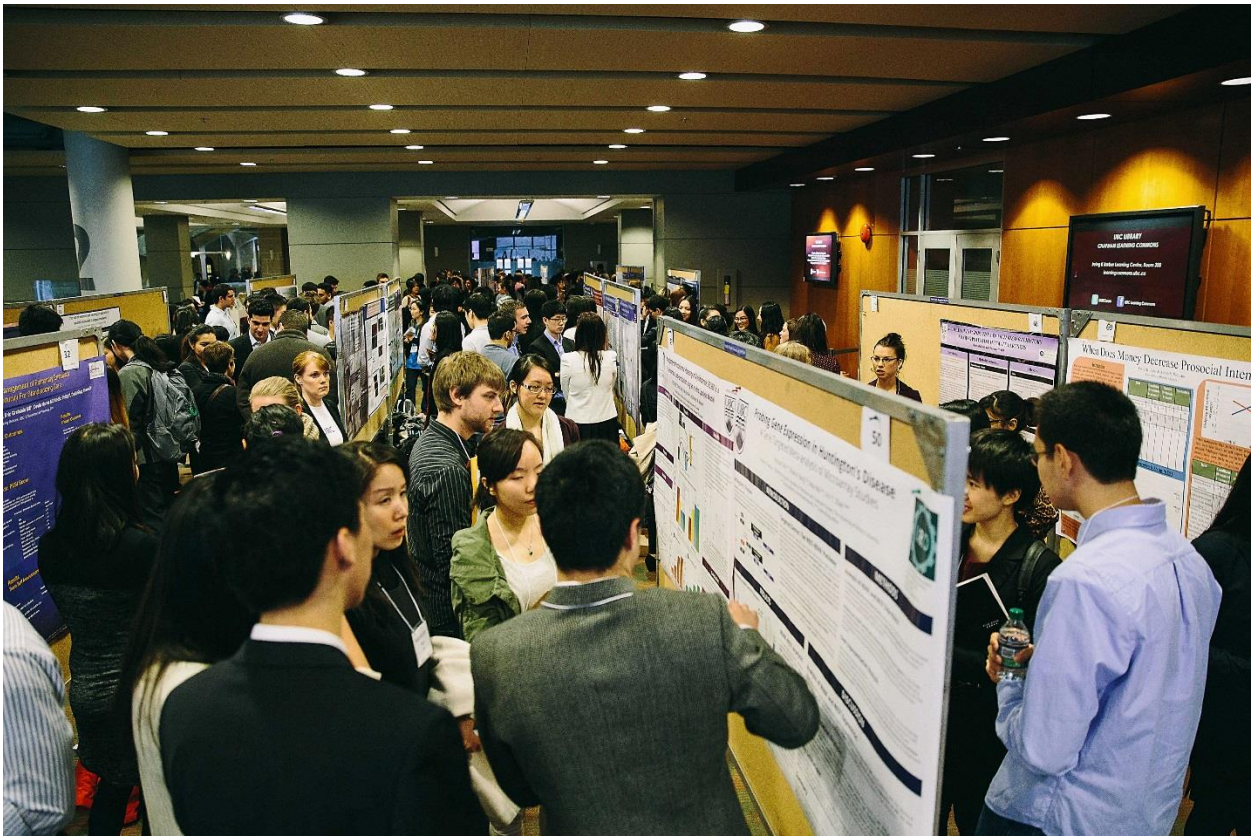

# MURC | MULTIDISCIPLINARY UNDERGRADUATE RESEARCH CONFERENCE

## Program Guide

Tuesday March 29th, 2016
Wednesday March 30th, 2016
Thursday March 31st, 2016

UBC Vancouver

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#MURC

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# WELCOME TO MURC 2016

## WHAT IS MURC?

**The Multidisciplinary Undergraduate Research Conference is an annual event that brings together undergraduate students, passionate about research, to showcase their projects and findings with their UBC community.**

**MURC welcomes any UBC undergraduate student who is participating in, or has completed their own Faculty-supervised research project to present in the conference. This year, MURC transitioned to a three-day conference in order to meet the need of an increasing number of presenters and to become more accessible to the wider UBC community. MURC 2016 features 233 presentations by 360 student presenters. MURC finalists will have the opportunity to apply to present at the annual Universitas 21 International Undergraduate Research Conference, taking place in Monterrey, Mexico in the summer of 2016.**

**We hope you are able to join us in celebrating the wide range of undergraduate research at UBC, and make the connections that allow us to continue on the path of excellent research and innovation.**

# ACKNOWLEDGEMENTS

## THANK- YOU

**A special thank-you dedicated to all listed below for your amazing work and support in organizing the conference this year. You have made an invaluable contribution to the success of MURC 2016.**

### Featured Presenters

Dr. David Oliver
Dr. Neil Guppy
Diana Canals
Rachel Jordan
Amin Nouri
Babek Adeli

### Workshop Presenters

Dr. Rick Gooding
Dr. Santokh Singh
Erick M. Carreras

### Volunteers

Evelyn Liu
Danica Verhoeve
Jacky Lau
Ben Stevens
Nian Liu
Trisha Teh HUi Yen
Shanshan Ling
Xuejie Tang
Brandon Huntington
Sepand Moalej
Lingzi Gao
Angela Lee
Zehui (Linda) Wu
Dhaneesh Kumar Gopala Krishnan
Kunjia Shi
J Evan zhou
Julianna Weldon
Yi Ho Phuah
Taylor Yang
Elaine Fung
Jasia Ho
Benedict Halim
Vivienne Jaehn-Kreibaum
Mengfan Wu
Mandee Chow
Juyeong Oh
Evan Wang
Xiang Chuin (Ariel), Seah
Chi-Wen Kao

### Adjudicators

Zhenguo Wu
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Ahn Lee
Leah Keegahn
Natalie Marshall
Govinda Sharma
Mina Orobadi
Jia Wang
Love-Ese Chile
Yangfan Zhang
Travis Tai
Julie Sou
Matthew Haslam
Shawna Stanwood
Hitesh Arora
Karen Fong
Leo Chen

### Conference Organizers

Georgia Anstey
Sanya Ranchal
Erick M. Carreras
Farris Kassam
Cheneil Antony-Hale
Eduardo Garza
Howell Liu
Hayami Lou
Agnes Ho
Evan Chen

# 3-DAY PROGRAM AT-A-GLANCE

## OVERVIEW OF MURC 2016

### *Tuesday March 29, 2016 (Day 1)*

| | | |
|---|---|---|
| **8:00am - 8:00pm (All Day)** | Posters on Display | Irving K. Barber Learning Centre (IBLC) - 2nd Floor Foyer |
| **5:00pm - 6:30pm** | Oral Presentations | Henry Angus Building (ANGU) - 2053 Main Mall<br>ANGU 243, 335, 345, 347, 350, 354 |
| **6:45pm - 8:00pm** | Poster Presentation Adjudication | Irving K. Barber Learning Centre (IBLC) - 2nd Floor Foyer |

### *Wednesday March 30, 2016 (Day 2)*

| | | |
|---|---|---|
| **8:00am - 8:00pm (All Day)** | Posters on Display | Irving K. Barber Learning Centre (IBLC) - 2nd Floor Foyer |
| **4:00pm - 4:45pm** | Featured Speaker | Buchanan Building (BUCH) - 1866 Main Mall - BUCH A103 |
| **5:00pm - 6:30pm** | Oral Presentations | BUCH B302, B303, B304, B306<br>BUCH D304, D314, D323 |
| **6:45pm - 8:00pm** | Poster Presentation Adjudication | Irving K. Barber Learning Centre (IBLC) - 2nd Floor Foyer |

### *Thursday March 31, 2016 (Day 3)*

| | | |
|---|---|---|
| **8:00am - 8:00pm (All Day)** | Posters on Display | Irving K. Barber Learning Centre (IBLC) - 2nd Floor Foyer |
| **3:00pm - 4:15pm** | Poster Presentation Adjudication | Irving K. Barber Learning Centre (IBLC) - 2nd Floor Foyer |
| **4:30pm - 6:00pm** | Oral Presentations | Irving K. Barber Learning Centre (IBLC)<br>IBLC 185, IBLC 461,<br>Dodson Room, Lillooet Room |
| ***6:30pm – 8:00pm*** | Awards Ceremony | *Private event.* |

# FEATURED SPEAKERS

## SPEAKERS

### Dr. David Oliver, PhD

Dr. Oliver is MURC 2016's featured speaker, hosting, "*So you want to be a rock and roll star?* Exploring research as a foundation for careers in academia, industry, education, and beyond…" on **Wednesday, March 30th, 2016** (4:00pm – 4:45pm) at **Buchanan A103**.

*Dr. David Oliver earned his BSc and PhD in the Department of Microbiology and Immunology and University of British Columbia. Dave followed up his doctoral training as a Michael Smith Foundation for Health Research Post-Doctoral fellow at Simon Fraser University. He then transitioned into a management position at a biotechnology company which focused on the development and manufacture of point-of-care diagnostics devices. Dave returned to his academic roots in 2014 to pursue his long-standing passion for teaching and learning. He is currently a tenure-track Instructor in the Department of Microbiology and Immunology at UBC.*

### Dr. Neil Guppy, PhD

Dr. Guppy, Acting Managing Director, Student Development & Services, will present the key address at the MURC Awards Reception, and present the MURC finalists with their awards.

### 3-minute Thesis Presenters

**Diana Canals**, MSc in Medical Genetics
The role of podocalyxin in cancer metastasis

**Amin Nouri**, PhD in Chemical and Biological Engineering,
The Curious Case of Benjamin's Bubble

**Rachel Jordan**, MSc in Audiology
Auditory Evoked Potentials to Gaps in Infants

**Babak Adeli**, PhD in Chemical and Biological Engineering
Toward Solar Hydrogen

# ORAL PRESENTATION OVERVIEW (1)

DAY 1 PROGRAM - MARCH 29, 2016

## Time: 5:00pm - 6:30pm

## Henry Angus Building - ANGU 335

| *Research Topics (Abstracts page 11-13)* | *Presenters* |
|---|---|
| Class(y) Faces | Kieran Kitchener<br>Megan Fass |
| Assessing the Effect of Diet on the Regulation of Metabolic Gene Expression in the nematode worm C. elegans | Amy Poon |
| The Effect of Mating on Female Drosophila Survival | Tiffany Chih |
| Identifying Intervention Strategies for High-Risk Drinking on the UBC Campus | Jacques Martiquet |
| Investigating the role of Vitamin B12 and its link to the Mediator MDT-15 in embryonic viability in Caenorhabditis elegans | Arshia Beigi |
| Genetics and Fetal Alcohol Spectrum Disorder (FASD): Discovering genes that modulate the effects of prenatal alcohol exposure on the developing mouse brain | Aria Shokoohi<br>Emilie Theberge |

## Henry Angus Building - ANGU 345

| *Research Topics (Abstracts page 14-16)* | *Presenters* |
|---|---|
| Towards the synthesis of tanshinone analogues for treatment of osteoporosis | Andy Un |
| Earth is not a Donut | Darrick Lee |
| A Qualitative Analysis on the Chaotic Non-Linear Pendulum | Edmond Ching |
| Searching for Majorana Modes in Superconductor-Magnet Heterostructures | Alex Toews |
| Eating on a drier planet: exploring dietary choices more appropriate for a world of increasing water scarcity | Belle Wilaingam<br>Celine Coschizza |
| The role of incretin hormones, Gastric Inhibitory Polypeptide (GIP) and Glucagon-like Polypeptide (GLP-1), and their interaction with IDE inhibitors in insulin degradation for Type 2 Diabetes | Charanpreet Sasan<br>David Kang |

## Henry Angus Building - ANGU 347

| *Research Topics (Abstracts page 17-19)* | *Presenters* |
|---|---|
| A comparison of invasive lionfish behaviour and feeding patterns between culled and non-culled sites in Cuba | Viviana Lee |
| The Use of Rumen-Reticulum Thermometers to Monitor for Estrus and Ovulation in Holstein Cows | Regina Chan |
| Peer Tutor Programs in First Year Biology (With a special focus on Biology 112) | Sam Seyedin |
| Equitable matrices applied to temperature and high arctic plant seasonal cycles | Cassandra Elphinstone |
| Prolyl-4-Hydroxylase Inhibition; A New Neuropathic Pain Treatment | Seth Holland |
| Investigating a Potential Biopesticide: The Effect of Pawpaw Extracts on Spider Mites and a Predatory Mite | Victoria Lei |

## Henry Angus Building - ANGU 350

| *Research Topics (Abstracts page 20-22)* | *Presenters* |
|---|---|
| Zebrafish Aggression in Enriched Laboratory Environments | Gabriella Schauber |
| The effects of evolution and feeding ecology on the anterior digestive tract of Odontocetes and Mysticetes | Carla Di Filippo |
| Is rat escape behaviour during euthanasia related to the degree of aversion to $CO_2$? | Andrea Jia |
| Evidence for Emotional Lateralization in Zebrafish | Varsha Rani |
| Waiting time in heifers as a measure of motivation to learn | Emilie McConnachie |
| Humane Killing: Coho Salmon Behaviour during Exposure to Anaesthetics | Betsy Robertson |

## Henry Angus Building - ANGU 354

| *Research Topics (Abstracts page 23-25)* | *Presenters* |
|---|---|
| Artificial Neural Network Model of Neuronal Computation During Learning | Andre Beukers |
| Uncovering the Unconscious with Ouija boards: a new platform for understanding semantic implicit memory | Mahtab Borhani<br>Andrew Mcdonald<br>Annie Wang<br>Remi Kandal |
| Behavioural Biomarkers of Parkinson's Disease Implemented as Games | Laura Jowon Kim |
| Improvements in functional mobility seen with different combinations of rehabilitative training in individuals with incomplete spinal cord injury | Andrew Au<br>Chelsea Chua<br>Felix Ng |
| Investigating demyelination in rat spinal cords with MRI scans and validation with tissue histology | Tian Rabbani<br>Regina Wong |
| Non-Coding RNAs in Cancer: From Bench to Clinic | Kevin Ng |

## Henry Angus Building - ANGU 243

| *Research Topics (Abstracts page 26-28)* | *Presenters* |
|---|---|
| Difficulty breathing? The critical role gut microbes play in preventing allergic asthma. | Emily Fogarty |
| Enterovirus: An emerging role in ALS | Jacqueline Siu |
| The Confluence of Food and Judaic Practice in Lodz Ghetto, 1939-1944 | Maria Dawson |
| “Performing Gender and Race in Indie Music: Whiteness, Masculinity, and Discursive Silences” | Heather Gunn |
| The Establishment of Sexual Norms in Ancient Greek Culture Via Erotic Art | Michelle Milton |
| How appropriate is red blood cell transfusions in the Neonatal Intensive Care Unit? | Claire Wu |

# ORAL PRESENTATION ABSTRACT (1)

MARCH 29, 2016

## Henry Angus Building - ANGU 335 Time: 5:00pm - 6:30pm

### Class(y) Faces

**Kieran Kitchener, Megan Fass**

We are currently developing a computer simulation of phenotypic variation over time in stratified social groups. We are specifically measuring facial feature differentiation in averaged faces of individuals in the Indian caste system archived in public databases. We will present on our results on whether there is a quantifiable difference in facial structure across the micro-populations created by the caste system, and if these differences persist through time.

### Assessing the Effect of Diet on the Regulation of Metabolic Gene Expression in the nematode worm C. elegans

**Amy Poon**

An organism's ability to alter its gene expression is important for adaptation to dietary changes. MDT-15 is a subunit of the Mediator complex that is evolutionarily conserved in eukaryotic organisms, including the model organism nematode Caenorhabditis elegans (C. elegans). By regulating gene expression, the Mediator complex performs many functions including the coordination of metabolic and stress response gene expression (fat metabolism, drug metabolism, etc.). Consequently, mutants that cannot produce the subunit MDT-15 have severely altered metabolism, leading to multiple phenotypes including embryonic lethality. The standard laboratory diet of C. elegans is the bacterium Escherichia coli (E. coli). However, previous research in our lab has shown that a diet of Comamonas aquaticus (Comamonas), a bacterium that is able to produce Vitamin B12 compensates for the lack of MDT-15 and rescues embryonic lethality. Based on this finding, we hypothesize that Comamonas could downregulate MDT-15 protein levels. To determine whether MDT-15 protein abundance is regulated by Comamonas, we compared MDT-15 protein levels in C. elegans fed either E. coli or Comamonas by Western Blotting, a technique for detecting proteins through antibody staining. We expect to observe decreased MDT-15 protein levels in worms fed a Comamonas diet, as we anticipate that the excess Vitamin B12 supplied by Comamonas may be working coextensively with MDT-15. In other words, the increased dietary intake of Vitamin B12 contributes to metabolism such that there is a decrease in demand for MDT-15. This work will provide new insights into the interplay between nutrients and cellular adaptations.

## The effect of mating on female Drosophila survival

**Tiffany Chih**

Successful reproduction in many animals requires mating between a male and a female. The process of mating involves the transfer of sensory cues (eg. smell, vision), seminal fluids that cause mating-induced physiological changes, and sperm for fertilization. In females, the combined effects of these cues influence many aspects of metabolism, physiology, and behaviour to maximize reproductive capacity. In our lab, we use the fruit fly, Drosophila melanogaster, as a model to study how mating-induced changes in females affect their response to an environmentally and ecologically relevant stress, starvation. Our data show that mating significantly enhances female survival after starvation; however, it is unclear which mating-related changes cause mated females to survive longer than unmated females. The goal of my project is to dissect how each mating-induced change in female biology contributes to starvation survival. To do this, I test starvation survival in females where specific aspects of the mating process have been disrupted. My current finding indicates that the sensory cues transferred during mating and social interactions do not enhance starvation survival in females. In addition, transfer of seminal fluids and sex peptide play a role in the extended survival of female flies. The next step of the experiment is to test the effect of sperm transfer and egg production on female starvation survival by measuring survival in females mated to males without sperm as well as females that are unable to make eggs. This will allow me to determine whether it is reproduction, or changes in physiology, that allow mated females to survive longer. Overall, this project will allow us to determine the physiological mechanisms underlying how mating changes female stress responses.

