liability to a company's valuation. The procedure largely follows that of Bai et. al (2004), but with recent data from 2008-2011. A panel model is used to explain the effect of corporate governance variables (such as ownership concentration, identity of top shareholders) and financial performance variables (such as return on assets, revenue) on Tobin's Q, a ratio of Market Capitalization to Total Assets that is typically used as a measure of how appropriately valued a company is. The results show that

state-ownership continues to have a statistically significant and negative effect on firm valuation, while conventional financial indicators for firm value were statistically significant and had minimal effect on Tobin's Q. These findings suggest that the Communist Party of China should continue its reforms of state-owned enterprises and make more government-owned shares available to institutional and individual investors.



Education in Medicine

Mass Gathering Medicine Elective: Education in the Field

Presenter: Earle, Rosie & Guy, Andrew

Faculty Sponsor: Adam Lund

High patient volumes are common at mass participation sporting events, concerts and music festivals. As highlighted at the 2013 Boston Marathon bombing, unanticipated events can result in a mass casualty incident, requiring on-site emergency medicine (EM) and disaster response. The literature contains sparse reference to learner participation in mass gathering medicine (MGM) or disaster medicine (DM). Limited resources and unpredictable conditions at mass gatherings help prepare learners from health professions for challenges faced in emergency departments, and during mass casualty incidents and/or disasters. A longitudinal, shift-based elective for EM residents and medical students has run at UBC since 2008. Learners complete event shifts under attending physician supervision, with each shift 'equivalent' to an EM shift. Set in exciting, dynamic inter-professional environments like the Ironman triathlon, learners are exposed to the management of unique, acute presentations in the pre-hospital setting, and are involved in solving

logistical issues in the field. From 2008 to 2013, 61 residents and 126 medical students participated in 77 MGM events. Five years of participant survey data that evaluated elective efficacy returned overwhelmingly positive reviews, reporting that the elective provides unique learning opportunities that enhance CANMEDs competencies and disaster management skills. The MGM elective provides a platform for training, serving as an introduction to MGM, leadership, hands-on field experience, inter-professional collaboration, emergency management and disaster planning. These important skill-sets benefit both learners and the communities they serve. Furthermore, MGM's inter-disciplinary nature would allow natural incorporation into other health care training programs such as nursing, physiotherapy, and paramedicine.



Education in Medicine

Student Developed Online Modules for Global Health Pre-Departure Training

Presenter: Fairley, Jillian & Hendren, Elizabeth

Faculty Sponsor: Videsh Kapoor

Background: Pre-departure training (PDT) is important to support the growing number of Canadian medical students participating in global health exchanges. In the 2013-2014 academic year, PDT will become an accreditation standard for Canadian medical schools. Since 2011, UBC's Global Health Initiative has offered an annual one-day PDT workshop, however students in clinical rotations or at distributed learning sites are often unable to attend. Online training modules would offer greater flexibility, improving student compliance.

Methods: Two medical students created four online modules (health & safety, ethics, cultural competency, post-return debrief) based on Canadian PDT guidelines. During the 2013 PDT workshop, attendees piloted the "Personal Health & Safety" online module and were asked to complete a survey assessing content and delivery.

Results: The response rate was 73% (33/45 attendees). 88% of respondents felt the modules

helped prepare them for travel abroad. More than 90% of respondents gave positive feedback regarding knowledge acquisition, quality/quantity of information provided, and ease of navigation. Respondents indicated that the module: enhanced their knowledge base (94%), was easily navigable (94%) and provided the right amount (91%) and complexity (100%) of information. 18% of students indicated that parts of the module were confusing - identifying an area for further improvement.

Conclusion: Student-developed online modules are a well-received format for PDT, offering greater flexibility and accessibility than in-person training. Modules facilitate efficient tracking of student completion and can be standardized to meet accreditation requirements. Further evaluation comparing knowledge acquisition and retention of online vs 'live' workshops is warranted.



Education in Medicine

Development of an ultrasound curriculum for paramedics: a systematic review of the literature

Presenter: Harris McCallum, Jessica

Faculty Sponsor: Hussein Kanji

Objective: Ultrasound is being applied in the pre-hospital setting by paramedics and physicians, particularly for trauma. This systematic review summarizes ultrasound curricula designed for paramedics specifically, highlights the challenges of ultrasound curriculum design and implementation in this setting, and makes recommendations for evidence-based ultrasound curriculum development for this unique population.