## Identifying Intervention Strategies for High-Risk Drinking on the UBC Campus

**Jacques Martiquet**

The national average for the proportion of students who engage in regular binge-drinking is 32 percent. High-risk drinking on British Columbian campuses is practiced at the same level. In British Columbian universities, forty five percent of alcohol-drinking students drank more than 5 drinks the last time they socialized. On the UBC campus, the administration has enacted a policy on alcohol use at events and facilities on the UBC campus; however, this policy does not indicate any need or mandate to reduce high-risk drinking on the UBC campus. The Alma Mater Society of UBC has recently developed a Safe Partying Plan that assists event organizers to understand their responsibilities as party organizers. However, there is no comprehensive strategy to reduce high-risk drinking and its associated harms at UBC. High-risk drinking by students has been associated with unplanned sexual activity, missing classes, lower grades, sleep disturbances, and declines in executive brain function. Universities in New Hampshire and in Nova Scotia have joined forces in the Learning Collaborative on High-Risk Drinking to research and test intervention strategies directed at reducing high-risk drinking harms. An assessment of the efficacy and appropriateness of each intervention for the UBC campus will be conducted based on preexisting interventions, including: alcohol regulations in British Columbia, environmental controls on campus, and preventative approaches directed toward individuals. An evaluation of existing interventions will allow for the identification of next-step strategies and for recommendations on the development of a comprehensive policy for reducing high-risk drinking at UBC.

## Investigating the role of Vitamin B12 and its link to the Mediator MDT-15 in embryonic viability in Caenorhabditis elegans

**Arshia Beigi**

It has long been known that diet affects gene regulation and organismal phenotypes, but many of the genetic components allowing this adaptation are unknown. For example, feeding the nematode worm Caenorhabditis elegans, a powerful genetic model organism, a bacterial diet of Comamonas aquatica (CA) instead of the standard Escherichia coli (EC) lab diet causes dramatic changes in gene expression and life-history traits including developmental rate, reproduction and lifespan. The key metabolic compound in the CA diet is vitamin B12, which in mammals is required for embryonic development and cardio-metabolic health. Vitamin B12 functions exclusively in the propionyl-CoA breakdown and methionine/SAM cycle pathways. We have recently found that worms lacking mdt-15, a conserved transcriptional co-regulator, show near-complete embryonic lethality on EC, whereas a CA diet almost completely rescues this phenotype. Therefore, we hypothesized that the same compound (B12) is responsible for the observed rescue in mdt-15 reduction-of-function (rf) worms. To this end, we grew mdt-15(rf) worms on B12-supplemented EC diets, and compared embryonic lethality with mutants fed non-supplemented EC. Interestingly, we found that B12 partially restored the hatching success rate of mdt-15 worms. Current work is underway to better understand the dominant pathway by which B12 rescues the mdt-15(rf) worms, and our preliminary data indicate that the methionine/SAM pathway is not involved. Further experiments will focus on the role of the propionyl-CoA breakdown pathway. Collectively, this work will determine the role of a conserved transcriptional co-regulator as a genetic buffer for developmental events against adverse environmental effects.

## Genetics and Fetal Alcohol Spectrum Disorder (FASD): Discovering genes that modulate the effects of prenatal alcohol exposure on the developing mouse brain

**Aria Shokoohi, Emilie Theberge**

Fetal Alcohol Spectrum Disorder (FASD) is the most prevalent developmental disability among children in Canada, and encompasses a range of birth defects caused by prenatal alcohol exposure. Previous research has shown a strong correlation between alcohol consumed by the mother during pregnancy and the effects on fetal development. The brain is a specific and vulnerable target of alcohol's impact. It has been demonstrated that cells of the developing brain can undergo death following alcohol exposure. However, the underlying pathways by which alcohol acts remain largely unknown. The purpose of our research is to identify genes responsible for mediating the extent of alcohol's effect on brain development. Mouse embryos were exposed to alcohol and examined for cell death within different regions of the brain. Following tissue staining and calculating the density of dying cells, variations of cell death within the different regions allow us to make inferences about the genes implicated in alcohol's effect. GeneNetwork, a mouse genome database, was used to evaluate potential genes of interest. Our results thus far have shown likely candidate genes on Chromosomes 10 and 19 that mediate alcohol's effect in the forebrain. In addition, we have narrowed down 12 candidate genes on Chromosome 14 that mediate cell death in the brain stem, one of which is bone morphogenic protein 4 (BMP4) that has previously been shown to induce cell death in neural crest cells. Ultimately, our research has important preventative therapeutic implications by furthering our understanding of developmental processes in the brain impacted by alcohol.

## Henry Angus Building - ANGU 345

## Time: 5:00pm - 6:30pm

### Towards the synthesis of tanshinone analogues for treatment of osteoporosis

**Andy Un**

Osteoporosis is a disorder characterized by decreasing bone mineral density. The disease leads to increased risk of bone fractures and physical injuries, and can affect both sexes, regardless of age. It is estimated that the Canadian healthcare system spends over 2.3 billion dollars on relevant treatment costs on an annual basis [1]. Tanshinones are a family of diterpenoid compounds most commonly found in the roots of the Chinese herb Salvia militorrhiza; the plant extract has been used for treating cardiovascular diseases, blood clots, arthritis, and other diseases [2]. In collaboration with Prof. Dieter Brömme's research group, we aim to synthesize analogues for biological testing, in the hopes of discovering a potent small molecular inhibitor of the collagen protease, cathepsin K. These results will advance our understanding of human physiology and contribute further to drug research and development.

[1] Osteoporosis Canada. Osteoporosis Facts and Statistics. http://www.osteoporosis.ca/osteoporosis-and-you/osteoporosis-facts-and-statistics/ (Accessed March 14, 2016)

[2] Guo, Y.; Li, Y.; Xue, L.; Severino, R. P.; Gao, S.; Niu, J.; Qin, L. P.; Zhang, D.; Bröome, D. Salvia miltiorrhiza: An ancient Chinese herbal medicine as a source for anti-osteoporotic drugs. J. Ethnopharmacol., 2014, 155 (3), 1401-1416.

### Earth is not a donut

**Darrick Lee**

Imagine there is no way of externally looking at the Earth; how can we determine that it is in the shape of a sphere? We know it cannot be flat because if we walk in any single direction, we will always return to our starting position. However, if we walk in any direction on a donut, we will also return to our starting point. So how do we determine which it is?

This can be answered by considering the fundamental group of the space, which is the collection of all possible loops one can draw on the space. A branch of mathematics called algebraic topology aims to draw connections between the fundamental group and its underlying space in order to better understand complicated and higher dimensional spaces. This talk will discuss the connection that allows us to distinguish between a sphere and donut, and also another conjectured connection which was the focal point of my research.

## Genetics and Fetal Alcohol Spectrum Disorder (FASD): Discovering genes that modulate the effects of prenatal alcohol exposure on the developing mouse brain.

**Aria Shokoohi, Emilie Theberge**

Fetal Alcohol Spectrum Disorder (FASD) is the most prevalent developmental disability among children in Canada, and encompasses a range of birth defects caused by prenatal alcohol exposure. Previous research has shown a strong correlation between alcohol consumed by the mother during pregnancy and the effects on fetal development. The brain is a specific and vulnerable target of alcohol's impact. It has been demonstrated that cells of the developing brain can undergo death following alcohol exposure. However, the underlying pathways by which alcohol acts remain largely unknown. The purpose of our research is to identify genes responsible for mediating the extent of alcohol's effect on brain development. Mouse embryos were exposed to alcohol and examined for cell death within different regions of the brain. Following tissue staining and calculating the density of dying cells, variations of cell death within the different regions allow us to make inferences about the genes implicated in alcohol's effect. GeneNetwork, a mouse genome database, was used to evaluate potential genes of interest. Our results thus far have shown likely candidate genes on Chromosomes 10 and 19 that mediate alcohol's effect in the forebrain. In addition, we have narrowed down 12 candidate genes on Chromosome 14 that mediate cell death in the brain stem, one of which is bone morphogenic protein 4 (BMP4) that has previously been shown to induce cell death in neural crest cells. Ultimately, our research has important preventative therapeutic implications by furthering our understanding of developmental processes in the brain impacted by alcohol.

## Searching for Majorana Modes in Superconductor-Magnet Heterostructures

**Alex Toews**

75 years ago, Italian physicist Ettore Majorana disappeared under mysterious circumstances. He never resurfaced, but his ideas have, and could be the key to entering a new age of computing. This talk discusses a search for 'Majorana Modes' which are a potential building block of quantum computing - if only they could be realized outside the physicist's mind! The results presented here will guide future experimental efforts to build structures exhibiting these 'Majorana Modes'.

## Searching for Majorana Modes in Superconductor-Magnet Heterostructures

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## The role of incretin hormones, Gastric Inhibitory Polypeptide (GIP) and Glucagon-like Polypeptide (GLP-1), and their interaction with IDE inhibitors in insulin degradation for Type 2 Diabetes

**Charanpreet Sasan, David Kang**

Type 2 diabetes (T2D) is a chronic condition that occurs due to factors such as diet, physical activity levels and genetics. T2D affects the quality of life of those diagnosed with it, and as a result of its global prevalence, it is of utmost importance that treatment options are developed.

Insulin, the hormone responsible for glucose storage is insufficiently produced for T2D patients. The degradation of insulin is regulated primarily by insulin degrading enzyme (IDE), and yet much is unknown about how IDE regulates in vivo insulin and glucose homeostasis. Global deletion of IDE initially improved glucose homeostasis in mice; however over time glucose intolerance emerged despite elevated insulin levels. Although these results are likely due to a compensatory response to the persistent hyperinsulinemia, the results suggest that partial inhibition of IDE may provide an approach to treat T2D. Treatment with an IDE inhibitor was found to improve glucose homeostasis in both lean and diet-induced obese (DIO) mice. Interestingly, this was only observed following an oral glucose and not an intra-peritoneal glucose, tolerance test (OGTT and IPGTT respectively), suggesting incretin influence. To test the potential incretin interaction, we treated mice either null for GIP (gastric inhibitory polypeptide; GIPKO), GLP-1 (glucagon-like peptide-1; GLP1KO) or both (termed G-DBKO) with an IDE inhibitor, in either male lean mice, or DIO mice. Oral glucose tolerance was improved in both GIPKO and GLP1KO mice, but impaired in G-DBKO mice, indicating that at least one of these incretins is required for the benefits of IDE inhibitors.

## Henry Angus Building - ANGU 347

## Time: 5:00pm - 6:30pm

### A comparison of invasive lionfish behaviour and feeding patterns between culled and non-culled sites in Cuba

**Viviana Lee**

Invasion of predatory lionfish has been a critical issue to marine ecosystems throughout the western Atlantic Ocean and the Caribbean. Many Caribbean countries have implemented culling programs to reduce lionfish densities. Cuba, as one of the most species rich regions in the Caribbean, lacks studies on the lionfish invasion to support its management. This study aims to examine the biological effects of culling on lionfish in Cuba. I hypothesized that culling would alter lionfish behaviour in two ways: level of alertness and feeding patterns. Correspondingly, I measured and compared lionfish's alert distances upon approaching divers and the proportion of active individuals in a culling region and a nearby control /non-culled region. I also compared the stomach contents of lionfish specimens collected from the two regions. The results indicated that lionfish from the culled region had significantly greater awareness towards divers than those from the control region. I found a significantly lower proportion of active lionfish from the culled region than the control. But there was no significant difference in the amount or the composition of preys lionfish consumed between the two regions. Then I concluded that culling can heighten the alertness of lionfish while has little impact on lionfish feeding patterns in Cuba. The increased alertness was also detected in other regions, implicating that this might be a common response of lionfish to culling, which should be considered in the design of lionfish control programs. The unshifted predation capacity and preference also implicated that culling can hardly reduce lionfish's pressure on local species at the individual level.

### The Use of Rumen-Reticulum Thermometers to Monitor for Estrus in Holstein Cows

**Regina Chan, Tracy A. Burnett, Ronaldo L.A. Cerri**

Observing an increase in activity level of Holstein dairy cows is a common method for determining when she is in estrus. Estrus is a period of time when the cow is sexually receptive, and restlessness is a key behavioral characteristic of this period. When the estrus event is observed, farmers normally inseminate the cow 12-16 h later, after the end of estrus, thus synchronizing semen deposition with ovulation time. Advanced technology is used to more effectively predict when a cow is in estrus. The aim of this study was to determine whether a change in rumen-reticulum temperature is correlated with a change in activity level during estrus. A collar-mounted automated activity monitor (AAM) was used to determine the change in movement of cows during estrus. The AAM continuously recorded the movement of the animals and changes in movement were wirelessly transmitted to a database every 2 h. Thermometer boluses were inserted into the rumen of the cows for the continuous monitoring of body temperature; rumen-reticulum temperature was logged every 1 h. Data collected from the two devices were analysed using the MIXED procedure of SAS with cow as a random effect. High peak activity had higher maximum temperature around estrus (MTE) than those with low peak activity. Long duration of estrus were associated with higher MTE than short durations. Overall, animals with high expression of estrus, measured by AAM, had increased body temperature during estrus. Future research needs to be performed to determine whether this increase in temperature at estrus can be used to make an automated alert for estrus or ovulation using only the bolus thermometers.

## Peer Tutor Programs in First Year Biology

**Sam Seyedin**

BIOL 112 is a first year cell biology course at UBC where we explore the essence of various topics in the most basic unit of life. Inspired by an interactive model of higher education teaching, BIOL 112 has integrated a peer-tutoring program into its structure. Peer tutors are selected from a pool of highly competent upper level undergraduate students in life sciences at UBC. They take on the role of guiding and mentoring students in the course using mentoring models in higher education. Our peer tutors are often the first line of contact for many students entering UBC and this gives our program great importance in its mandate to provide peer-to-peer support. This program has now entered its fourth year and a comprehensive study was needed to assess the current methods in use and to develop and implement new strategies. Hence, I report on my Directed Studies project to address these needs in the context of Biology 112. The main pillars of the project include peer tutor training, online forums supervision, lecture and learning center leadership, and workshop development and leadership. In this talk I will discuss the empirical measurements I carried out to assess the effectiveness of the peer-tutoring program from the perspective of the students as well as of the peer tutors. Additionally, I will share my suggestions for peer tutoring programs in first year biology and beyond.

## Equitable matrices applied to temperature and high arctic plant seasonal cycles

**Cassandra Elphinstone**

A technique employed to evaluate temporal temperature patterns was also found effective in quantifying the relationship between the seasonal cycles of individual plants in the high Arctic at Alexandra Fiord, Ellesmere Island (79 degrees North). The technique involves the use of linear correlations between all possible pairs of multipoint series to create matrices that have properties similar to those of a mathematical group. Matrices with these properties are known as equitable matrices and are particularly applicable to limited discrete 2 or 3D data sets that could be represented in terms of separable functions. The shifting and stretching of a general phenology function (the timing of events in a plant's seasonal cycle) was determined to be an equitable system. The equitable model appears to accurately describe the phenology of up to 500 individual plants within a community of a given species relative to a reference individual. Using this model, plants such as *Dryas integrifolia* are shown to synchronize their flower bud break time with phenology rates that compensate for a late or an early start in the spring. As well, equitable systems can accurately represent long term temperature patterns as functions of both day number and year. This equitable system shows the climate warming at a rate of about 1.5 °C/decade since 1986 at Alexandra Fiord.

# Prolyl-4-Hydroxylase Inhibition; A New Neuropathic Pain Treatment

**Seth Holland**

Neuropathic pain is a unique type of pain; it is the result of damage to the sensory nervous system that causes neurons to send a pain signal when they shouldn't. Currently there is no mechanistic understanding of why these signals fire. This makes it particularly difficult to treat, leaving patients who suffer from neuropathic pain with relatively ineffective treatment options. In the majority of patients with a spinal cord injury severe neuropathic pain is present. This research project aims to gain a deeper understanding of the mechanisms behind this type of pain and to develop a target for pharmacological treatment. When a neural injury occurs the neuron support cells (called glia) react. These reactions can be beneficial or harmful depending on the injury. In our research we have identified a group of proteins; Prolyl-4-Hydroxylases (PHD) that are critical in mediating the glial response to injury. PHDs are highly conserved, sense cellular oxygen levels, and can regulate cellular division. Our research investigates the effect of a pan-PHD inhibitor on neuropathic pain in mice. Neuropathic pain was induced surgically with a L5 spinal nerve lesion. Preliminary results show that PHD inhibition reverses the onset of neuropathic pain. To gain a deeper understanding of what is occurring on the cellular level we will image the tissue of the mice using immunofluorescent antibodies. This will identify which type of glial response is implicated in neuropathic pain and whether or not regulating cellular division is important. All research will be completed by March 15th.