Methods: Electronic searches of MEDLINE, Embase, CINAHL, and the Cochrane Center Register of Controlled Trials were conducted and reference lists of relevant articles were searched using PRISMA guidelines. Primary literature describing acute care ultrasound curricula for paramedics were included. Literature describing application of telemedicine and remote technology were excluded. Two reviewers independently screened abstracts, assessed for risk of bias, and extracted outcomes. Due to significant heterogeneity, a meta-analysis could not be

performed.

Results: 12 studies were included describing curricula for abdominal, pleural, cardiac, and fracture detection ultrasound. There were 187 paramedics trained to use various ultrasound modalities using a variety of curricula. Duration of the curricula varied widely depending on the ultrasound modality being taught, with effective curricula teaching abdominal ultrasound in a 6 – 8 hours, pleural ultrasound in 25-minutes, and fracture detection in 2-minutes. There has not been an effective cardiac ultrasound curriculum for paramedics described at this time. Abdominal, pleural, and fracture detection ultrasound is currently being applied in the field by paramedics, although there is little evidence of outcomes resulting from paramedic-performed ultrasound.

Conclusions: Curricula designed for paramedics in abdominal, pleural, and fracture detection ultrasound is feasible and time-effective, however current cardiac ultrasound curricula have been too short to effectively impart proficiency. More research describing impact of paramedic-performed ultrasound on management is needed.



Gender & Indigenous Studies

The Roles of Okanagan Women: Shaping Syilx Culture

Presenter: Alexis, Sarah

Faculty Sponsor: Margo Tamez

There are many Indigenous Syilx (Okanagan) scholars who are setting the baseline for Syilx academic work including Jeannette Armstrong, Marlowe Sam, and Bill Cohen. The importance of my research is to bring forth awareness of Syilx culture using traditional knowledge and community knowledge. This research project specifically focuses on Syilx women in contrast to previous Syilx research. Much of the knowledge of Syilx people and culture is derived from Nsyilxcen - the Syilx language - and the Captikwls, the oral narratives. The aim of this research project was to understand how Syilx women shape Syilx culture. This research holds the fundamental values of decolonizing Indigenous academic research utilizing an Indigenous Syilx based approach through various research methodologies. These research methodologies were, firstly, a pre-engagement, which included reviewing the general history of Syilx people through academic and community literature. This involved visiting Indigenous place-based sites and knowledge

centers in the Okanagan traditional territory, which extends to Washington State. The second methodology was directly engaging in traditional Syilx summer activities. This included learning and practising women's summer roles such as root digging, berry picking, basket making, and hide tanning, which situates Syilx women as central roles of teaching. The third methodology included the direct voice of community members across the Syilx traditional territory through a written questionnaire. The gathered knowledge from this research was that Syilx women play the essential roles as knowledge keepers, stewards of the land, teachers, and warriors through the ecological, social, political, and cultural regions of Syilx life.



Gender & Indigenous Studies

The Identification of Factors Critical to the Success of Aboriginal Athletes Representing Team Canada in Reaching the Olympic Podium

Presenter: Baker, Erica

Faculty Sponsor: Sheryl Lightfoot

This research project is concerned with the supports needed in assisting Aboriginal athletes in reaching the Olympic podium, specific to the needs of snowboard athletes in particular. Results from this project are being used to build better strategic partnerships between the First Nations Snowboard Team and Canada Snowboard, the national organizing body for competitive snowboarding in Canada, to better support Aboriginal athletes on their pathway to international competition. Further, this research project has developed an Aboriginal snowboard athlete support model and information valuable to division managers in continuing in leading their teams to the best of their ability. The research phase of the project was completed during the 2013/2014 winter season and information was gathered through qualitative interviews, field research on several mountains, and through a survey. Through identifying forms of support, rather than focusing solely on barriers to

participation in sport, this research project rejects a form of deficit-thinking that is common to research on Aboriginal peoples and instead has produced forward-thinking and practical research results that directly benefit the communities and research participants involved. Using a community-based and decolonizing research methodology, this research project has been completed in partnership with and for the First Nations Snowboard Team and Skwxwú7mesh Úxwumixw Squamish Nation. Rooted in this methodology, the research question was brought forward from the community to the researcher and the research project was approved by the Skwxwú7mesh Úxwumixw Squamish Nation's ethics board.