## Henry Angus Building - ANGU 350

## Time: 5:00pm - 6:30pm

### CHOICES (Cardiovascular Health/ Outcomes: Improvements Created by Exercise & Education for SCI)

**Marko Gavric**

This study aims to determine whether body weight-supported treadmill training (BWSTT) has beneficial effects, over and above arm-cycle ergometry training (ACET) on indicators of cardiovascular disease (CVD) risk in individuals with severe spinal cord injury (SCI). Research in this area is important because the primary cause of illness and death among people with SCI is CVD. Currently, preventative measures are focused around increasing physical activity, especially through the use of ACET. However, ACET's capacity to improve cardiovascular health is questionable. Research has demonstrated that BWSTT, an alternative form of exercise, may be capable of improving cardiovascular health in individuals with SCI. The primary outcome measure for this study is aortic pulse wave velocity (aPWV) which has been shown to have prognostic value for CVD above and beyond that of other risk factors. It is hypothesized that through large muscle mass involvement and postural challenge, the physical stimuli of BWSTT will reduce aPWV and lower CVD risk in individuals with SCI. The primary outcome measure (aPWV) and secondary cardiovascular and autonomic parameters will be assessed using a combination of electrocardiography, ultrasound, blood pressure, and tonometry techniques. Fitness will be determined using a peak oxygen consumption test on an arm-cycle ergometer and body composition will be determined using a dual energy x-ray absorptiometry (DEXA) scan. Quality of life levels will be assessed using questionnaires. Training will involve 3, 60-minute exercise sessions per week, for 24 weeks and measurements will take place at baseline, 3 months, 6 months, and 6 months following exercise[HD1].

### The effects of evolution and feeding ecology on the anterior digestive tract of Odontocetes and Mysticetes

**Carla Di Filippo**

Within cetaceans, Odontocetes (toothed whales) and Mysticetes (baleen plated whales) have each developed a unique feeding ecology. Odontocetes bite and swallow small prey such as fish, while Mysticetes filter feed to consume large quantities of small organisms. The objective of this study is to identify the materialistic, mechanical, and anatomical properties of the anterior digestive tract, specifically the esophagus, within each group to better understand the extent to which evolution and feeding ecology have impacted the structure. One sample of esophagus from a fin whale, Balaenoptera physalus, (mysticete) and two from a harbour porpoise, Phocoena phocoena, (odontocete) from stranding or entanglements were manually stretched, and a force transducer and voltmeter set up allowed for the recordings of force required to stretch in volts. The stretch was videotaped and length measurements were extracted using ImageJ. Stress-strain curves were then compiled to compare the samples. We found that the fin whale esophagus shows greater extensibility with less force than that of the harbour porpoise. The fin whale esophagus also displays a change in esophagus wall composition from a muscular anterior to a fatty posterior, a trend that is not seen in the harbour porpoise. These findings can help us understand the major differences in evolution and diet between Odontocetes and Mysticetes, as one could trace similar characteristics in ancestors to see where they diverged . It can also be used to predict the diet or esophagus properties of terrestrial animals if they show similar feeding styles.

## Is rat escape behaviour during euthanasia related to the degree of aversion to CO2?

**Andrea Jia**

Carbon Dioxide ($CO_2$) is commonly used to euthanize laboratory rats. However, rats find $CO_2$ aversive, and show signs of distress during $CO_2$ euthanasia. This poses ethical problems because euthanasia is required to be as stress-free as possible. During gradual-fill $CO_2$, some rats try to escape intensely, while others do not attempt escape. Researchers wonder if rats that do not attempt escape are less distressed than others. Therefore, we intend to verify if the rats' tolerance of $CO_2$ can predict the rat's escape behaviour during $CO_2$ euthanasia. Twelve female Sprague Dawley rats were tested with a forced exposure to gradual-fill $CO_2$. Observers recorded whether the rat attempted escape. Then, an aversion-avoidance setting was used. Each rat was placed in a light-dark box, and when it settled down in the dark chamber, a $CO_2$ flow started. Observers measured the threshold of aversion (the time at which the rat emerged from the dark). Control experiments used air instead of $CO_2$. Our preliminary results showed that 50% of the rats tried to escape at least once in $CO_2$. We found no significant correlation between escape behaviour and threshold of aversion. However, we observed a tendency for rats with low threshold of aversion to attempt escape at least once, and vice versa. While the lack of significance might be attributed to the small sample size, the difference in escape behaviour could be attributed to each rat's unique coping style under stressful situations. Further study is important to ensure a stress-free euthanasia method for rats.

## Evidence for Emotional Lateralization in Zebrafish

**Varsha Rani**

Determining emotional state in animals is of central importance to animal welfare science. While there is a body of literature investigating emotional state in mammals, such tests are rare in fish. In this experiment, we explored the potential utility of behavioral-lateralization—the tendency to favor one side of the body over the other—as an indicator of emotional state in zebrafish. Previous research has suggested that certain species use the left side of their body to interact with fearful stimuli, but evidence for such emotional-lateralization in zebrafish remains inconclusive. To date, research has shown that zebrafish generally favor their left-eye for inspecting novel stimuli, which could indicate an association between left-eye usage and fearful processing (the majority of tests were conducted under potentially fear-inducing conditions) but could also simply reflect an association between left-eye usage and information gathering (i.e. non-emotional processing). To separate fearful processing from information gathering, we tested fish under minimally stressful conditions (i.e. in social groups and in their hometanks, N = 6) by inserting novel object into hometanks and recording their inspection pattern. While object inspections remained high across the 100 second observation period, zebrafish only favored their left-eye during close inspections in the first 10 seconds—i.e. they used their left-eye significantly more for the most risky inspections (p.2). These results are consistent with emotional-lateralization and point to the potential utility of using behavioral-lateralization to determine emotional state in zebrafish.

## Waiting time in heifers as a measure of motivation to learn

**Emilie McConnachie**

The mental stimulation provided by cognitively enriched environments could increase animal welfare for farm animals, like dairy heifers, by decreasing negative affective states and improving quality of life. To determine whether cognitive enrichment is something heifers desire, their motivation to participate in learning activities must be measured. The objective of this research was to determine if waiting time is a potential measure of motivation in heifers and, if so, whether there is indication of desire for cognitive challenges. Video footage was analyzed of 12 heifers waiting to enter an alley outside of their pen; there, 6 of the heifers were able to partake in a learning activity, while the other 6 were a control group. The northwest corner of the pen held a platform preceding a gate that led to this alley. Waiting time per heifer was defined as the time spent on the platform in front of the gate as a proportion of the time spent in the pen before the learning activity. Waiting time was correlated with performance of operant responses, an established measure of motivation, during the learning activity. There was little correlation between operant responses and waiting time in both the learning and control group (R=0.22 for both) suggesting that waiting time is not a valid measure of heifers' motivation in this context. If other experimental results suggest that heifers are motivated by cognitive enrichment, then perhaps learning opportunities should be incorporated into dairy heifer housing as a way of bettering animal lives.

## Humane Killing: Coho Salmon Behaviour during Exposure to Anaesthetics

**Betsy Robertson**

Each year in Canada, approximately one million fish are used in research studies, at the end of which most are killed. This is often done with an overdose of anaesthetic in part because this is considered to be humane. However, the most commonly used anaesthetic, tricaine methanesulfanate (TMS), was found to be aversive for zebrafish, but little is known about how other fish species respond to this and other agents. One method of assessing the animal welfare effects of different agents is measuring changes in behaviour, but the literature is currently lacking regarding fish behaviour during exposure to anaesthetics. The aim of this study was to assess behavioural responses of coho salmon (Oncorhynchus kisutch) during anaesthetic induction with different concentrations of TMS and two other agents (eugenol and metomidate hydrochloride). A total of 108 salmon were exposed to these agents; behavioural responses (coughing, headshaking, and increased swimming activity) were assessed via continuous focal sampling of video recordings. The lowest frequencies of these behaviours were displayed by salmon exposed to metomidate. For example, average coughs per second during the initial stages of induction were 0.65 ± 0.07 with TMS, 0.92 ± 0.05 with eugenol, and 0.05 ± 0.01 with metomidate; headshaking occurred with higher concentrations of TMS and eugenol but not metomidate. These findings support the use of coughing, headshaking, and increased swimming activity as indicators of aversion during anaesthetic exposure, and provide a scientific basis for the recommendation of changing from TMS to metomidate for the humane killing of salmonids.

## Henry Angus Building - ANGU 354 Time: 5:00pm - 6:30pm

### Artificial Neural Network Model of Neuronal Computation During Learning

**Andre Beukers**

Hearts pump, kidneys filter, brains compute. Unlike the machine onto which I now type however, brains do not have their software entirely pre-installed. In order for brains to perform the interesting and useful computations that give rise to mind, learning takes place. Consider Mr. A who on a foggy day sees for the first time a cedar tree. Mr. A who up to now has only seen, under suboptimal conditions, a single cedar tree is now readily able to categorize similar objects regardless of the angle, lighting conditions or situation upon which the object is encountered. Furthermore, such a cognitive process (i.e. categorization) is accompanied by phenomenal experience (i.e. mind). How do minds get so much information from such sparse and noisy sensory data? (Tenenbaum et al., 2011). In addressing the above question, I study the non-linear computations implemented by neuronal dendrites (as electrophysiological processes) and how these computations change during learning (neuroplasticity). The biophysical explanation of these computations are implemented, although considered throughout, is presently methodologically intractable. I therefore perform an exploratory modelling study that uses artificial neural networks (ANN) to model two-photon calcium imaging data from individual neuronal dendrites. ANN is a data-driven machine learning model. To study how the computations implemented by neurons change during learning I fit and analyze two multi-layer perceptron network models, one to a pre-learning neuron another to a post-learning neuron.

### Uncovering the Unconscious with Ouija boards: a new platform for understanding semantic implicit memory

**Mahtab Borhani, Andrew Mcdonald, Annie Wang, Remi Kandal**

Long-term memory is split into two classifications: explicit and implicit. Implicit memory describes memory that is not available to conscious awareness, skills that an individual has but cannot describe consciously, or automatic responses; whereas explicit memory can be retrieved, recollected and reflected upon consciously. The nature of implicit memory makes it difficult to study by traditional means, as a lack of conscious awareness implies an inability to self-report memory acquisition. Traditional definitions of implicit and explicit memory suggest familiarity is correlated with the implicit, whereas recollection is correlated with cued recall or the explicit. Taking the next step in memory research, this research aims to study the recollection of implicit memories by revealing semantic long-term implicit memories which refer to facts, concepts, or other knowledge of the world. The experiment creates a hypothesis that synthesizes the concept of ideomotor actions, which are actions performed nonconsciously that arise as an expression of a nonconscious thought, with implicit long-term semantic memory: using the Ouija board as a platform, nonconscious knowledge can be revealed via ideomotor actions.

## Behavioural Biomarkers of Parkinson's Disease Implemented as Games

**Laura Jowon Kim**

Parkinson's disease (PD) is a neurodegenerative movement disorder characterized by tremor,rigidity, postural instability, and cognitive deficits. Biomarkers, quantitative measures of biological processes, are important for PD because: 1) patients become symptomatic after the majority of dopamine secreting cells are lost, so detecting the pre-symptomatic stage is of upmost importance, 2) early stages of the disease may be confused with similar conditions like Essential Tremor, 3) quantitative assays of motor and cognitive performance are needed to track disease progression and effects of therapy. Therefore, improved identification of behavioural biomarkers may lead to great advances in early pre-symptomatic detection of PD. Quantification of behavioural biomarkers via an accessible, tablet-based game holds great potential in measuring and monitoring PD patients in their own home, instead of them having to travel to a centralized location to receive a lab-based assessment. This will ensure that patients remain engaged and utilize the measurement frequently, and may ultimately be invaluable in designing patient-specific therapeutic approaches. In this presentation, we introduce "Pumpkin Garden", a tablet-based game in development by rearchers of UBC (Pacific Parkinson's Research Centre) and NTU (Singapore), which aims to complement traditional clinical diagnosis of PD and provide insight into the relationship between disease progression, currently validated clinical assessments, and game performance. The game includes engaging tasks which measure motion synchronization ability, task-switching, micrographia, and short-term memory of players. The design and development of the game, scientific and clinical implications, and future steps in implementation for use in the clinic and home will be explored.

## Improvements in functional mobility seen with different combinations of rehabilitative training in individuals with incomplete spinal cord injury

**Andrew Au, Chelsea Chua, Felix Ng**

Spinal cord injury has an annual incidence of nearly 500 000 worldwide, with approximately half classified as 'motor-incomplete' (iSCI), implying some preservation of motor function. Functional ambulation, the ability to walk safely in a daily life setting, is often compromised within these individuals. Previous studies have established effective functional ambulation rehabilitation methods for iSCI patients including resistance strength training, functional electrical stimulation (FES), and body weight supported treadmill training (BWSTT). However, the potential benefits of these methods in combination have not yet been explored. Thus, this study aims to investigate whether the combination and order of training results in varying degrees of benefits in the functional ambulation of iSCI patients. Individuals will be recruited according to the classification system of the American Spinal Injury Association. The three rehabilitations interventions used in the proposed study are: 1) Strength: resistance training targeted at lower limb muscles 2) BWSTT: harness-supported body weight during treadmill training 3) FES: stimulation of muscles associated with foot clearance during BWSTT. Participants will be randomly assigned to 1 of 6 groups, each performing a unique order of the three training interventions (each intervention lasting three months). Functional ambulation outcomes will be assessed before and after each intervention through the Spinal Cord Injury Functional Ambulation Profile (SCI-FAP) to track changes. Differences in SCI-FAP scores will be determined by using analysis of variance (ANOVA) to understand the effectiveness of each training order. The results from this study will further aid in developing novel rehabilitation strategies.

## Investigating demyelination in rat spinal cords with MRI scans and validation with tissue histology

**Tian Rabbani, Regina Wong**

Observing an increase in activity level of Holstein dairy cows is a common method for determining when she is in estrus. Estrus is a period of time when the cow is sexually receptive, and restlessness is a key behavioral characteristic of this period. When the estrus event is observed, farmers normally inseminate the cow 12-16 h later, after the end of estrus, thus synchronizing semen deposition with ovulation time. Advanced technology is used to more effectively predict when a cow is in estrus. The aim of this study was to determine whether a change in rumen-reticulum temperature is correlated with a change in activity level during estrus. A collar-mounted automated activity monitor (AAM) was used to determine the change in movement of cows during estrus. The AAM continuously recorded the movement of the animals and changes in movement were wirelessly transmitted to a database every 2 h. Thermometer boluses were inserted into the rumen of the cows for the continuous monitoring of body temperature; rumen-reticulum temperature was logged every 1 h. Data collected from the two devices were analysed using the MIXED procedure of SAS with cow as a random effect. High peak activity had higher maximum temperature around estrus (MTE) than those with low peak activity. Long duration of estrus were associated with higher MTE than short durations. Overall, animals with high expression of estrus, measured by AAM, had increased body temperature during estrus. Future research needs to be performed to determine whether this increase in temperature at estrus can be used to make an automated alert for estrus or ovulation using only the bolus thermometers.

## Non-coding RNAs in Cancer: From Bench to Clinic

**Kevin Ng**

The advent of next-generation sequencing has moved the non-coding RNA transcriptome to the forefront of cancer genomics. In particular, small non-coding RNAs have emerged as major regulators of key cellular processes such as proliferation, RNA splicing, gene regulation, and apoptosis. Functioning primarily in the cytoplasm, microRNAs (miRNAs) remain the best studied and understood of the small non-coding RNA family. We have recently identified miR-106a and miR-106b as being overexpressed in metastatic lung adenocarcinoma. Cell models indicate these miRNAs are metastatic agonists, affecting the metastatic potential of cells likely through EMT-dependent mechanisms. Additionally, tumours with high expression of these miRNAs had an increased mutational burden. Based on in vitro cell cycle results, these miRNAs likely decrease the expression of cell cycle regulators leading to escape and propagation of sequence errors. In contrast to miRNAs, PIWI-interacting RNAs (piRNAs) function in both the cytoplasm and the nucleus, and their role is best understood in the context of germline gene silencing. We have recently described widespread somatic expression of piRNAs in both malignant and non-malignant tissue, with piRNA expression patterns able to distinguish tissue of origin. An increasing number of studies have shown that aberrant piRNA expression is a signature feature across multiple tumour types, and represent an exciting field of research both mechanistically and clinically.

## Henry Angus Building - ANGU 243 Time: 5:00pm - 6:30pm

### Difficulty breathing? The critical role gut microbes play in preventing allergic asthma

**Emily Fogarty**

Asthma affects ~300 million people worldwide and is a growing concern in developed countries. Allergic asthma is triggered by an inappropriate immune response to a harmless substance in the environment. Immune cells called T-helper 2 cells secrete a chemical signal called IL-4. This stimulates B-cells to produce antibodies that elicit inflammatory responses from cells in the airway, causing difficulty breathing for asthmatic patients. The question is why does the body recognize these harmless substances as dangerous invaders? From birth, humans are all colonized with hundreds of species of beneficial microbes that mainly reside in our gut. It has been hypothesized that these microbes are necessary to educate the immune system correctly and prevent the body responding to harmless environmental triggers. When children are given high doses of antibiotics, this decreases the diversity of their gut microbes and decreases the continual stimulation of the immune system, potentially increasing their risk of developing allergic asthma. My research, within the Finlay laboratory, uses a mouse model to look at the oral administration of the antibiotic vancomycin. This antibiotic decreases the diversity of gut microbes in mice. I am aiming to determine how administration of vancomycin affects the secretion of certain antibodies by B-cells. The aim is to determine what signals lead to their production and where this occurs. We hypothesize that the secretion of these antibodies promotes the development of allergic asthma. Determining the mechanisms of allergy development allows for future therapeutic advances potentially targeting gut microbes to prevent allergic asthma.