Gender & Indigenous Studies

Gender Representation in Science Textbooks: A historical comparison

Presenter: Villar, Paz

Faculty Sponsor: Neil Guppy

Schooling is central to our socialization process. In my research, I focus on the socializing power of educational materials. More specifically, I look at science textbooks for grades 7, 8, 9, 10 and 11. I collected and coded data from authorized books by the Ministry of Education of British Columbia for the 1950s, 1970s, 1990s and 2000s. I conduct a content analysis of gender representation in photographs and drawings. The impact of visual texts can be greater of that of words. Yaghoob Foroutan conducted a similar analysis of language textbooks in Iran, he explains, that images are powerful in the transmission of symbolic meaning (intended and unintended) because “readers assume they are objective slices of reality, giving the photographs authority and allure” (2012).

Coding of the images includes quantitative and qualitative analysis. First, I designed a coding scheme to gather quantitative data like number of males and females depicted in positions of authority, “doing science”, and being active. Second, I do a qualitative analysis of significant

images that contain more information about gender representation than numbers can reflect. For example, one of the books teaches the systems of the human body using drawings. Half of these drawn figures are male and half are female. The significance of these images is, however, not expressed by numbers but by a critical examination of which systems are depicted through the male and the female body.

I choose to focus on science education because despite the advancement of women in education, women still tend to disproportionately pursue careers in the humanities and other professions considered “female oriented”. Science education has an important role in encouraging or deterring girls from pursuing careers in the sciences. I am interested to see if there is evidence, via representation, of this process in science textbooks. A question for the audience to consider during this presentation is, should textbooks depict an equal proportion of women and men in science or should they illustrate the true underrepresentation of women in science?



Literature & Writing

Linguistic Themes in Argumentation Rhetoric: A
Corpus Analysis of Canadian Literary Studies

Presenter: Budd, Alyson

Faculty Sponsor: Katja Thieme

Exploring a corpus of 20 articles, I sought to determine the nature of the relationships of linguistic elements employed in argumentation rhetoric in the genre of Canadian literary analysis. What makes Can lit so interesting, and what sets it apart from English lit, is that it intersects with First Nations, Aboriginal and Indigenous issues. The articles that were about more controversial pieces of literature-- that is, literature involving First Nations issues, tended to use more argumentative language. Looking at the quantitative evidence of these language features, a positive linear relationship was found in terms of the semantic rating of argumentativeness with modal verbs and reporting clause verbs and adjectives. My methods involved ranking and scaling these features according to a semantic scheme. My approach was informed by discourse analysis methodologies, which include analyzing parts of speech, rhetoric and lexicon. It was also informed by practices in linguistics and psychology research, like qualitative and quantitative coding of data

according to a scheme that is developed to assess a corpus, or body of information-- in this case, a set of articles in Canadian literary studies. These findings demonstrate the fluidity of the genre, and that topics charged with controversy tend to maintain that charge transcending through levels of analysis, underscoring that Canadian literary analysis engages with the readership when it comes to these important topics. In contrast, many other academic genres use very modest language features, like hedges and modest modals, and these norms are contrasted with those in Canadian literary analysis to demonstrate the importance of understanding the challenges of interdisciplinarity. An awareness of differing practices between disciplines ensures one is adept at understanding a range of academic topics that may intersect with and influence each other. The implications of this study suggest that Canadian lit analysis is more openly engaged in social justice, relying on quality argumentation to present information, unlike other genres that use statistics or empirical evidence as sole rhetorical implements.



Literature & Writing

Bridging the Gap: An analysis of writings from the classroom to the real world

Presenter: Newton, Josh

Faculty Sponsor: Jaclyn Rea

It has been argued that in order to belong to a discipline's professional community, one must demonstrate belonging by communicating in shared ways (Madigan, Johnson & Linton, 1995). Yet undergraduates often feel as though they don't belong, that the research papers they produce in classrooms leave much to be desired when compared to professional academic writing. Students seeking to improve their writing often turn to writing textbooks; however, research indicates that textbook information and advice can be misleading or have little applicability to professional writing contexts and practices (Paxton, 2005; Myers, 1992; Wegner, 2011). Noting this disparity, nevertheless, does not address students' perceptions about their disciplinary positions or the ways their writing might or might not demonstrate their participation in disciplinary communities. To address the ways student writing compares to textbook advice about how to join the community as well as writing from the professional community, I analyzed psychology

writing textbooks and compared the advice in these textbooks to the writings produced by psychology students (in undergraduate research papers) and psychology scholars (in peer reviewed experimental psychology articles). Specifically, I used corpus-supported methods to compare the use of citation and definition, both of which are discussed in psychology writing textbooks. I also compared students' and professionals' use of 'research-activity' verbs. I found that the differences between student and professional writing, in Psychology, were not as profound as many students believe, but that the differences that do exist point to students' status – both actual and perceived – within the disciplinary community.