### Enterovirus: An emerging role in ALS

**Jacqueline Siu**

Amyotrophic lateral sclerosis (ALS) is a neurodegenerative disease affecting brainstem and spinal cord motor neurons. It is the most common motor neuron disease worldwide, and <20% of patients with ALS survive more than 5 years. Although ALS has been described for over 140 years, there is still no cure or effective treatment. Dr. Prusiner's discovery of prions broadened our definition of an infectious agent from a foreign pathogen to include small, proteinaceous, infectious particles. This prion paradigm, with its pathobiology of protein misfolding and aggregation, has since been associated with numerous neurodegenerative diseases including ALS. However, the underlying causes of ALS remain unclear. Enterovirus infection has been linked to ALS pathogenesis since 1972 the late seventies. Despite this, the mechanism(s) by which a previous enterovirus infection contributes to ALS pathogenesis remains elusive. Using virion and host factors, enteroviruses often alter a cell's apoptotic/ programmed cell death pathway in persistent infections; the apoptosis pathway is also a major factor in ALS motor neuron death. Specifically, TAR DNA-binding protein 43 (TDP-43), a key component of ALS pathogenesis, has been shown to mislocalize into the cell cytoplasm following enterovirus infection. We hypothesize that a previous enterovirus infection can contribute to ALS pathogenesis through disruption of nucleocytoplasmic transport of various key prion-like proteins as well as by contributing to chronic neuroinflammation. Specifically, I demonstrate how host TDP-43 and exosomes modifications result from an enterovirus infection, and how these modifications can contribute to ALS neuropathophysiology. Finally, I propose how future treatments can target the host modifications identified.

## The Confluence of Food and Judaic Practice in Lodz Ghetto, 1939-1944

**Maria Dawson**

Taken from a larger thesis project that examines the ways different groups interacted with food in the Lodz ghetto during World War II, this presentation focuses on the confluence of food and Judaic practice within the confines of the ghetto. Located in central Poland, the Lodz ghetto was established by the Nazi Germans in 1939 and existed until August of 1944. It was created to segregate Jewish citizens of the county, and eventually became part of the Nazis' Final Solution, their effort to exterminate the European Jewry. Within the ghetto starvation was rampant; food deliveries were few, infrequent, and often of low quality. This presentation will briefly explore how different people navigated the potential tensions between the observation of religious tradition and maintenance of one's own health, and how the Jewish governing body within the ghetto, the local Nazi German authorities, and the ghetto residents navigated these holidays over the course of the ghettos existence.

## Performing Gender and Race in Indie Music: Whiteness, Masculinity, and Discursive Silences

**Heather Gunn**

My project is an interdisciplinary research paper that uses intersectional feminist frameworks and critical race theory to analyze musicological and ethnomusicological research on indie rock music. I assert that the scholarship on indie music (particularly indie rock) has been discursively dominated by narratives that normalize white masculinity and hold up the voices of any minority as "the other". Research on music made by women of colour, for instance, is plagued by extensive discussions of identity and how it factors into their music-making. This implies that their minority status is more discursively important than their work. In contrast, research on music made by white men, (which is comprises the majority of the existing literature,) glosses over and is not critical of identity factors that contribute to their music-making or their commercial and aesthetic success. My observations suggest that there should be more research on the music of minorities in indie and alternative genres, and for further application of critical race and intersectional feminist theories to research on white male performers.

## The Establishment of Sexual Norms in Ancient Greek Culture Via Erotic Art

**Michelle Milton**

The Western world has been profoundly affected by strict values concerning sexuality, sexual expression and gender. The study of sexuality and gender in ancient Greece- a place widely considered the cradle of the democratic Western civilization- has been purposefully ignored by 19th and 20th century scholars to avoid any unsavoury linkage. It is within the last few decades, when sexuality and gender enter popular discourse and fields of study, that we begin to speculate on ancient Greek views of sex. Ancient Mediterranean culture understood sex, in the most basic terms, as an act a person does to another. Unlike the Judeo-Christian tradition of the West, sexual thought wasn't defined by recourse of religion, but with consensus. Indeed, all sexual acts were accepted by the community at large, so long as they didn't threaten the political life of the city. Scholars have done immense work identifying the mythical figures and gods present in erotic art, but they do not seem to directly address their significance for the potential ancient Greek viewer. Using five artefacts ranging from 520 B.C to the 3rd century B.C, from Corinth, Athens and Vulci, the presentation will demonstrate how the ancient Greeks established sexual norms, and guided citizens from potentially disastrous behaviours for the community at large and the polis.

## How appropriate are red blood cell transfusions in the Neonatal Intensive Care Unit in B.C. Canada?

**Claire Tsai-Yi Wu**

Red blood cell (RBC) transfusions are a mainstay of treatment for individuals who are bleeding and anemic. It is associated with poorer outcomes in some patient populations and is a costly treatment with demands in excess of supply. Though RBC transfusions should be undertaken only when necessary, it is not known what proportion of transfusions are given for appropriate reasons in B.C. Therefore, we have undertaken a retrospective study to identify the number of appropriate versus inappropriate RBC transfusions in the Neonatal Intensive Care Unit (NICU) at B.C. Children's Hospital. The eligible study population is any non-surgical recipient of RBCs in the 2014 calendar year, which was used to calculate a sample size of 182 transfusion events. All clinical information was stored online using REDCap and extracted electronically with Powerchart/Cerner and individually with patient charts. The details of each transfusion event were reviewed by a hematopathologist to determine appropriateness. Of the 182 transfusion events, 66% of transfusions in 2014 was considered to be appropriate with recipients (71% males) born at 27.4±3.6 weeks with a birth weight of 1.0±0.6 kg and pretransfusion hemoglobin of 96.7±17.6 g/L. The most responsible diagnosis was prematurity (82%) along with confounding factors, such as anemia of prematurity (81%), intra-uterine growth restriction (25%), and respiratory disease (96%). These results help to establish a baseline appropriate RBC transfusion rate in the NICU population of B.C. and identify suboptimal practices, which can be targeted with education to improve patient safety.

# POSTER PRESENTATION OVERVIEW (1)

DAY 1 PROGRAM - MARCH 29, 2016

## Irving K. Barber Learning Centre - 2nd Floor Foyer

## Time: 6:45pm - 8:00pm

| *Research Topics* | *Presenters* |
|---|---|
| The Effects of Graphene Oxide on Cancer Stem Cell Differentiation | Laveniya Kugathasan<br>Ho-Young Jung |
| Investigating the Acute Glycemic Response to High-Intensity Interval Training in Type II Diabetes | Trevor O'Malley |
| The absence of effector proteins in S. typhi causes systemic infection in humans. | Candace Yip<br>Dylan Zhao<br>Margaret Lee<br>Meilin An |
| How Novel Objects Affect Aggression in Zebrafish | Rachel Koo |
| Temporal Dynamics of Audio-Visual Speech Integration in Infants | Cassie Tam |
| Reference and reference-free genome similarity comparisons using Bloom filters | Kerri Mak<br>Tamar Av-Shalom<br>Anna Zietlow<br>Estelle Wu |
| Microbial diversity of alginate degrading culturable isolates associated with the kelp Macrocystis pyrifera | Jordan Lin |
| Application of statistical deconvolution in peripheral whole blood of individuals with allergic asthma | Gemma Jo<br>Brian Kim<br>Iris Liu<br>Judy Song<br>Wendy Song |
| The impact of water stress and re-watering on the morphology, physiology, and biochemistry of green bean (Phaseolus vulgaris) plants | Gagandeep Gill |
| Effects of active anti-methamphetamine vaccination, MH2[R], on amphetamine addiction in rats | Alireza Alimadad<br>Ariel Zhang<br>Oonagh Fogarty<br>Aman Sharma<br>Minjie Woo |
| Comparative Analysis of Static and Dynamic Intraoperative Skull-Femoral Traction (IOSFT) in Adolescent Idiopathic Scoliosis (AIS) Correction | Yale Tang |
| The role of glia in neurodegenerative diseases | Veronica Pagowski<br>Justin Jao |

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| | Joanna Xia<br>Lucy Lui<br>Fiona Corcoran |
| Effects of Prenatal Alcohol Exposure and Early Life Adversity on Anxiety-Like Behaviour in Adolescent Rats | Kiran Ubi |
| Computational and structural analysis of non-synonymous single nucleotide polymorphisms in human FXN (frataxin) gene | Neha Deo<br>Jubin Kim<br>Ting Cheng<br>Hakhamanesh Behmanesh |
| Affects of aerobic exercise on working memory capacity and cognitive performance in anxious individuals | Barbara Lindner |
| The role of caspase-12 during ER stress in β-cells | Kate MacDonald<br>Hootan Roshand |
| Defining the distribution of Gα13 and branched N-glycans with respect to Cav1 and focal adhesions and to identify the components of the Gα13-Cav1 signalling mechanism | Ian Ang |
| Carbon Exchange in Plants of Burns Bog | Devin Gamble<br>Anson Yam<br>Joe Wang<br>Zarah Zheng |
| Epidemiology of cardiac surgery associated acute kidney injury in neonates: A prospective cohort study | Alanna De Mello |
| Design Studies of a Free Electron Laser for TRIUMF's ARIEL Electron Linac | Ali Muljiani<br>Aaron Troy<br>Hafsa Zahid |
| The Impact of Sociocultural Factors on the Experience of Computerized Dementia Screening | Jen-Ai Lai |
| Effectiveness Of Different Noise Cancelling Algorithms On Electroencephalography Data | Clarence Su<br>Onurtuna Onurtuna |
| CRISPR-Cas9 and Gene Editing: A Wonderfully Dangerous Scientific Advancement | Jake Johnston<br>Blake Tamboline |
| Bridge Principles and the Normativity of Logic | Adrian Yee |
| A Prospective Longitudinal Study on the Impact of Cognitive Flexibility on Crime Rates, Income, Health and Higher Education. | Ting Ting Ma<br>Sarah Abdelazim<br>Sukhi Dhindsa |
| COMPOSTABILITY OF SINGLE SERVE BEVERAGE INGREDIENT PACKAGES | Miriam Pang |
| Perceptual Learning of speech sounds: A bias for 'sippers' over 'zippers'? | Zoe Lawler<br>Carolyn Norton |
| Hygiene Hypothese | April Tian<br>Jasper Yoo<br>Sumire Sasayama |

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|---|---|
| Statistical Analysis of Somatic Mutations and Gene Expression Data for Diffuse Large B-cell Lymphoma, Bladder Cancer and Stomach Adenocarcinoma | Shideh Mirhadi |
| Mechanisms of Regulatory T cell proliferation after allergen immunotherapy | Haya AbuZuluf<br>Jae Sheen |
| The Effect of H3K27ac-associated Cancer-Specific Enhacers on Gene-Expression in Pancreatic Cancer | Kathy Ma<br>Jenn Ko<br>David Jung<br>Andrew Oh |
| Labor Market Discrimination | Viyan Petekkaya |
| Screen of schizophrenia-linked IgSF proteins for roles in synapse formation | Alex Badalan<br>Alex Law |
| The Venture Formation Process: Setting Apart High-impact and Marginally Innovative Start-ups | Alex Nguyen |
| The Effect of Impact Energy and Turgor Pressure on the Bruise Volume of BC Royal Gala Apples | Summer Shan<br>Mary Shen<br>Leo Chen |
| Tuberculosis - a disease of the poor | Himani Bhatnagar |
| Vaccination Gantenerumab prevents memory loss and amyloid burden in an APP23 mouse model of Alzheimer's disease. | Rebecca Chen<br>Ashley Lee<br>Chris Chang<br>Chizom Wali |
| Relationship of perioperative variables and renal graft function in pediatric renal transplantation patients at discharge, six months, and twelve months: a single center study. | Boyuan Zheng<br>Erick Carreras |
| Early Life Differences in the Microbial Composition of Cesarean Born Infants | Dora Xiong<br>Amila Tjoa<br>Veronica Lai<br>Quinn Stewart |
| To establish the toxicity of personal care products using human spermatozoa as a biological screening model | Amolak Dhillon<br>Anokh Dhillon |
| The gut microbial ecology of seagrass associated invertebrates | Bobby Chan |
| IDH Real-Time PCR Genotyping Assay in Gliomas | Jessica Que |
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| Modulation of Synaptic Plasticity by MEF-2 Transcription Regulated Genes | Laura Gomez |
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# POSTER PRESENTATION ABSTRACT (1)

MARCH 29, 2016

## Irving K. Barber Learning Centre - 2nd Floor Foyer

## Time: 6:45pm - 8:00pm

### The Effects of Graphene Oxide On Cancer Stem Cell Differentiation

**Laveniya Kugathasan, Ho-Young Jung**

Medulloblastoma (MB) is the most common type of pediatric brain tumor, and comprises 20% of all childhood cancers. MB was first known as a single disease entity but now has been classified as four distinct molecular variants based on tumor heterogeneity. The Cancer Stem Cell (CSC) hypothesis states that a subpopulation of cancer cells play a significant role in initiation and recurrence of the primary tumors. CSCs exhibit stem cell-like properties and are capable of self renewal and undergo multi-lineage differentiation. The high tumorigenic potential of CSCs make conventional treatments like chemotherapy and radiation therapy ineffective, leading to poor disease prognosis. Graphene is a two-dimensional, hexagonal lattice sheet of pure carbon that can be oxidized to synthesize the hydrophilic derivative graphene oxide (GO). The role of graphene has made significant advances in drug delivery systems because of its nontoxic, inert nature and ability to bind to cell surfaces. The hydrophilic derivative, GO flakes has recently demonstrated its capability to selectively target CSCs and induce differentiation of CSCs in six different prominent cancers. Signal transducer and activator of transcription 3 (STAT3) signal transduction pathway was found to be significantly inhibited in tumor cells administered with GO flakes. We propose a study to investigate the efficacy of GO flakes as a novel anti-cancer therapeutic drug in MBs. We also seek to further understand the mechanism by which GO flakes inhibit the major signal transduction pathway that has been known to contribute to the "stemness" in multiple malignancies. GO in combination with conventional cancer treatments has the potential to revolutionize cancer treatment and improve the clinical outcome of patients via the differentiation based nano- therapy.

### Investigating the Acute Glycemic Response to High-Intensity Interval Training in Type II Diabetes

**Trevor O'Malley**

High-intensity interval training (HIIT) has gained popularity for improving metabolic health in type 2 diabetes (T2D), but the acute effects of cardio- or resistance-based HIIT on blood glucose (BG) in T2D are unclear. The purpose is to examine the variability in the acute BG response to HIIT during a 12-week training intervention. It was hypothesized that BG would decrease after exercise; however training mode, pre-exercise BG and meal timing would impact responses.

Forty participants with T2D (56 ± 10 y, A1c: 7.0 ± 0.7%, BMI: 35 ± 7 kg/m2) performed two sessions of cardio-HIIT (C-HIIT) and one session of resistance-HIIT (R-HIIT) per week for 12 weeks. BG was obtained from a finger prick immediately before and 5 minutes following each session. Meal timing and medications were recorded prior to training sessions.

On average, mean BG was lowered by 1.1 ± 1.7 mmol/L ($p < 0.01$). Reductions in BG were 0.4 ± 0.2 mmol/L greater in C-HIIT than R-HIIT ($p < 0.01$). Regression analysis revealed that pre-exercise BG predicted 22% of the variance in the delta BG ($p < 0.01$). A greater reduction in BG was seen when exercise was performed in the postprandial compared to fasted state (by 0.6 ± 0.7 mmol/L, $p < 0.01$). HIIT is an effective way to lower blood glucose in patients with T2D. The largest reductions in blood glucose were seen with cardio-based HIIT and when exercise was performed in the postprandial state.

## The absence of effector proteins in S. typhi causes systemic infection in humans

**Candace Yip, Dylan Zhao, Margaret Lee, Meilin An**

There are a number of different strains of Salmonella, a Gram-negative intracellular bacteria, of which many are known to cause illness. Two specific serovars, Salmonella Typhimurium and Salmonella Typhi, cause gastroenteritis and typhoid fever, respectively. S. Typhimurium infection occurs through the passage of the bacteria through the gastric acid barrier of the stomach to the intestine, which eventually leads to an invasion of the epithelial cells. This process stimulates a release from the immune system, which results in an inflammatory reaction. Alternatively, S. Typhi is able to cross the intestinal mucosa with a limited immune response, ultimately causing a systemic disease in humans rather than gastrointestinal disease. The difference between the two serovars may be due to loss-of-function mutations in the S. Typhi genome, causing an absence of certain effector proteins. We hypothesize that the absence of a particular effector subset is what allows S. Typhi to become systemic. The effectors of interest were cloned from S. Typhimurium and inserted into S. Typhi with the intention of generating a response in S. Typhi similar to that of S. Typhimurium. We used in vitro cell culture models, specifically TC-7 human intestinal epithelial cells and THP1 human monocytes, to evaluate invasion, replication, and immune responses.

## How Novel Objects Affect Aggression in Zebrafish

**Rachel Koo**

Environmental enrichment enhances the complexity of captive animal housing and has the potential to improve welfare by, for example, providing opportunities to explore. At the same time, however, both complex housing and exploratory behavior have been found to be associated with increased aggression in some species. As such, before adopting a new form of environmental enrichment, it is desirable to evaluate its impact on aggression. In the present research, we assessed the effect of novel objects—which stimulate exploratory behavior and could thereby improve welfare—on aggression in zebrafish (Danio rerio). Over the course of a month, we placed 30 novel objects in 6 zebrafish tanks (10 fish/tank) for 10 minutes and each object presentation was recorded on video. We counted the number of aggressive acts over two 100 second periods: (i) when the object was first placed in the tank and (ii) 400 seconds later right before the object was removed. We compared aggression during these periods to aggression during a baseline period, one hour before the object was placed in the tank. We found a significant decrease in aggression during the beginning of object presentation ($p < 0.0001$), but that aggression quickly rose back to baseline levels even within the first 100 seconds ($p < 0.0001$). By the end of object presentation, aggression had stabilized at baseline levels. These findings suggest that novel objects are unlikely to pose welfare concerns by increasing aggression. More research is needed to determine their long-term effects on zebrafish welfare.