Literature & Writing

Trauma, Memory, the Regulation of Female Behavior and Popular Victorian Novels

Presenter: Singh, Simran

Faculty Sponsor: Katharine Patterson

Female characters in Victorian era literature often reflect the proper role of women in society during that time period. Therefore, these characters' responses to particular traumatic events are likely to be a reflection of what was deemed as socially acceptable in relation to how women should behave. In their study conducted on trauma and memory, Paul Appelbaum, Mark Elin and Lisa Uyhehara have concluded that traumatic events lead to "indelible memory trances [...] in which the trauma [leaves an impression and repeatedly intrudes into [the traumatized person's] consciousness" 226. Furthermore, Jill Matus' literary analysis on Victorian literature in relation to trauma reveals that, theories of shock formed a crucial aspect of the way Victorians attempted to think through the relations between mind and body" (19). Matus specifically analyzes the history of trauma theory in relation to how trauma impacted Victorian thinking of consciousness and emotion. Both modern day trauma theory and Matus' analysis on trauma in Victorian

literature show how trauma is not a one time incident that simply occurs and ends. Rather the trauma continues to haunt an individual through the process of memory. However, little research exists that examines the representation of trauma on female characters and their self-determination in Victorian literature. Using three popular mid-century novels written by William Thackeray, Anthony Trollope and Charlotte Yonge, I will examine how these authors utilize trauma and memory in their novels and how it impacts the actions of their female characters. Using these examples I will argue that the impact of trauma on these female characters is a tool used by the writers control their gender performance and contain their female autonomy.



Literature & Writing

Being “Discriminating” About Oppression

Presenter: Wang, Edward

Faculty Sponsor: Tim Christie

Young and Frye’s work tries to define those who are oppressed as suffering in certain special ways. There are 5 key criteria, specifically: violence, exploitation, marginalization, and powerlessness.

They claim that when groups of people suffer in all five respects, they should be viewed as opposed according to our common-sense meaning of the word. Appropriately, this theory is titled “Five Faces of Oppression”

My contention is two-fold. Like you, I share a certain degree of caution with respect to their definition of what a “group” is, and this worry is only confounded by the importance that the concept of “groups” play in their theories. Their definition of a group is spread across several different chapters, but generally, groups are aggregates of people whose membership in that group affects them greatly:

“subject’s particular sense of history, sense of identity, affinity, and separateness, even the person’s mode of reasoning, evaluating and expressing feeling are constituted at least partly

by her or his group affinities

I argue that this answer is insufficient. I talk about how criminals should be viewed as a group if we accept their definition.

And secondly, I move on to their 5 criteria for oppression. One by one, I show that criminals face those types of sufferings. And importantly, they face suffer because they are member of identity as convicted felony – i.e. their group affiliation.

However, this is obviously mistaken. Young and Frye are arguing about our common-sense conception of oppression. Most of us would not accept that criminals are oppressed as a group.

This is why Young and Frye’s definition is too expansive and overly broad. We need to limit it in certain ways, which I will discuss in the latter part of my essay. As such, I call for a more “discriminating” – that is, a pickier, narrower – definition of oppression.



Medicine in Life

Impact of Seizures on Brain Development in Infants with Congenital Heart Disease

Presenter: Kwan, Vivian

Faculty Sponsor: Vann Chau

Congenital heart disease (CHD) is the most common type of birth defect. After open-heart surgery, nearly 15% of newborns with CHD will experience seizures — the most common neurological complication. Past research in animal models has shown that seizures can potentiate brain injuries. However, it is unknown whether seizures affect brain development in human newborns. Given the potential side effects of antiepileptic drugs, it is unclear how aggressive clinicians should be with seizure treatment.

The objective of this study was to determine whether seizures are associated with altered brain development in term newborns with CHD. Between May 2006 and February 2013, 45 newborns with CHD were recruited at BC Children's Hospital. Participants underwent magnetic resonance imaging (MRI) on median day of life 4. This included standard MRI (to detect stroke and white matter injury), diffusion tensor imaging (to assess brain microstructural development) and MR spectroscopy (to assess

brain metabolic development). During and immediately after surgery, amplitude-integrated EEG (a non-invasive tool used to record brain activity) was used to detect seizures. Clinical data were recorded from chart reviews.

Our analysis revealed that newborns with seizures have significantly lower N-acetylaspartate/choline ratios ($P < 0.001$). This is indicative of disturbances in metabolic integrity. In addition, newborns with seizures more frequently had lower fractional anisotropy ($P = 0.077$), indicative of abnormal brain microstructural development. Importantly, these findings suggest that prevention and improved management of seizures may improve brain maturation in infants with CHD. Whether these changes are associated with adverse neurodevelopment will be assessed as the children grow.



Medicine in Life

Beetroot juice does not beat hypoxia

Presenter: Nugen, Sean

Faculty Sponsor: Jim Rupert

Many athletes compete at altitude such as mountain climbers, skiers, and cyclists. At altitude there is a reduction in the partial pressure of oxygen, which results in decreased aerobic exercise performance (Martin et al., 2011). The decrement in exercise performance is also greater in trained versus untrained people (Fulco et al., 1998). Thus there is a need for something that can help attenuate the aerobic exercise performance decrements that are associated with altitude. Beetroot juice (BR) is a supplement that has been demonstrated to increase aerobic exercise performance at sea level (Lansley et al., 2011) and at altitude (Muggeridge et al., 2013), but much research in the field has lacked applicability and has consisted of inconsistent supplement dosing protocols. Previous research has also not looked at the relationship between fitness and the effects of the supplement. Thus the aims of this study were to determine: 1. The effect of BR on cycling performance at a simulated altitude of 3000 m, and 2. The influence of fitness on the effect of BR on cycling performance at a simulated altitude

of 3000 m. Cycling performance was measured via maximal power output and economy using a stationary cycle ergometer, altitude was simulated using an altitude chamber, and a 70 mL acute dose of BR was used for the supplement. The main findings of this research were: 1. BR did not have an effect on cycling performance, and 2. Fitness did not have an influence on the effect of BR on cycling performance.



Medicine in Life

Consequences of Stent Placement to Artery Wall Structure

Presenter: Sasitharan, Saaranga

Faculty Sponsor: Jay Kizhakkedathu

Stents, used as a treatment for patients suffering from narrowed arteries due to plaque buildup, have time limited effectiveness. Eventually, re-stenosis due to vasculitis occurs. To attempt to slow this process, stents coated with hydrophilic poly(N,N-dimethyl acrylamide) (PDMA), an anti-athrogenic material, were placed in pig iliac arteries for comparison to the response to uncoated stents. The overall hypothesis was that athrogenic responses to the stents should be diminished when the stents had been coated and, as compared to the uncoated stents, the effects of the coated stent to the tissue wall would be non-significant.

The 3 mm diameter stents were either uncoated or coated with hydrophilic brushes (PDMA) and then placed into the iliac arteries of three porcines. At two weeks the animals were sacrificed, the portions of artery containing the stents were removed and histological techniques were used for quantitative and qualitative analysis. By examining the artery tissue sections using light microscopy

we were able to qualitatively observe the direct effects of the stents to the artery wall structure. Further, using ImagePro, a computer software program, quantitative analysis was performed on these artery tissue sections to determine if the effects of the coated stents and uncoated stents to the artery wall structure were significantly different. As structure and function are often interrelated understanding the changes to the artery wall structure is vital to determining the functionality of the stented arteries.

It is clear that the stent is out of the blood flow by two weeks following placement. Although the stent compresses the media, a new volume of thickened intima has been added. Preliminary morphometric assessment of the artery wall showed that intimal thickening was not increased for coated stents. Our observations suggest that at two weeks, this action of sinking into the artery wall does not seem to induce an acute inflammatory response, as there seems to be few neutrophils present. Even though the stent is effectively removed from circulation, coating it with our anti-athrogenic polymer may slow or prevent the onset of chronic inflammation and re-stenosis.