## Temporal Dynamics of Audio-visual Speech Integration in Infants

**Cassie Tam, D. Kyle Danielson, Padmapriya A. Kandhadai, Janet F. Werker**

Research has demonstrated that infant speech perception is multisensory early on (Navarra et al., 2012). Infants have been shown to match seen and heard speech in native and non-native languages without prior experience (Kuhl & Meltzoff, 1982; Patterson & Werker, 2003; Pons et al., 2009). However, little research has explored the temporal dynamics of audio-visual speech perception in infants. Thus, this experiment examines how infants integrate audio-visual speech when perceiving an unfamiliar language. Six-month-old English learning infants were familiarized with dental and retroflex syllables in Hindi, which do not exist in English. These sounds were mismatched such that infants heard dental syllables while seeing a speaker produce the retroflex syllables, or vice versa. There were three familiarization conditions that varied the saliency of each sensory modality: the audio track preceded the visual track, the visual track preceded the audio track, or both were presented simultaneously. During the test trials, infants were presented with four audio tracks (two of each syllable) and a checkerboard on the TV while looking times to the screen was measured. It was predicted infants would match the test syllables to the item that they perceived during familiarization. If infants used auditory information to categorize the syllables, they would look longer to the checkerboard with the sound they heard during familiarization. If they used visual information, they would look longer to the sound they saw during familiarization.

## Reference and reference - free genome similarity comparisons using Bloom filters

**Kerri Mak, Tamar Av-Shalom, Anna Zietlow, Estelle Wu**

Early discoveries in the field of comparative genomics have allowed researchers to explore an organism's evolutionary relationships, culminating in the construction of an accurate tree of life. With the advancement of DNA sequencing technologies, there has been an exponential increase in genomic data, requiring the development of more efficient tools capable of comparing genomes. Conventional methods require that the collected genome data be fully aligned before being analyzed. Often, these dataset are also required to be fully assembled in advance, which can be difficult due to the unavailability of full genome assemblies for certain organisms. Our objective is to design a tool which will be able to process assembled and unassembled genome datasets, and determine the similarity between them with comparable or better figures than the current literature. The applications to such a tool may be extremely broad. Uses could include determining the phylogenetic distance between two species and detecting parent - child relationships between individuals. A low - memory, probabilistic data structure, a Bloom filter could potentially be employed because of its ability to represent sets of data without alignment. We propose a new algorithm which utilizes Bloom filters for comparing genome to overcome these issues.

## Diversity of bacteria associated with the kelp, Macrocystis pyrifera

**Jordan Lin**

Kelp forests are an integral and highly productive part of the coastal marine ecosystem. Kelp provide a habitat, growth substrate, and nutrient source for many marine organisms. The role of bacteria in the productivity of this ecosystem is of great interest, as they may participate in the cycling of kelp carbon. Kelp tissue contains a high abundance of alginate as its main carbon source and alginate can be broken down and consumed by certain bacteria. Thus, bacteria growing on kelp that can digest alginate may be important contributors to kelp degradation and nutrient cycling.

The goal of this project is to investigate bacterial communities directly associated with the giant kelp Macrocystis that can be grown in the lab. By testing these bacteria to see if they degrade and consume alginate, evidence may be obtained to support their hypothesized role in kelp carbon cycling. To accomplish this, Macrocystis individuals off the coast of Calvert Island, BC were sampled from 3 kelp beds. Bacteria were isolated and grown in the lab, tested for the degradation of alginate, and sequenced to discover their identities. The results of these analyses will allow us to determine whether alginate degradation is a common trait among the bacteria living on kelp.

## Application of statistical deconvolution in peripheral whole blood of individuals with allergic asthma

**Gemma Jo, Brian Kim, Iris Liu, Judy Song, Wendy Song**

Transcriptomic studies of whole blood are usually challenged by the heterogeneous nature of blood. Statistical deconvolution, as an alternative to experimental separation of the cell types, offers a simpler and more practical approach to infer cell type-specific expression and cellular composition. In our study, statistical deconvolution was used to estimate both the cellular composition and the cell type-specific expression in peripheral whole blood of individuals with allergic asthma. We hypothesized that statistical deconvolution analysis would accurately quantify the cellular composition and the cell type-specific expression in individuals with allergic asthma.

A cell type-specific expression signature was created based on publicly available expression profiles from purified blood immune cell subset (E-GEOD-48558). With statistical deconvolution, the cell-type specific expression signature was used to estimate the cellular composition of whole blood of fourteen subjects with mild allergic asthma that underwent an allergen inhalation challenge. Peripheral whole blood samples were collected prior to and two hours after the challenge. Upon allergen exposure, individuals with an isolated acute airway contraction were classified as early responders (ERs) and individuals with both the acute airway contraction and another chronic airway contraction were classified as dual responders (DRs). Expression profiling was performed using Affymetrix Human Gene 1.0 ST arrays and the cellular composition was measured through an automated hematology analyzer.

The estimated cellular composition was compared against the measured cellular composition. The performance of estimation was high in quantifying granulocytes ($R^2$=0.84, RMSE=0.049) and T cells ($R^2$=0.86, RMSE=0.060) but relatively low in monocytes ($R^2$=0.39, RMSE=0.024) and B cells ($R^2$=0.47, RMSE=0.025). Differential expression analysis and statistical deconvolution were applied to compare the gene expression and cell type-specific expression of ERs to that of DRs. No significant genes were found by comparing ERs with DRs through a differential expression analysis. However, 692 genes were down-regulated in granulocytes of DRs compared to those of ERs after applying deconvolution.

## The impact of water stress and re-watering on the morphology, physiology, and biochemistry of green bean (Phaseolus vulgaris) plants

**Gagandeep Gill**

There is a considerable amount of literature that states that water stress has an effect on plant growth and productivity. However, the impact of re-watering on the growth and productivity of water-stressed green bean (Phaseolus vulgaris) plants has not been studied. Therefore, I propose to assess the impact of water stress and re-watering on the morphology, physiology and biochemistry of water-stressed green bean plants in order to determine the limits of green bean resilience to water stress. Two-week-old green plants were subjected to water stress at different time intervals, followed by re-watering. Morphological changes were determined by measuring leaf size, wilting, and plant height. Physiological changes were analyzed by measuring the carbon sequestration and transpiration rates using a gas exchange system (CI-340 Photosynthesis system). The biochemical parameter dehydrin, a stress protein related to dehydration, was analyzed using SDS-page gel electrophoresis and Western Blot. My results indicate a decrease in plant height and leaf area and an increase in leaf wilting in water-stressed plants compared to non-stressed control plants. My results also indicate a decrease in carbon sequestration and transpiration rates in the water-stressed plants, with a larger decrease as severity of stress was increased. The Western Blot of the secondary and quaternary leaves of plants from different stress groups showed strong bands, which indicated the presence of dehydrin. The significance of water stress and re-watering in growth and development of green plants will be discussed.

## Effects of active anti-methamphetamine vaccination, MH2[R], on amphetamine addiction in rats

**Alireza Alimadad, Ariel Zhang, Oonagh Fogarty, Aman Sharma, Minjie Woo**

There is a current lack of effective pharmacotherapeutic interventions for addiction to psychostimulant drugs like amphetamine. Vaccines for drugs of abuse are increasingly being investigated in preclinical models of drug abuse and also show promise in clinical trials. Vaccines against drugs like methamphetamine produce an immunological response when the drug is taken by an addict. Despite this progress no vaccines exist that target amphetamine, which is an active metabolite of methamphetamine. We will investigate the efficacy of an existing vaccine undergoing Phase II clinical trial for methamphetamine, MH2[R], for the treatment of amphetamine addiction in rats. Behavioural paradigms such as self-administration of amphetamine and locomotor sensitization will be used to evaluate the effectiveness of MH2[R] on amphetamine reinforcement. This investigation will identify if treatments for methamphetamine are effective for addicts who also abuse amphetamine.

## Medieval tools in modern times: Dynamic vs. Static Traction in AIS Correction Surgery

**Yale Tang**

Objective: Existing literature suggests Adolescent Idiopathic Scoliosis (AIS) correction with Intraoperative Skull-Femoral Traction (IOSFT) to be an effective and safe adjunctive technique of reducing healthcare resource use in spinal curves >80 degrees. No published reports compare safety nor efficacy of various traction methods. Dynamic IOSFT entails hanging weight from bilateral femora and the skull, while static IOSFT places a fixed traction force. To compare the intra- and post-operative neurologic safety and clinical efficacy of static and dynamic IOSFT.

Hypothesis and Design : Static and dynamic IOSFT are equally safe and efficacious in AIS correction. Ninety-nine consecutive surgical patients treated by two surgeons at a tertiary care facility with minimum 6-month follow-up between 2011 and 2014 were identified. Sixty-three patients received static and 33 patients received dynamic IOSFT. Each surgeon employed only one mode of traction. Primary outcome measures included neuromonitoring (NM) changes, estimated blood loss (EBL), operative (OR) time, length of stay (LOS), percent curve correction and complications.

Results: Demographic variables, NM changes, EBL, OR time, LOS, curve correction and complications were non-significant between static and dynamic groups. Mean spinous process removal (osteotomy) was significantly higher in the static group.

Conclusion: IOSFT in AIS correction is a safe and effective adjunctive technique even in curves <80 degrees, without neurologic complications in this cohort and similar rates of NM changes regardless of static or dynamic application. Clinical outcomes, healthcare utilization and postoperative radiographic outcomes were excellent compared to published non-traction cohort literature. Further research should quantify safe amounts of IOSFT.

## The role of glia in neurodegenerative diseases

**Veronica Pagowski, Justin Jao, Joanna Xia**

Alzheimer's disease (AD) is a major source of suffering throughout Canada and the world. Evidence shows that glial cells play a significant role in the progression of AD. Glia are commonly found in the brain in the form of astrocytes, microglia, oligodendroglia, satellite cells and schwann cells.

In the past, glia have been characterized as a glue, structuring and ensheathing the nervous system. However, recent research has investigated the specialized roles glia play in providing nutrition to neurons, repairing damage in the nervous system, and regulating neuronal interactions in the brain.

This study investigates the role of glia in AD by reviewing previous literature on the influence of glia on cognitive decline. Specifically, we will focus on studies regarding changes in glial morphology and abundance, as well as the role of glia in providing energy for neuronal activity, regulating extracellular calcium levels, and affecting the formation of reelin and beta amyloid plaques in AD. Finally, we will evaluate the practicality of the Blue Brain Project, an attempt to reverse engineer the human brain and recreate it at the cellular level, and suggest possible future improvements to such simulations.

## Effects of Prenatal Alcohol Exposure and Early Life Adversity on Anxiety-Like Behaviour in Adolescent Rats

**Pushpkiran Ubi**

Fetal Alcohol Spectrum Disorder (FASD) encompasses a wide range of cognitive, social, behavioural, and biological deficits resultant from prenatal alcohol exposure (PAE). PAE has been shown to increase the prevalence of mental health problems, including anxiety. Moreover, children with FASD are at a higher risk of being exposed to adversity in their lives, going through experiences such as foster care, and physical, emotional, or sexual abuse. Previous literature has shown that both PAE and early-life adversity individually increase prevalence of anxiety in adolescence but their combined effects have yet to be studied. Therefore, with the use of a rat model, the goal of this study was to examine the unique and/or interactive effects of PAE and early-life adversity on anxiety-like behaviour. Pregnant females were assigned to three different diet groups: PAE (liquid ethanol diet - 36% ethanol-derived calories), pair-fed (liquid control diet yoked to PAE consumption), and control. In addition, to model early-life adversity, half the litters in each group were exposed to a limited bedding environment from postnatal day (PND) 8-12, a procedure shown to induce abusive-like maternal behaviour. Anxiety-like behaviour was then tested for each pup on PND30 and PND45 with the use of the Light-Dark Emergence test. Preliminary data analysis suggests that PND30 PAE males and females show signs of anxiety-like behaviour. In conclusion, our results indicate that PAE alone or in combination with early-life adversity produces signs of anxiety-like behaviour; however, this effect was sex and age specific. Supported by NIH/NIAAA R37AA007789 and R01AA0222460, and NeuroDevNet.

## Computational and structural analysis of non-synonymous single nucleotide polymorphisms in human FXN (frataxin) gene

**Neha Deo, Jubin Kim, Ting Cheng, Hakhamanesh Behmanesh**

Friedreich ataxia is an autosomal recessive neurodegenerative disease that occurs mostly due to the expansion of GAA trinucleotide repeats in the first intron of FXN gene. Although little is understood about the causation of Friedreich ataxia, recent studies suggest that point mutations might be involved in Friedreich ataxia patients. With a total of 95 non-synonymous single nucleotide polymorphisms (nsSNPs) reported for FXN gene on the Single Nucleotide Polymorphism Database (dbSNP), this study provides structural and functional insights into the effect of these nsSNPs on the stability and activity of mutant frataxin protein. The harmfulness of these nsSNPs was evaluated using eight different computational approaches such as I-mutant, SIFT, Polyphen2, SNP & GO, Mutpred, etc. Deleterious nsSNPs were prioritized and further evaluated for protein stability changes. Protein crystal structure for frataxin protein was obtained from the protein data bank (PDB), while the mutant protein structure was modelled using homology modelling. GROMACS (Groningen machine for chemical simulations) was used to simulate native and mutant protein structures over time. Loss in structural and functional protein characteristics was observed in the case of mutant by evaluating hydrogen bonds, solvent accessibility surface area, root mean square deviations, root mean square fluctuations, etc. over a fixed time interval. Our analysis provides a basis for understanding the effects of functional nsSNPs in changing the dynamic behavior and structural conformation of FXN protein and their role in causing Friedreich ataxia.

## Affects of aerobic exercise on working memory capacity and cognitive performance in anxious individuals

**Barbara Lindner**

Research has suggested that anxiety has positive affects on cognitive performance in individuals with high working memory capacity (WMC) and adverse affects on cognitive performance in those with low WMC. Working memory capacity is defined as the ability to hold and manipulate information in memory to formulate a response. Evidence also suggests that WMC can be improved by engagement in moderate intensity aerobic exercise - which is defined by the Canadian Physical Activity Guidelines (2012) as any movement of the body produced by skeletal muscles that increases heart rate, breathing, and energy expenditure. Notably, research has demonstrated that exercise has a particularly augmenting affect on WMC in individuals with inherently low WMC. However, there appears to be room in the literature for exploring a combination of these findings, specifically how exercise affects WMC in anxious individuals with low WMC - and, if there is a resulting increase in WMC due to exercise, will it improve cognitive performance. The purpose of this study is to examine whether an endurance aerobic exercise program can improve the WMC of anxious individuals with low WMC. If this is the case, will improvements in WMC translate into greater performance on cognitive tasks. Exploring these concepts is important as the results have an impact on the cognitive testing abilities of those who find their anxious states debilitating and may be unable to reach certain academic, career, or life aspirations.

## Studying the role of caspase- 12 during endoplasmic reticulum stress in β-cells

**Kate MacDonald, Hootan Roshand**

Insulin is essential for blood glucose regulation. Synthesis and maturation of this hormone occurs in the endoplasmic reticulum (ER) of β-cells – specialized cells of the pancreas. If demand for insulin production exceeds ER synthesis capacity, ER stress can occur. This phenomenon often leads to accumulation of improperly folded proteins in the ER and consequent activation of the Unfolded Protein Response (UPR). In the pathogenesis of type 1 (T1D) and type 2 diabetes (T2D), β-cells are highly susceptible to ER stress. Chronic, above-threshold ER stress often leads to β-cell dysfunction and ultimately cell death by apoptosis. In this study, we will investigate the role of caspase-12, an initiator caspase far upstream in the protein cascade activated as a result of ER stress in β-cells. This caspase's activity may be responsible for many adverse cellular consequences of ER stress, including dysfunction and apoptosis. We hypothesize that attenuation or suppression of caspase-12 expression in β-cells can protect cell function under conditions of ER stress. First, we will assess glucose response and stimulated insulin secretion in β-cells isolated from caspase-12 knockout mice, previously generated. Next, we will assess response to ER stress in the same cells, after treatment with proinflammatory cytokines and exposure to high glucose concentrations. We aim to elucidate the extent of caspase-12 involvement during ER stress-induced UPR progression in β-cells. This will improve our understanding of the molecular mechanisms underlying ER stress in β-cells and potentially lead to novel therapeutic strategies for diabetes, targeted to reduce ER stress.

## Defining the distribution of Ga13 and branched N-glycans with respect to Cav1 and focal adhesions and to identify the components of the Ga13-Cav1 signalling mechanism

**Ian Ang**

Caveolae are distinctive invaginations of the plasma membrane. In non-muscle cells, caveolin-1 (Cavl) and Cavin family members are major components of caveolae. Galectin-3 (Ga13) interacts with beta-1-6 branched N-glycans generated by the activity of the Golgi glycosyl transferase Mgat5 to promote stabilization of focal adhesion proteins within focal adhesions. A novel signaling mechanism between extracellular Gal3 binding to beta1-6 N-glycans and intracellular caveolin-1 (Cav1)is a key regulator of focal adhesion signaling, pseudopodial protrusion and cancer cell migration. In my project, I have made use of confocal microscopy to optimize Gal 3 binding and labelling on MDA 231, human breast cancer cells. By making use of a variety of conditions such as Latrunculin A, I am aiming to inhibit F-actin polymerization and thus endocytosis of Gal3. In the process, defining optimal conditions for Gal3 labelling on the cell surface. Subsequently, I am using particle localization super-resolution microscopy to define the distribution of Ga13 and branched N-glycans with respect to Cav1 and focal adhesions and to identify the components of the Ga13-Cav1 signalling mechanism.