Particles, Protons & Physics

Application of PT Symmetric Quantum Theory to
Maxwell Electrodynamics on an Euclidean 4-Torus

Presenter: Martin, Kevin

Faculty Sponsor: Ariel Zhitnitsky

Previous results from calculating the Casimir energy on a Euclidean 4-Torus have produced non typical contributions resulting from the topology of it's $U(1)$ gauge field. This result, known by the Topological Casimir Effect, has an imaginary component to it's energy that is extremely sensitive to external magnetic flux. Behaving similarly to a theta-parameter (similar to the theta vacuum from Quantum Chromodynamics), this term denoted theta-effective, could be the result of a complex Hamiltonian. The accepted Quantum Mechanical theory does not allow for such Non-Hermitian Hamiltonians, and limiting the ability of the current theory to describe this system. Recent research involving PT (Parity-Time) symmetric Hamiltonians may provide the needed tools to resolve this seemingly unphysical result.



Particles, Protons & Physics

Studying the behaviour of Non-Newtonian fluid displacement flow.

Presenter: Shamsuddin, Rehmani & Dong, Steven

Faculty Sponsor: Ian Frigaard

Understanding the flow characteristics of non-Newtonian fluids, such as drilling mud and cement slurry, has many real-world application especially in oil well completion projects. These flow characteristics cannot be accurately predicated from existing mathematical models and simulations since such fluids are affected by a wide array of variable like viscosity—how easily a fluid flows—, the angle at which the fluid flows and whether the fluid is being displaced by a denser or lighter fluid. To overcome this challenge, a pragmatic solution is an experimental approach. The researchers at UBC Complex fluid lab, including my partner and I, have set up an apparatus that mimics the flow of non-Newtonian fluids and with the help of various data analysis software and imaging techniques have been able to visualize and analyse the behaviours of these fluids. Two straight pipes separated by a gate valve are secured in fish tanks. A moveable jack is connected to these fish tanks and is used to simulate the flow behaviours at angle from 0 to

90 degrees in vertical plane. In addition, pressure tanks are used to increase the flow rate and vary the mean velocity of fluid flow. The purpose of these experimental setup is to introduce two fluid, a displacing—normally water— and a displaced fluid—any non-Newtonian fluid and gather data on how they mix and behave with time. This data can then be interpreted and applied towards the oil well completion projects to predict how, for example, drilling mud and cement slurry behave when flowing together.



Preserving Ecosystems & the Environment

Use of Camera Traps in Borneo to Study the Effects of the Palm Oil Industry on the Distribution and Diversity of Species

Presenter: Boisvert-Plante, Virginie

Faculty Sponsor: Jedediah Brodie

The increasing demand for palm oil results in more forest clear-cutting, causing the loss of habitat and, consequently, the loss of biodiversity in tropical forests. Solutions must be found to minimize the negative impacts caused by the transformation of forests into palm oil plantations. In Borneo, the resulting habitat fragmentation is problematic and ecologists want to know if forest patches spread across the plantations are worth conserving. This study aimed to analyze pictures to determine the species abundance and diversity at each camera site. To do so, multiple camera traps were installed across segments of untouched tropical forest, palm oil plantation and forest fragments. The cameras were triggered by motion and took three pictures per second each time they were triggered. The animals on the pictures from each camera, at each site, were then classified into species. My job consisted of reviewing the classification of pictures and making sure that each picture was in the right species file.

Surprisingly, there was no significant difference between the number of species in the forest and in the plantation. However, most species were found at the border of the plantation and the forest, suggesting that they might use the forest as their main habitat and the plantation as a foraging site. The next step is to check if the animals use the remaining forest fragment to move from one forest to another. If so, it would be suggested to maintain these patches in order to facilitate the movement of species and maintain biodiversity.



Preserving Ecosystems & the Environment

Carbon Sequestration Potential of Turfgrass

Presenter: Wu, Yihan

Faculty Sponsor: Santokh Singh

With the rise of suburban neighbourhoods, large carbon sinks such as forests are cut down to make room for residential housing and roads. The carbon sequestration potential of forests and oceans has been well studied. Many have suggested that urban landscapes residential lawns, golf courses and parks could offset the loss by sequestering carbon. Research into urban landscapes have not been as extensive as research into forests. The majority of such areas is composed of various species of turfgrass, some of which can be quick growing and have extensive root systems that may sequester more carbon. Golf courses, roadside grass and empty fields may be good carbon sequesters. I measured the carbon sequestration potential of different species and mixes of turfgrass, specifically Kentucky bluegrass, ryegrass and red fescue, which are used at UBC. Carbon sequestration potential of grass species was measured as net photosynthesis rate using the CI Handheld photosynthesis system. Both the perennial ryegrass and the creeping red fescue showed higher rates of photosynthesis than the

Kentucky bluegrass. Photosynthesis rates were higher overall in grasses that were cut rather than left to grow unattended. Net photosynthesis rate drops immediately after trimming but increases to a higher level by 24 hours for all grasses in the experiment. It appears that these grass species can contribute to carbon sequestration. Future research would focus on longer term experiments.



Preserving Ecosystems & the Environment

Where the Wild Things Are: Looking for
Uncultured Arbuscular Mycorrhizal Fungi

Presenter: Zaitsoff, Dylan

Faculty Sponsor: Miranda Hart

Arbuscular mycorrhizal fungi (AMF) are fungi that form mutualistic symbiotic relationships with approximately 80% of vascular plants. These fungi provide many benefits to their host plants including enhanced nutrient acquisition, resistance to pathogens, stress tolerance to conditions such as drought or heavy metal contamination. Because of these traits, they are important determinants of above ground community structure. Currently, there are 244 described species of AMF, however these cultured isolates likely only represent easily cultured fungi possessing a single life-history strategy, specifically those with “weedy” growth habits. This observation suggests that the true diversity of AMF is actually much higher than currently thought and that our knowledge of these fungi is biased towards those from disturbed habitats. Using the MaarjAM public database (an AMF-specific ribosomal-DNA sequence database), we performed a meta-analysis on previously published studies describing AM fungal communities from various habitats and

host plants. We found a greater proportion of uncultured AMF taxa in undisturbed habitats. Specifically, undisturbed forests and grasslands/savannahs contained significantly more uncultured taxa than human-impacted habitats. In addition, wild host plants were found to associate with more uncultured taxa than cultivar plants. These results confirm that the majority of AMF in natural communities have not yet been cultured and suggest that our understanding of AMF-plant symbioses is severely biased towards the associations of AMF with cultivar host plants and in disturbed habitats. Thus, our ability to understand and conserve natural plant communities may be limited by our lack of knowledge of AMF that live in these systems.



Space & Astronomy

Carbon Sequestration Potential of TurfgrassLife on Mars? Myth or Reality?

Presenter: Krishnan, Sarangadev

Faculty Sponsor: Mark Jellinek

Although an immense amount of research has gone into identifying if there is or has been life on Mars, there hasn't been much in terms of analyzing the actual number of individuals that could occupy the Red Planet if conditions permitted as the study within this particular field is somewhat limited to only the conditions that would help support life. By going one step further and simulating an Earth-like environment in terms of the three most important variables: carbon emissions, temperature change and population growth rate, I wanted to investigate how many people Mars could support. By using the quantitative relationship between carbon emissions, temperature change and population growth rate found on Earth, one can determine the number of individuals that would be able to live on the Red Planet. Using the relationships between carbon emissions and temperature change I derived an equation of line. Then using the Martian surface temperatures obtained from several NASA rovers and the relationship derived

earlier - I plotted another the potential carbon emissions line for Mars, which was plotted on a secondary axis with potential Martian population. Through this methodology, the result was that Mars could support 0.07 billion people - the population size of Iran.



Space & Astronomy

Using electric charge to fight biofilms - in space

Presenter: Mortazavi, Armin

Faculty Sponsor: Erin Gaynor

Bacteria change their virulence and growth rates in space. On the International Space Station (ISS), *Pseudomonas aeruginosa* - a very common pathogenic bacterium - has been recently characterized with a strange column-and-canopy biofilm structure not seen on Earth. Biofilms are a slime made by bacteria that live on solid surfaces. They can cause many problems ranging from corrosion damage to urinary tract infections. These special space biofilms described above have increased biomass and thickness compared to those on Earth. This change in architecture may contribute to their resilience, promoting corrosion damage in long-term space missions and posing a threat to those on board the ISS. Astronauts have no access to health care facilities, and have limited medications on their missions. Therefore, understanding a way to circumvent these biofilms is crucial. So what might be a solution?

I propose to determine if static electric charge can alter the shape of a *Pseudomonas aeruginosa* biofilm and make it more susceptible to antimicrobials. A Van de Graaff generator can be

used to induce a charge on the metal surface over which the bacterium will grow. Then, antibiotic sensitivity tests and microscopy can be performed to see if antibiotic killing was enhanced with the static charge.