## Effects of Vegetation on Carbon Exchange in a Restored Bog Ecosystem

**Devin Gamble, Anson Yam, Joe Wang, Zarah Zheng**

The Burns Bog Ecological Conservation Area, located in Delta, British Columbia, is one of the largest bogs in North America surrounded by urban development. Greenhouse gas exchanges in wetlands are an essential ecosystem service that mediate climate from a local scale. Bogs act as long-term carbon storages by sequestering carbon dioxide ($CO_2$), but also emit methane gas ($CH_4$). Burns Bog sustains a variety of animals, plants, and microorganisms, all of which emit and absorb greenhouse gases. Our team aims to better understand the effects of vegetation on $CO_2$ emissions and whether $CH_4$ fluxes vary with location. We measured $CO_2$ fluxes by setting up collars (open-air chambers) at sites with different vegetation types (moss, grass, and moss-grass mixture), and $CH_4$ fluxes within collars in distinct sites across our study area. We then collected portable chamber measurements of $CO_2$ and syringe samples of $CH_4$. We found that $CO_2$ collars containing more moss emitted less $CO_2$ from respiration, and that $CH_4$ fluxes showed spatial variation in one out of four collars. We suggest the conservation of bog ecosystems with high moss abundance and further research on $CH_4$ fluxes in different plant species.

## Evaluating the Diagnostic Criteria for Neonatal Cardiac Surgery-Associated Acute Kidney Injury

**Alanna De Mello**

Purpose: Cardiac surgery-associated acute kidney injury (CS-AKI) in neonates is challenging to define due to the naturally evolving pattern of kidney function during the first weeks of life. Current diagnostic criteria for AKI includes both change in serum creatinine (ΔSCr) and reduction in urine output (U/O) criteria. We compared the incidence of AKI in this population using each criteria, while also exploring the ability of urine biomarkers neutrophil gelatinase-associated lipocalin [NGAL] and interleukin-18 [IL-18] to predict post-operative AKI.

Methods: This prospective study includes 59 neonates (≤ 28 days old) who underwent cardiac surgery at BC Children's Hospital. We recorded ΔSCr and U/O up to 3 days post-operatively. Urine NGAL and Il-18 were collected pre-operatively, and at 2, 8, and 24 hours post-operatively. Area under the Receiver Operator Characteristic curve (AUC) was calculated for each biomarker to predict AKI.

Results: 24% of neonates developed AKI based on ΔSCr criteria alone, however incidence more than doubled to 56% when including U/O criteria. The 8 hour urinary NGAL biomarker demonstrated the highest predictive ability of AKI and severe AKI (stage >2) using both ΔSCr and U/O based definitions. Il-18 was a poor predictor of AKI and severe AKI at all time points.

## Design Studies of a Free Electron Laser for TRIUMF's ARIEL Electron Linac

**Ali Muljiani, Aaron Troy, Hafsa Zahid**

Free Electron Lasers (FELs) are devices that work in conjunction with particle accelerators to produce high power, tuneable laser light from a beam of high energy electrons. This is achieved by passing the beam through a series of magnets of alternating polarity known as an undulator or wiggler, where the changing magnetic field stimulates the emission of coherent radiation from the beam. This emitted light can have a wide range of adjustment, making it useful for a range of applications such as material science, molecular structure analysis, and medicine.

TRIUMF is currently building a new high power electron linear accelerator (eLinac) as part of the Advanced Rare IsotopE Laboratory (ARIEL). The addition of an infrared FEL is being considered as an extension to the eLinac. We have evaluated the design of the ARIEL eLinac to determine the operating parameters and requirements of the FEL. Our design studies outline an FEL configuration that will interface with the ARIEL eLinac and the design parameters for the beamline devices required for its operation - the wiggler, optical cavity, and chicane. The final result is a 4 micrometer infrared beam with a near megawatt max power.

## The Impact of Sociocultural Factors on the Experience of Computerized Dementia Screening

**Jen-Ai Lai**

Within the next 15 years, the number of Canadians with dementia (including Alzheimer disease) is expected to double. To ensure quality of life for our older demographic, it is imperative that innovations for screening and diagnosis of dementia are aligned with individuals' social, ethical and cultural backgrounds. Computerized cognitive screening for dementia is one such innovation that is rapidly gaining popularity in clinics across North America. While many of these tests have been validated in similar ways to their pen-and-paper counterparts, challenges associated with sociocultural factors and patient experiences with computerized tests remain poorly described. Here we will deliver results on the benefits, harms and sociocultural implications of computerized testing for dementia from the patient perspective. A series of short, semi-structured interviews will be conducted with patients undergoing computerized screening for dementia at the UBC Hospital Clinic for Alzheimer Disease and Related Disorders (UBCH-CARD). Interviews will take place both before and after the computerized screening intervention and will be designed to last 40 minutes in total .The interview guide will cover specific areas of interest such as patient trust in computer-aided diagnosis and the evolving nature of the doctor-patient relationship. Data will be coded and analysed using the constant comparison method. This project will address important issues that accompany the rise of computerized tools in the clinical context, such as ethnic and cultural disparities in patient care. Results from thisstudy will guide future efforts to promote ethical and culturally-sensitive health care delivery.

## Effectiveness Of Different Noise Cancelling Algorithms On Electroencephalography Data

**Clarence Su, Onurtuna Onurtuna**

Introduction: Measurement precision is crucial in many areas. In medicine, the precision of a measurement derived from clinical data can directly affect medical decisions, which in turn influences a patient's life. For processed electroencephalography (EEG) signals, which are used to derive depth of anesthesia indices (DOA), noise as introduced by electrosurgical interference, can cause deviations in the DOA value. Too much interference can reduce the signal-to-noise ratio to such a level that DOA values can no longer be extracted. The aim of this work is to compare different noise reduction algorithms in this setting. Methods: Using a procedural EEG generator, we will generate 60 sec segments of EEG at different levels of DOA (30-95, in steps of 5). Next, Least Mean Squares, Normalized Least Mean Squares, and Recursive Least Squares (RLS) algorithms will be applied to this data. Filtered EEG will be replayed through a DOA algorithm and resulting DOA values compared to their expected values. Root-mean-square error (RMSE) and standard deviations (SD) of 42 noisy EEG episodes will be compared for each of the three algorithms. Results: We expect the RMSE and SD of the RLS to be smaller than the respective values for both other algorithms. Conclusion: RLS is expected to be the best algorithm, since its SD is smallest, indicating it to be most effective in EEG noise data cancelling

## CRISPR-Cas9 and Gene Editing: A Wonderfully Dangerous Scientific Advancement

**Jake Johnston, Blake Tamboline**

Gene editing is the process in which the genome of an organism is modified by inserting or removing specific sequences of DNA using artificially engineered nucleases in order to obtain a specific effect. The new and most popular gene editing system is Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) and Cas9 protein system. This Cas9 system has grown exponentially in popularity because of its ability to cleave virtually any desired DNA sequence with excellent precision. Nonetheless, there are still a multitude of other gene editing techniques that are equally as popular such as, Zinc fingers, and transcription activator-like effector nuclease (TALENs). Gene editing and gene therapies show extreme promise in the fields of health, medicine, agriculture, and manufacturing. Despite these promises, gene editing is a highly controversial topic in the media due to the ethical implications that surround this technology. The data from this research report was extracted from a collection of peer reviewed journal articles, and was critically analyzed to provide inside into whether the benefits of gene editing and gene therapy outweigh the ethical implications. Ultimately it is crucial to understand gene editing, and its potential impact on the future.

## Effects of active anti-methamphetamine vaccination, Bridge Principles and the Normativity of Logic

**Adrian Yee**

Logic is the study of valid argument. By `argument' we mean a series of statements broken up into premises and an conclusion. An argument is valid if the conclusion is never false when the premises are true. Humans care about valid arguments since they show us how we can arrive at true conclusions, given true premises, with certainty. This is useful whenever we are concerned about making an argument for or against something. One difficulty for this account of validity is that there are certain valid arguments which we don't think are good for reasons independent of considerations of validity. I argue that this deficit lies in issues of relevance, computational tractability, and obligations on human action. I suggest that these issues arise when we attempt to formalize and idealize the definition of validity by using robust, mathematical frameworks. Instead of rejecting the mathematical tools used in such formalizations, we should instead reflect on what we value in arguments besides that they are valid. Sometimes we value reasoning which deals with inconsistent information or instead values preserving relevance rather than truth. Yet the definition of validity outlined previously says nothing about how to reason from contradictions or how to incorporate matters of relevance. Instead, the focus is only on the preservation of truth. My thesis is that we should care not so much whether an argument is valid as much as we should care about whether an argument is useful.

## A Prospective Longitudinal Study on the Impact of Cognitive Flexibility on Crime Rates, Income, Health, and Higher Education

**Sarah Abdelazim, Sukhi Dhindsa, Yuet Ting Ma, Daphne Ling**

Executive functions (EFs) refer to a family of cognitive processes needed when one needs to concentrate and when acting on one's first impulse would be insufficient or ill-advised (Diamond, 2006). EFs include or make possible: inhibition (self-control and discipline), working memory (mentally manipulating information) and cognitive flexibility (switching priorities). In a study by Moffitt et al. (2011). 1,037 individuals were followed from birth until 32 years to determine whether self-control can predict health, wealth, and criminal offending. Here, we seek to extend Moffitt's findings by examining whether cognitive flexibility correlates with measures of health, wealth, higher education prospects and involvement in crime. In this prospective longitudinal study, 1,500 Grade 8 students from schools across greater Vancouver will be recruited, randomly selected, and stratified by gender and socioeconomic status from among those who give consent. EF measures on cognitive flexibility, along with demographics, will be assessed at 4-year intervals (ages: 14, 18, 22, 26, and 30). We anticipate that higher cognitive flexibility is correlated with less drug abuse and crime, better career opportunities and higher migration (Beversdorf et al., 1999). Our understanding of this relationship is essential for building a framework for early intervention.

## COMPOSTABILITY OF SINGLE SERVE BEVERAGE INGREDIENT PACKAGES

**Miriam Pang**

When urbanization rate and economic development surges, increase in consumption proposes a challenge in solid waste management. The municipal waste market is an economic sector represented by an intricate relationship between policy makers, the public, technological innovators, and private investors. The food and beverages market, specifically the single-serve coffee category continues to grow over $5Billion in 2014 US and Canada sales according to the Euromonitor 2015 report, which is 32% increase from previous year. In perspective, that contributed to 60,000 tonnes of waste generated are in landfill last year alone. The Gcup Technolog Corporation . (GTC), a Vancouver based company, has developed and patented a biodegradable and compostable single servinged beverage ingredient package as a green alternative. The product contains shells made of complex polymers such as crystallized polylactic acid (CPLA) and sugar can bagasse (SCB), or commonly known as bioplastic, and is made to be compatible within a Keurig® coffee brewing machine. The underlying challenge is that although all plastics are technically biodegradable, meaning in suitable conditions, microbes can fully degrade them, the commercial product must meet the industrial composting criteria ofr the American Society for Testing and Materials (ASTM) standards. A range of existing compositing technologies diverse regionally can affect decomposition criteria. In partnership with the University of British Columbia's, Department of Chemical and Biological Engineering, this research project will is to determine the biodegradability of GTC's product under different composting parameters. Through such knowledge exchange forum, we hope better assist G-Kup's product development in an effective manner.

## Perceptual Learning of speech sounds: A bias for 'zippers' over 'sippers'?

**Zoe Lawler, Carolyn Norton**

No two speech sounds are exactly the same. Despite this variability, listeners successfully and quickly map speech sounds into their appropriate categories. Perceptual learning has been proposed as a cognitive mechanism that can account for this variation by updating a listener's existing phonetic categories using clues from the lexical context (Norris, McQueen & Cutler, 2003). Perceptual learning of speech is especially relevant in multicultural contexts, including the UBC campus. Listeners are exposed to accented speech and novel pronunciations of different interlocutors in their day-to-day lives, and must accommodate these productions in order to successfully communicate. While perceptual learning may assist in the processing of dialect and accent differences (Kraljic, Brennan & Samuel, 2008; Crista et al., 2012), non-canonical speech (Kraljic, Brennan & Samuel, 2008b), and across the lifespan (White & Aslin, 2011; Trude et al., 2013; Witteman et al., 2013), little is known about whether some forms of speech are easier to perceptually learn than others. The present study by Lawler and Norton investigates whether a bias for perceptually learning voiceless or voiced sounds exists by exposing listeners to sentence stimuli with sentencefinal voiceless [s] and voiced [z] fricatives (e.g. 'He couldn't handle any more dinner, but there might be room for dessert'). While research on perceptual learning of speech has advanced over the past decade, the learnability of a voiceless vs. voiced fricative has not yet been examined. The findings of this research will contribute insight to answering how people perceptually learn various aspects of speech.

## Abstract: Increased Asthma Development after Early Childhood Exposure to Respiratory Syncytial Virus

**April Tian, Jasper Yoo, Sumire Sasayama**

Background: The hygiene hypothesis describes the increased prevalence of asthma and allergies as a response to improved public health measures and better hygiene. The consensus is that fundamental changes in lifestyle are leading to decreased neonatal exposure to microbes important to development of immune regulatory mechanisms. However, recent studies have correlated increased asthma development to childhood upper respiratory infections. This research would add knowledge about asthma and other allergic diseases' etiology and allows for potential redefinition of the hygiene hypothesis.

Purpose/Goals: This research focuses on the prevalence of RSV (respiratory syncytial virus) in guinea pig populations that show early asthma development. These results will be used as a model for human populations, and will assess the risk of asthma development after infection with RSV.

Methods: The guinea pig's airway response will be measured through a pneumatograph implant into the trachea of guinea pigs to measure the pleural pressure by a pleural balloon attached to the neck.

Hypothesis: If the guinea pigs are repeatedly exposed to RSV, they will demonstrate a higher risk of asthma development. Incidence of asthma will be higher in the test group than the control group.

Results: The results would show increased airway sensitivity in RSV-infected models. Pleural pressure would increase when RSV-inoculated models are challenged with ovalbumin and histamine, and the development of isolated late asthmatic reactions with subeffective ovalbumin dose would also be observed.

## Statistical Analysis of Somatic Mutations and Gene Expression Data for Diffuse Large B-cell Lymphoma, Bladder Cancer and Stomach Adenocarcinoma

**Shideh Mirhadi**

Alcohol intoxication affects learning ability (1). Learning ability depends on the correct expression and functionality of the nervous system genes. Since many nervous system genes are targets for alcohol (2,3,4), alcohol can perceivably affect learning by disrupting various gene functions. This project focuses on the effect of alcohol on a particular type of learning: habituation. Habituation is a type of learning measured as a gradual decrease in response to repeated stimuli that is not due to fatigue or adaptation (5). The model organism Caenorhabditis elegans was used to study genes that contribute to the effects of alcohol on habituation of the Tap Withdrawal Response (TWR). Using a candidate gene approach, this project primarily focuses on the Gαs/cAMP/PKA and the Gαo/DGK/DAG pathway of C. elegans. Strains of worms with mutations in the Gαs/cAMP/PKA pathway and the Gαo/DGK/DAG pathway of C.elegans were analyzed to see whether any of these genes are involved in the abnormal habituation observed under alcohol intoxication. In the Gαs/cAMP/PKA pathway, Gαs (gsa-1), Adenylyl cyclase (acy-1) and the negative regulator cAMP phosphodiesterase (pde-4), were found to be involved in the alcohol-induced deeper habituation, but the regulatory subunit of PKA (kin-2) may not to be. In the Gαo/DGK/DAG pathway, Gαo (goa-1) was found to be involved in both the alcohol-induced deeper habituation and deeper initial response, whereas, unc-13, in the same pathway, was not. This study identified novel mechanisms underlying learning impairment under alcohol intoxication.

## Mechanisms of Regulatory T cell proliferation after allergen immunotherapy

**Haya AbuZuluf, Jae Sheen**

Allergen Immunotherapy is an effective means of reorienting inappropriate immune responses in patients with allergic asthma, and can be administered subcutaneously or sublingually. The sublingual method is preferred as it can be easily administered without repeated clinical visits. Sublingual Immunotherapy (SLIT) involves the administration of a known allergen to patients, which has been shown to desensitize the immune system to the allergen. Although SLIT has shown its effectiveness in patients, the cause of desensitization is not completely elucidated. We propose that there is a two-step mechanism that leads to tolerance towards the allergen, centered around a population of white blood cells with suppressive functions known as Regulatory T-cells (T-reg). The initial mechanism relies on the shift from Th2 to the Th1 cells, which then promotes the upregulation of Th1-like Treg cells via CD46 in an IL-2 dependent manner. This shift allows for the production of the appropriate cytokine environment, allowing for the promotion of Tr1 and subsequently Treg cells, both of which have been shown to have regulatory effects on the immune system. To examine the immune modulations elicited by SLIT, we use trasgenic mice (T-bet$^{-/-}$;BALB/c) and wildtype pre-sensitized to grass-pollen, along with a control mice not sensitizited to grass-pollen and left untreated. Both treated mice were subjected to a constant dosage of grass-pollen sublingual tablets (Grastek). To test the effects of our treatment, we will analyze the cytokine production in murine blood and perform flow cytometric analysis of isolated cells, after initial administration daily for every 2 weeks for 2-months, followed by every month for an additional 2-months. Post 4 months, sectioning of the bronchi stained with Periodic acid–Schiff (PAS) will be done, in order to show mucus count and inflammation score. Predicted results show that T-bet null mice are unable to produce both the Th2-Th1 shift and proper tolerogenic responses. In order to allow the transgenic mice to produce a tolerogenic response, we will either inject IL-10, TGF-β, or PBS into the mice, monitoring cytokine productions and characterizing isolated cells, followed by a dissection at the end of 2 months. Overall, our results will lead to a better understanding of how SLIT induces tolerogenic responses and help expand SLIT treatments to a broader range of allergies.

## The effect of H3K27ac-associated cancer-specific enhancers on gene-expression in pancreatic cancer

**Kathy Ma, Jenn Ko, David Jung, Andrew Oh**

Pancreatic cancer is the 4th most common cancer with a mortality rate of 80% in British Columbia. Previous studies analyzed mutations, and gene-expression levels in pancreatic cancers reporting that they are relevant to the disease, such as over-expression of mesothelin proteins compared to normal cells. Despite ongoing research, the overall survival rate of pancreatic cancer patients has not improved over the last two decades. Recently, aberrant epigenomes that dysregulate gene expression by perturbed modification of histone proteins associated with DNA have been discovered in various cancer types such as colon cancers, and glioblastomas. In particular, enhancers that activate gene expression have been shown to be associated with acetylation of a particular histone residue, such as H3K27, and have been reported to be perturbed in cancer. In pancreatic cancers, perturbed patterns of other histone modification marks were found, but enhancer-associated H3K27ac marks have not been studied. We propose a hypothetical analytical framework to identify cancer-specific enhancers by using the publicly available H3K27ac profiles from the ENCODE consortium. H3K27ac profiles are generated using Chromatin Immunoprecipitation followed by the sequencing (ChIP-Seq) method. We expect that genes whose over-expression have been reported in pancreatic cancer such as GRP94, will be associated with enhancers that exhibit increased levels of H3K27ac marks. Our study proposes a method to identify pancreatic cancer-specific enhancers that may benefit future research that investigates the application of epigenome-targeting therapeutics such as histone deacetylase inhibitors, in pancreatic cancers.

## Socioeconomic Status: A Cause of Labour Market Discrimination?

**Viyan Petekkaya**

Previous economic research has focused on race and gender as the root causes of labour market discrimination. We argue that labour market discrimination could be a function of socioeconomic status (SES) in addition to race and gender. We use data from the U.S. Census Bureau to show that income inequality has been growing in recent decades. As income inequality grows, it is reasonable to expect that there will be greater variance in socioeconomic status, and it is important to know if there is a differential outcome in terms of labour market discrimination. Knowing all the causes of labour market discrimination will allow progressive firms and policy-makers to create better-informed solutions to this problem. Through appropriate policies such as income redistribution, it is possible to decrease labour market discrimination and correspondingly increase productivity and market efficiency.

## Screen of schizophrenia-linked IgSF proteins for roles in synapse formation

**Alex Badalan, Alex Law**

Background: Neural synapse are structures that allow neurons to send signals to each other. Synaptogenesis, or the formation of synapses, occurs between the dendrite of one neuron and the axon of another and is mediated by a myriad of proteins. However not all proteins involved are discovered. The immunoglobulin super family (IgSF) is one of the largest families of proteins in mammals.

Purpose: The goal of this project is to investigate IgSF proteins that are linked to schizophrenia for potential roles in synaptogenesis. These proteins contain one or more immunoglobulin domains in their structures. Several IgSF proteins are already found to be mediators of synaptogenesis, and many also be implicated in human neural diseases such as schizophrenia. Increased levels of SEMA3A and NCAMs have been found in patients with schizophrenia. CHL1 is mapped to chromosome 3p26, a region suspected to be involved with schizophrenia.

Methods: We are using a neuron-fibroblast co-culture assay to screen for hemi-synapse formation between rat hippocampal neurons and cells expressing our candidates NCAM120, NCAM140, NCAM180, CHL1, and SEMA3A-G. Using this assay, we can identify if any of these proteins promote or suppress the formation of synapses.

Conclusion: Changes in synapse number are thought to underlie some aspects of schizophrenia, therefore discovering potential roles of these schizophrenia-linked proteins in synapse formation is important for our better understanding of the development of this disease.

## The Venture Formation Process: Setting Apart High-impact and Marginally Innovative Start-ups

**Alex Nguyen**

Actively pursuing transformative technologies and/or business models, high-impact start-ups are companies that are most equipped to contribute to the advancement of our economy and society. However, currently in scholarly literature, there is virtually no differentiation between them and the marginally innovative crowd. Therefore, due to the magnitude of their overall positive impacts, we will focus on solely early stage high-impact start-ups and their venture formation process. Specifically, we aim to establish the factors within the venture formation process that set the distinction between high-impact and marginally innovative start-ups in the early stage. Building on past research about the effects of the inventor network and knowledge spillover on the venture formation rate, and the spatial clustering of venture capital, we predict that the most significant factors are the start-up founders' level of connectedness to a highly research-driven establishment and their proximity to venture capital firms that are knowledgeable about their technology. Using a multivariable regression model, we anticipate that a high-impact start-up would have a positive relationship with both the factors; more specifically, the more closely connected to these factors they are, the more likely they are to be high-impact.

# The Effect of Impact Energy and Turgor Pressure on the Bruise Volume of BC Royal Gala Apples

**Summer Shan, Mary Shen, Leo Chen**

Background: Apple bruising is one of the major causes for economic losses for apple farmers in BC. In this study, the bruise susceptibility, bruise threshold, and bruise volume of the BC Royal Gala Apple was investigated as a function of impact energy.

Method: Impact energy was delivered using a pendulum apparatus, with tests varying by regular height intervals of 2 cm. Additionally, turgor pressure was adjusted for by immersing the apples in water for 0, 1, and 18 hours, respectively. Impact energy and bruise volume was measured following the Bruise Thickness Method using the LoggerPro and ImageJ analytic softwares. The relationship between bruise volume and impact energy was analyzed using regression models on Microsoft Excel.

Result: Linear regression models revealed that in general, apples with higher turgor pressures tend to have lower overall bruise volume when subjected to similar levels of impact energy. Apples with increasing turgor pressure also had the best fit for the model. The bruise threshold of Gala apples was measured to be 0.08J and bruise susceptibility varied from 6.7 cm3/J in apples without water immersion to 2.31 cm3/J in apples immersed for 18 hours. Immersing apples in tap water for 18 hours was found to be an effective method to reduce apple bruise susceptibility.

Conclusion: The findings of this study suggests that treating BC Royal Gala Apple with a 18-hour long water bath before distribution offers a practical and inexpensive method to reduce apple bruising during transport.

# Tuberculosis - a disease of the poor

**Himani Bhatnagar**

Tuberculosis, or TB, is a global killer that according to WHO, takes 1.5 million lives a year. HIVAIDS also has been estimated to be the cause of death for 1.5 million people worldwide per year. Despite the similarity in mortality of the two lethal infectious diseases, HIV/AIDS and other more sensationalized diseases such as Ebola continue to receive greater funding and attention, while TB remains a neglected, silent killer. Data from the National Institute of Health (NIH) displays its distribution of funding for various Research, Condition, and Disease Categories (RCDC) and it is evident that HIV/AIDS received ten times more funding than TB research in 2014, and the pattern continues for the 2016 estimates. Such inequality stems from the fact that the greatest prevalence of TB exists in low-income countries due to the poor being unable to afford the costly treatment regime – and the poor aren't a great market for big pharmaceuticals. In addition to affordability, several socio-cultural and political factors play a role in TB pathogenesis such as gender disparity and Structural Adjustment Programs instilled by loans from the IMF. The results of this inequality manifest themselves in forms of dated diagnostic and treatment methods for TB, inadequate research into MDR-TB and XDR-TB, low pharmaceutical interest into TB drug production, and increased mortality and morbidity across the globe. The consequences and causes of underfunding of TB research and treatment interventions due to structural inequalities will be explored in this poster.

## Vaccination Gantenerumab prevents memory loss and amyloid burden in an APP23 mouse model of Alzheimer's disease

**Rebecca Chen, Ashley Lee, Chris Chang, Chizom Wali**

Alzheimer's Disease (AD) is a neurodegenerative disease causing cognitive impairment and memory loss. Among the leading theories of the cause of AD is the amyloid hypothesis, in which the accumulation of a hydrophobic isoform of amyloid protein accumulates and eventually leads to neuronal death. One possible treatment of AD is the use of antibody vaccination, which has the potential to trigger a pathway for plaque degradation. We tested the antibody Gantenerumab as a potential treatment of AD, using the APP23 mouse model. To test whether amyloid deposition can be prevented in this mouse model, the antibody was given prior to the onset of plaque deposition. Thus, young pre -depositing APP23 mice were injected with the antibody over a time period of one month. To test cognitive function prior and after the treatment we conducted Morris water maze experiments and compared to a vehicle (placebo) treated control group. The results show a clear improvement of cognitive function in the animal group that received the treatment in comparison to the control groups. Furthermore, overall amyloid load was reduced significantly upon treatment in comparison to the vehicle group. Immunohistological staining of microglia show morphological differences in comparison to the vehicle group hinting towards their potential role in plaque degradation through phagocytosis. Overall we report the successful reduction of amyloid load and beneficial effects on cognitive function of Gantenerumab in APP23 mice, making this antibody an interesting potential treatment for humans suffering from AD.

## Relationship between Perioperative Risk Factors and Short-term Outcomes in Pediatric Kidney Transplantations: A Single Centre Study

**Boyuan Zheng, Erick Carreras**

Renal transplantation is the gold standard therapy for end-stage kidney disease and failure, unfortunately graft rejection remains a major concern. Many risk factors have been well investigated in previous studies, unfortunately little is known about how peri-operative factors may affect renal graft outcomes. This retrospective cohort study analyses two decades of peri-operative variables from renal transplantation procedures at British Columbia's Children's Hospital (BCCH). BCCH is a pediatric tertiary centre that services the entire Canadian province of British Columbia. The study included all patients < 19 years of age who had their first, and or only, renal transplant between January 1st, 1993, to May 31st, 2013. A total sample size of 139 patients was reviewed. Our primary outcome was estimated glomerular filtration rate (eGFR) measured at time of discharge, 6-months, and 12-months post-operatively. Preliminary results show the probability of a pediatric renal transplant patient being discharged with a healthy eGFR of ≥ 90 mL/min/1.73m2 is greater if the z-score of the lowest diastolic pressure during the patient's Intensive Care Unit stay is > -1.1 than if it is ≤ -1.1 (P = 0.0059). The same outcome is also more likely if the recipient is > 6 years-old than if they are ≤ 6 years-old at the time of transplantation (P=0.0019). Further analyses will need to be conducted however to achieve more comprehensive results and provide further insights into the predictive value of peri-operative risk factors on renal graft outcomes in pediatric patients.

## Early Life Differences in the Microbial Composition of Cesarean Born Infants

**Dora Xiong, Amila Tjoa, Veronica Lai, Quinn Stewart**

Over the past century, the frequency of caesarean delivery has risen around the world. This is especially evident in populous countries such the United States, where the rate rose to 31.8% in 2007 and in China, where it is approaching 50% (Neu and Rushing, 2011). Various studies suggest that infants born through caesarean delivery are more prone to long-term health consequences compared to vaginally delivered ones. These consequences include affiliations such as obesity and the occurrence of allergies (Collado et al., 2012). Research also shows that the intestinal microbiota of caesarean infants differs from that of vaginally delivered infants. Vaginally delivered babies have more Lactobacillus, Prevotella, Sneathia, and Escherichia Shigella, while babies delivered by caesarean section have more Staphylococcus, Corynebacterium, Propionibacterium, Clostridia and Bacteroides (Collado et al., 2012). There has not been much research conducted to determine whether these microbial differences persist through and past childhood. This project explored how delivery mode affected infant intestinal microbiota, whether these differences persisted through childhood, and how these compositional differences correlate to diseases that these infants contract. Stool samples from two year old infants were used to extract information regarding their intestinal microbiomes. 16S rRNA Illumina sequencing was used to identify and quantify the bacteria. Analysis of the microbiota identified was performed using R statistical analysis, and discovered that no significant differences in the microbial communities was discovered in these infants at two years of age.

## Determining the toxicity of cosmetic products using human spermatozoa as a biological screening model

**Amolak Dhillon, Anokh Dhillon**

Dibutyl phtalate (DBP) is primarily used as a plasticizer and it is often used in cosmetic products such as nail polish. Studies investigated the toxicity of DBP and the chemical is associated with reproductive toxicity (Dominique, 2007). More specifically, exposure to DBP has been shown to alter the balance of reactive oxygen species and antioxidants in the male reproductive system thus resulting in oxidative stress (Zhou D. et al, 2010). On the other hand, a review by the The American Chemistry Council declared that DBP is not harmful and safe to use. Although there are numerous commonly used cosmetic products that contain DBP, these products have not been exclusively tested and their toxicity to human cells has not been determined. Therefore, the rationale for our project is to use spermatozoa as a biological screening model to determine the toxicity of cosmetic products which contains DBP. Spermatozoa are being used as a biological screening model because they are fully mature and independent cells, cost effective, readily accessible and the end point tests are easy to measure. Our goal is to examine the effects of DBP on sperm quality as determined by the following parameters; motility, concentration, osmolarity, deoxyribonucleic acid damage and lipid peroxidation. We hypothesize that DBP will negatively affect sperm parameters.

Dominique, Williams "Toxicity Review for Dibutyl Phthalate (Dibutyl Phthalate or DBP)." Memo. United States Consumer Product Safety Commision. Bethesda, MD. Apr 2007. Print

Zhou, D., H. Wang, and J. Zhang. "Di-n-butyl Phthalate (DBP) Exposure Induces Oxidative Stress in Epididymis of Adult Rats." Toxicology and Industrial Health 27.1 (2010): 65-71. Web.

## The gut microbial ecology of seagrass associated invertebrates

**Bobby Chan**

A microbiome is the community of microbial life that lives on and in an organism. A relatively new topic of interest, the scientific community is discovering that an organism's microbiome not only forms deterministically but also has a profound effect on an organism's fitness. Microbes to Macrophytes is a group dedicated to exploring how the microbiome of seaweeds and seagrasses interact and how they form. Through the use of molecular and genetic techniques the composition of the microbiome of seagrass-associated invertebrates was found. This information will be used to examine the dynamics of how these microbiomes form, why they are of a specific composition, and how they affect the organism. With a better understanding of the organisms that interact with seagrass, research and conservation groups can work towards understanding and protecting these important habitats in the future.

## Development and Implementation of a IDH1/2 Genotyping Assay for Clinical Brain Tumour Specimens

**Jessica Que, Danielle Co, Julie Ho, Stephen Yip**

Diffuse gliomas are the most common type of primary brain tumours and are associated with high morbidity and mortality. Recent genome sequencing studies have revealed that recurrent mutations in the isocitrate dehydrogenase 1 and 2 genes (IDH1/2) are present in a large proportion of diffuse gliomas – particularly low grade astrocytomas and oligodendrogliomas (WHO II/III), and secondary glioblastomas (WHO IV). IDH1/2 mutations can distinguish diffuse gliomas from non- neoplastic mimickers including vasculitis, encephalitis, demyelinating disease, or reactive gliosis. Moreover, low grade gliomas that are wildtype for IDH1/2 have found to exhibit aggressive clinical behaviour similar to glioblastoma and this information can lead therapeutic change. Hence, there is a strong need to accurately identify the genotype status of IDH1/2 in gliomas. The R132H mutation-specific IDH1 antibody is used to detect the most frequent subtype of IDH mutations. While it is a powerful screen of brain biopsies, it does not detect the remaining 5% of IDH1/2 mutations. The purpose of this study is to develop and validate a real-time PCR clinical assay for the detection of the entire spectrum of IDH1/2 mutations in formalin fixed paraffin-embedded (FFPE) tissues of brain tumour surgical resection and biopsy specimens. Validation of the analytical performance of the IDH assay was performed by assessing accuracy, precision, sensitivity, specificity, reportable range, and reference range. We used a combination of artificial gene fragments and clinical brain tumour (gliomas and medulloblastomas) samples with known IDH1/2 status for assay validation. The assay can reliably generate results in 5 days from 50ng of input DNA. The results were 100% concordant with Sanger and next generation sequencing results for sample >2% mutation frequency. In conclusion, the IDH1/2 real-time PCR assay provides rapid and sensitive detection of IDH1/2 mutations in FFPE tissues and thus provides an important adjunct to existing diagnostic tools.

## Mce4 Inhibition in Mycobacterium tuberculosis

**Joshua Shepherd, William Lu, Andrew Wilson, Werd Khader, Calvin Wong**

Mycobacterium tuberculosis, the bacteria that causes Tuberculosis (TB), infects about one third of today's population and is becoming more resistant to current treatments. For this reason, new and effective treatments are desperately needed to combat the rise of TB. The ability of M. tuberculosis to catabolize cholesterol is essential for pathogenesis, and as a result, one promising treatment may be a drug that can inhibit the Mce4 transporter, thus preventing M. tuberculosis from using cholesterol as a carbon source. Using a screen to identify drugs that inhibit growth of M. tuberculosis using cholesterol in the presence of an additional carbon source, we will narrow down compounds to those that inhibit cholesterol uptake but do not cause downstream of uptake. Once a Mce4 inhibitor is identified, we will analyze the effect in macrophages infected with treated M. tuberculosis compared to untreated by looking at the production of. We want to determine whether the macrophage will still accumulate a large amount of cholesterol when infected with drug-treated M. tuberculosis that is no longer able to produce cholesterol-derived metabolites, which may be involved in the reprogramming of the host cell. This project could lead to a better understanding of both potential drug treatments for TB and the mechanisms through which M. tuberculosis dysregulates the macrophage.

## Expression of Activity Dependent Genes is Regulated by Neural Plasticity

**Laura Gomez**

During development, the brain is in a critical period where environmental events greatly influence the proper formation and wiring of neural networks. Events, such as sensory stimuli, induce long lasting functional and structural changes at synapses (where neurons communicate with one another). The strengthening and weakening of synapses in the brain from changes in activity is known as synaptic plasticity and is crucial in establishing and strengthening neuronal circuits. Since, memories are postulated to be encoded in the vast networks of neurons in the brain, synaptic plasticity is considered to be a fundamental biochemical mechanism underlying learning and memory. The machinery governing synaptic plasticity, however, is not entirely understood, nevertheless recent evidence shows that changes in synaptic activity influences the expression of nuclear and mitochondrial genes, believed to be key players in implementing plastic changes in the brain. To determine which activity-dependent genes are significant in neuroplasticity, real time PCR was used to detect the up or down regulation of over 20 genes in Xenopus laevis after inducing plasticity in vivo via visual stimulation. Using relative quantification methods and ANOVA protocols, it was determined that the mRNA transcription levels of 6 of the 22 genes investigated were significantly altered. Further investigation into these activity-dependent genes and their protein levels after inducing plasticity is being done and could lead to the discovery of a molecular mechanism driving synaptic plasticity. Understanding the fundamental mechanisms behind circuit formation in development is crucial in developing treatments for early diseases such as autism and schizophrenia.