Space & Astronomy

Cataloguing Compact Sources through the
SCUBA2 'All-Sky' Survey

Presenter: Nettke, Will

Faculty Sponsor: Douglas Scott

Large scale surveys are a driving force of astronomical research. In particular, catalogues of these surveys are important to astronomers because it tells them where to look next in order to plan future observations, so that they may achieve their research goals. Using data obtained from the SCUBA 2 'All-Sky' Survey (SASSy) I have been working to uncover and catalogue compact sources of interstellar dust and gas, characteristic of early star formation. The Sub-millimetre Common User Bolometer Array 2 (SCUBA 2) capitalizes on studying the galaxy in the millimetre and submillimetre region of the electromagnetic spectrum where these compact sources shine bright. By utilizing various noise reduction techniques, we are able to improve our data tremendously to help quantify our results and the catalogue we develop. We hope aid and promote further research in the field of stellar astrophysics through the publication of this catalogue.



Technical Medicine

Cytochrome C Alters Central Nervous System Inflammation

Presenter: Gouveia, Ayden

Faculty Sponsor: Andis Klegeris

During traumatic head injury and chronic central nervous system inflammation molecules known as damage associated molecular patterns (DAMPs) are released from dying cells. DAMPs may signal immune cells of the central nervous system (CNS) to become activated and produce inflammatory or neurotoxic chemicals. Long term this may cause chronic neuroinflammation, a common sign of neurodegenerative diseases such as Alzheimer's. The mitochondrial protein cytochrome c has recently been shown to increase in concentration in the CNS during traumatic injury and thus may represent a currently uncharacterized DAMP. This project studied the effect of extracellular cytochrome c on the inflammatory response of differentiated THP-1 cells, a model of one type of non-neuronal cells. This was studied by applying cytochrome c to differentiated THP-1 cells, with or without other inflammatory molecules, for 24 hours. Following the 24 hour incubation the supernatants containing neurotoxic secretions were transferred onto SH-SY5Y cells, a neuronal

model. After 72 hours of incubation the viability of the SH-SY5Y were determined using two independent assays. One assay detects the metabolism of a dye while the other measures release of an intracellular protein from dying cells. Cytochrome c was found to increase the neurotoxic secretions of differentiated THP-1 both independently and in the presence of the inflammatory interleukin-1. These results may indicate that cytochrome c may modulate the inflammatory response of non-neuronal cells in the central nervous system during traumatic head injury and chronic neuroinflammation.



Technical Medicine

Frosting the Donut: Immunocamouflage with mPEG on RhD Mismatched RBCs using Monocyte Monolayer Assay

Presenter: Kwok, Eunice

Faculty Sponsor: Mark D. Scott

Erythrocytes, or red blood cells (RBCs), are vital for transfusions for acute blood loss and chronic blood diseases. In general, blood typing often involves only ABO and RhD antigens. However, patients who chronically receive transfusion products may develop alloantibodies to minor blood group antigens and experience transfusion reactions. Hydrophilic mPEG molecules are adhered to RBC cell surfaces to protect them from attack, a term coined “immunocamouflage”. This experiment uses antibodies and monocytes (a type of white blood cell) to model a transfusion reaction.



Technical Medicine

Development of Force Control Medical Forceps using Nylon Actuators

Presenter: Pandit, Milind

Faculty Sponsor: John Madden

Minimally Invasive Surgeries (MIS) require lightweight grasping tools (forceps) that respond rapidly. Currently surgeons rely on visual information; however, tactile feedback that indicates and controls the level of applied force is more important. Precision medical forceps that can provide real time information on the force applied on tissue are needed. These forceps would be unique, since unlike current designs it does not require Shape Memory Alloys (alloy that returns to its pre-deformed shape when heated) for actuation (control a mechanism/system). This study looks into the possibility of using Nylon as an actuator to measure the applied force when the forceps grasp an object. A novel design for the forceps is used and the parts are constructed only for testing purposes. The design incorporates the antagonistic type of actuation (only contraction is used to both open and close the forceps). This design allows us to place the sensors on the back of the forceps instead of attaching them to the jaws; increasing the speed, force and accessibility

while decreasing its size. To compare the efficiency of the two types of actuators developed, they are tested with different weights. The actuators are connected to load cells that produce voltage when force is applied - to monitor the real time force applied by the forceps. This enhanced design will be of significant interest to all those developing MIS systems and will be of great help to the medical community.