## Curcuminoids As a Natural Food Preservative in Raw Beef

**Rosie Tran, Amelia Sudjana, Jody Mao**

Recent years have seen an increase in demand for the use of natural products in food preservation over the existing use of synthetic preservatives. Turmeric extract, from the Curcuma longa plant, contains a class of natural compounds that have previously been shown to have antimicrobial activity against food spoilage causing microbes. In particular, curcumin and demethoxycurcumin (DMC) are the two most abundant curcuminoids found in turmeric with antimicrobial activity. Curcumin has been shown to have strong inhibitory effect on gram positive bacteria such as Staphylococcus aureus, whereas DMC has shown to be more effective inhibition against gram negative bacteria, such as Escherichia coli and Yersinia enterocolitica. Therefore, this study investigates the antibacterial inhibition of E. coli, Y. enterocolitica, and S. aureus, as well as the reduction of microbial growth in raw beef using curcumin and DMC as food preservatives. Raw beef co-treated with $\geqslant$ 0.025% of curcumin and DMC then stored in air-permeable overwrap and refrigerated for 3-12 days showed significant delay in microbial growth. However, a palatability test that examined the flavour and visual appeal of curcuminoid-treated meat after six days of storage found that high concentrations of curcuminoids (0.045%) resulted in significantly reduced visual and flavour palatability, which was not observed at a curcuminoid concentration of $\leqq$ 0.035%. These results suggest that co-treatment of 0.035% curcumin+DMC displays a palatable and effective natural food preservative for raw beef, and shows potential as a natural food preservative to replace synthetic preservatives currently used in the market.

## The threshold concentration of cytochrome c required to form the apoptosome may be dependent on the expression of bcl-2

**Jeremy Soroka, Lorenzo Lindo, Talia Ang**

Cancers are a collection of diseases characterized by mutations causing uncontrolled cell division. Although many advances have been made, blood cancers still account for one third of all cancer deaths in Canada. Commonly found in cancers are mutations in p53, a tumoursuppressor which regulates many antiapoptotic and proapoptotic genes. Such mutations can confer resistance to apoptosis, some of which occurring in the BCL2 family of proteins, a regulator of the permeabilization of the outer membrane of the mitochondria, an important step in apoptosismediated cytochrome c efflux. The release of cytochrome c is essential to apoptosis as it contributes to the formation of the apoptosome which initiates apoptosis. One member of the BCL2 family, bcl2, is an antiapoptotic protein that, under normal circumstances, prevents the permeabilization of the mitochondria, therefore inhibiting programmed cell death. The inhibition of apoptosis is of great concern to researchers as it acts as a survival mechanism for cancer cells to persist and proliferate. To date, the effects of the overexpression of bcl2 and its relationship to cytosolic cytochrome c is not well understood. However, contemporary research has found that cells overexpressing bcl2 induces apoptosis at levels only 30% of that of wildtype cells when injected with cytochrome c. We therefore postulate that bcl2 affects the concentration of cytochrome c required to form the apoptosome. Here, we investigate the possible correlation between bcl2 concentration and frequency of apoptosis in leukemia and lymphoma cancer cells, which may afford researchers a new target for chemotherapy in cancer patients.

# ORAL PRESENTATION OVERVIEW (2)

DAY 2 PROGRAM - MARCH 30, 2016

## Time: 5:00pm - 6:30pm

## Buchanan Building - BUCH B 302

| *Research Topics (Abstracts page 59-61)* | *Presenters* |
|---|---|
| Growth and Degradation of Baleen in Fin, Right, and Bowhead Whale Baleen | Adrienne Hutchinson |
| Insect Size and Abundance Along a Precipitation/Productivity Gradient | Katrina Kaur |
| Characterizing Uterine Tissue Resident Macrophages in Lean and Obese Women | Taylor Bahen |
| Enhanced oxygen loading and delivery in migratory salmonids | Jacelyn Shu |
| Behavioural Analysis of Chemosensory Dysfunction in Caenorhabditis elegans (C. elegans) with Mutations in Presenilin 1, an Alzheimer's Disease Related Gene | Mahraz Parvand |
| Extracting High Quality Genomic DNA from a Chytrid Fungus | Emily Betz |

## Buchanan Building - BUCH B 303

| *Research Topics (Abstracts page 62-64)* | *Presenters* |
|---|---|
| Investigating the Human Conception of Animal Welfare | Andie Walterhouse |
| Algal Colonization of Seagrass Meadows on BC's Central Coast | Gwen Griffiths |
| Biological sex is a critical determinant of stress responses in Drosophila | Nazde Edeer |
| Sex Differences in Drosophila Body Size is Controlled by the Conserved Insulin Signaling Pathway | Marcus Narsaiya |
| Manual removal efforts of invasive English holly (Ilex aquifolium) may contribute to its spread | Morgan Haines<br>Thomas Hughes<br>Claire Cameron |
| A temporal comparison of the benthic community around the southern British Columbia coast, before and after a sea star wasting event | Jake Dytnerski |

## Buchanan Building - BUCH B 304

| *Research Topics (Abstracts page 65-67)* | *Presenters* |
|---|---|
| How perfectionism affects therapeutic alliance in psychodynamic group treatment | Joanne Zhou |
| Health advice in a digital world: Quality and content of online information about Alzheimer disease | Tanya Feng |
| Using a rodent model of postpartum depression to examine paroxetine efficacy | Robin Richardson |
| Schematic faces are not real faces: Comparing stimulus types using the N170 | Quentin Raffaelli |
| Behaviour Concerns in Children with Neurodevelopmental Disorders and Disabilities | Louise Harding |
| Don't Sugar Coat it: Cardiac Consequences of Developing Type 2 Diabetes after Spinal Cord Injury | Emilia Amiama |

## Buchanan Building - BUCH B 306

| *Research Topics (Abstracts page 68-70)* | *Presenters* |
|---|---|
| Exploring The Post-Concussed Adolescent Brain: A Graph-Theory Based Approach To Understanding The Trajectory Of Recovery In Functional Networks In The First 6 Months Post Injury | Vrinda Munjal |
| Targeting Lactate Transporters for the Treatment of Urothelial Carcinoma | Craig Stewart |
| Changes in resting heart rate and blood pressure during and after breast cancer chemotherapy, concurrent to exercise training | Erin Lee |
| Contribution of Vascular Smooth Muscle Cells to Foam Cell Formation in Atherosclerotic Lesions | Malcolm McDonald<br>Andrew Jeong<br>Shamim Hortamani<br>Roxanna Yan |
| Targeted deep sequencing in prostate cancer allows for genetic counseling and potential early screening for cancers in families of patients with DNA-repair gene aberrations. | Evan Warner |
| Incidence of infective endocarditis in patients with bovine jugular vein valves compared to other right ventricle to pulmonary artery conduits: a systematic review and meta-analysis | Ashutosh Sharma |

## Buchanan Building - BUCH D 304

| *Research Topics (Abstracts page 71-73)* | *Presenters* |
|---|---|
| Is Terrorism Effective? Public Opinion Evidence From Arab Populations | Parmida Esmaeilpour |
| Effect of Antipsychotic Drugs on C-reactive Protein in Rat Serum, Liver and Brain | Saman Fouladirad |
| A new variant in International Education: Internationalization 2.1 | Stefanie Yap |
| Apud Genus Omne Futurum: Virgil's Aeneid in Contemporary English Translation | Sophia Ly |
| Long-term Effects of Prenatal Alcohol Exposure and Chronic Unpredictable Stress on Depressive-Like Behaviour | Lily Takeuchi |
| Scientists Find God: Religiosity and Spirituality in Scientists' Conceptions | Sibyl Song |

## Buchanan Building - BUCH D 314

| *Research Topics (Abstracts page 74-76)* | *Presenters* |
|---|---|
| Green roofs: seismic-alarming or -appreciating? | Rachel Diao |
| Sensitivity of mountain glaciers to climate change with the use of a block model | Eviatar Bach |
| The Last Plague: Investigating the Lethality of Pandemics Under Simulated Parameters | Li Qing Wang<br>Uma Wu |
| Assessing The Mining Industry: The Development Of A Mining-Centered Rating System Based On Environmental, Economic, and Ethical Standards. | Daniel Lim<br>Jess Chen<br>Liam Crozier<br>Jay Ko |
| Microwave oxidation treatment of sewage sludge: A pilot-scale study | Cristina Kei Oliveira |
| Measuring Perceived Relatedness | Veronica Letawsky<br>Alfred Ko |

# Buchanan Building - BUCH D 323

| *Research Topics (Abstracts page 77-79)* | *Presenters* |
|---|---|
| Determining Key Regulators in Cerebellar Development Using a Gene Expression Database | Cody Lo |
| Measuring transcript level changes upon CrPV infection by 4sU-labeling | Clarence Yeung |
| Activity-Independent Mechanisms of Dendritic Filopodial Outgrowth | Jodi Wong<br>Sina Safabakhsh |
| Identification of Gene Candidates involved in a Mammalian-Fungal Dual Organism Interaction Model | Luka Culibrk<br>Carys Croft |
| Creation and Implementation of a BC/Canadian Registry for Familial Hypercholesterolemia | Aria Shokoohi |

# ORAL PRESENTATION ABSTRACTS (2)

MARCH 30, 2016

**Buchanan Building - BUCH B 302** **Time: 5:00pm - 6:30pm**

## Growth, Mechanics, and Degradation of Baleen in Fin, Right, and Bowhead Whales

**Adrienne Hutchinson**

Whales within the sub-order Mysticeti lack teeth, and instead they filter tiny prey from seawater using large racks of keratinous plates called baleen (Young et al., 2015). These plates degrade along their inner edge, exposing thin, tapered bristles. Bristles originate at the base of each baleen plate, and are referred to as tubules until they become exposed at the plate tip. The complete mechanism of baleen filtration is not fully understood, and the precise role of the bristles has not yet been established. By quantifying the extent of bristle taper in three species of mysticete (fin, right, and bowhead), I have determined that this feature is at least partially caused by exposure to abrasion forces, as opposed to the growth style. This was accomplished by taking cross sections through baleen plates and measuring how the diameter of tubules changes as they grow. The effect of degradation on the mechanical properties of bristles was assessed through tensile testing to gauge the bristles' importance with respect to the filtration process. Preliminary data indicates a slight trend of decreasing stiffness from bristle base to tip, suggesting that wear may slightly alter bristle properties. The aim of this study was to enhance the understanding of baleen filtration by determining the style of growth and degradation in bristles. Understanding the properties of bristles under tensile stress has implications to numerous other animals with keratinous structures, such as the fracture characteristics of horse hooves. Young et al. (2015). The Anatomical Record. 298(4), p. 703-19.

## Insect Size and Abundance Along a Precipitation/Productivity Gradient

**Katrina Kaur**

Social spiders live in large cooperative colonies, and in order to be sustained they require prey in the form of large insects that can provide food for multiple colony members. If insects are not large enough, or if insects are not abundant enough, this negatively impacts the survival of social spider colonies. Temperature has been suggested as a regulating factor of insect size, which would explain the decrease in insect size and of spider sociality with increasing elevation in eastern Ecuador. However, lowland coastal regions of Ecuador, although expected to exhibit high temperatures throughout, lack social spiders in some areas that would otherwise seem suitable for habitation. We suspect this may be a result of these areas not being wet or productive enough for large insects to develop, or for insect populations to reach an abundance suitable to support social spider colonies. We tested these hypotheses by examining insects that inhabit coastal Ecuador along a precipitation/productivity gradient using visual sampling, sweep net sampling, and two trapping methods. Results suggest that insect size increases in sites with higher annual precipitation but insect abundance stays relatively constant throughout. The trend provides evidence that precipitation is correlated to insect size and also suggests that the warm temperatures alone are not sufficient enough to promote large insect growth. Consequently, large social spider colonies are absent from dry coastal areas lacking large insects. Therefore this study not only investigates insect responses to climate, but also emphasizes the importance of climate in determining species distributions

## Characterizing Uterine Tissue Resident Macrophages in Lean and Obese Women

**Taylor Bahen**

The growth and development of a healthy placenta is fundamental to the health of the mother and fetus. During the development of the placenta fetal tissue invades the uterine wall, the endometrium differentiates into a thick mucosal layer and the spiral arteries are remodeled to ensure the fetus the access to the maternal blood it needs to survive. These processes are tightly regulated by leukocytes found in the thick mucosal layer - one of these being uterine macrophages. The regulation of placentation is dependent on the microenvironment and when that environment is altered by immune-specific influences it could lead to inadequate remodeling, an imbalance of immunosuppressive and pro-inflammatory macrophages and/or altered placentation. The disruption of these key events could potentially lead to growth restriction, preeclampsia, pre-term delivery, still birth and spontaneous loss of pregnancy. Obesity-associated low-grade chronic inflammation is a potential cause of an altered microenvironment during pregnancy. Research in adipocytes and in other metabolically active tissues supports that obesity leads to local changes in the immune environment of the GI tract, the liver and the pancreas. However, the effects of obesity are not well studied in the uterus during pregnancy. There is support for an altered immune environment in pregnancy from the increased risk for growth restriction, preeclampsia, pre-term delivery, stillbirth and spontaneous loss of pregnancy experienced by obese women. However the mechanism behind this increased risk for obese women still needs elucidation. In this study, we will explore macrophages as the immune cells responsible for the increased risk associated with obesity. The aim of my thesis is to identify a difference in the localization and/or number of maternal M1-like and M2-like tissue resident macrophages in the decidua of lean and obese women.

## Enhanced oxygen loading and delivery in migratory salmonids

**Jacelyn Shu**

Most vertebrates require oxygen to survive. Bony fishes, which make up almost half of all vertebrates, are often faced with environmental challenges in supplying their tissues with oxygen. Consequently, many fish have evolved mechanisms that enhance oxygen extraction from the water and delivery to active tissues. This is often facilitated through pH-sensitive hemoglobin, where red blood cell (RBC) intracellular pH (pHi) can be optimized to increase oxygen binding at the gills or unloading at the tissues.

Recently, a system has been proposed where a fish can enhance both hemoglobin-oxygen binding as well as oxygen unloading during a generalized acidosis such as exercise. A RBC proton pump actively maintains a high pHi, favouring oxygen loading at the gills. At the tissues, the presence of plasma-accessible carbonic anhydrase short-circuits this mechanism, acidifying the RBC and driving oxygen from the hemoglobin. In some cases, this can double oxygen delivery to the tissues with no change in blood flow. This system has been described in the model teleost species, rainbow trout. However, closely related migratory salmon, which are known for their extensive spawning migrations and could benefit greatly from such a system, have not yet been studied. Here, I present evidence that a similar mechanism exists in both Atlantic and coho salmon. The enhanced oxygen loading and delivery associated with this system may play a major role in allowing these fish to complete their extensive migrations to ultimately reach their spawning grounds and reproduce, ensuring the survival of their species.

## Behavioral Analysis of Chemosensory Dysfunction in Caenorhabditis elegans (C. elegans) with Mutations in Presenilin 1, an Alzheimer's Disease Related Gene

**Mahraz Parvand**

Most cases of familial Alzheimer's disease (FAD), an uncommon form of Alzheimer's disease (AD), are linked to mutations of the presenilin (PS) genes. These genes are homologous with sel-12 genes in Caenorhabditis elegans (C.elegans), a transparent roundworm. C.elegans have a small nervous system consisting of 302 neurons, making it an ideal candidate for system-level genetic understanding of neural circuits and behavior. Many AD patients suffer from olfactory deficits. Experiments were conducted on worms with a mutation in sel-12 to gain better understanding of the relationship between PS mutations in AD and olfactory deficits. We found sel-12 worms were deficient in olfaction. To understand the effect of age on this deficit, we examined what stage of the worm's life cycle this deficit appeared. This provides preliminary insight into the dynamics of PS mutations and its subsequent effect on cellular pathways involved in chemosensation. Since C.elegans are innately repulsed by the odorant octanol, we utilized octanol in chemotaxis assays to assess the olfactory function of wild-type and sel-12 mutants. Adult sel-12 mutants had a significantly decreased sensitivity to octanol compared to wild-type worms. Introduction of human wild-type presenilin-1 (PS1) into the nervous system of C. elegans rescued the olfactory defect. Moreover, C.elegan sel-12 mutants presented deficits from hatch, and this deficit increased as worms aged, similar to the neurodegenerative nature in AD. Future studies will investigate the mechanisms of the relationship between PS mutations and olfactory deficits in AD.

## Extracting High Quality Genomic DNA from a Chytrid Fungus

**Emily Betz**

Fungi are ecologically important organisms which are masters of decomposing organic material. Most fungi are comprised of filaments, but chytrids have circular bodies called thalli (singular: thallus). Chytrids also differ from other fungi on the account that they possess motile spores called zoospores. These strong morphological differences make chytrids interesting from an evolutionary perspective. As chytrids are so different from other fungi, they may also possess unique degradative enzymes that may be industrially appealing.

Genomic sequencing is a powerful tool that allows researchers to gain insight into the genetic blueprints of an organism. These sequences can be compared amongst organisms to find novel enzymes as well as evolutionary differences. Currently there are very few chytrids that have sequenced genomes. Therefore, the Berbee lab nominated ten species, including Geranomyces variabilis, to be sequenced in the Joint Genome Institute's (JGI) 1000 Fungal Genomes Project.

I designed and attempted different methods of extracting high quality genomic DNA from G. variabilis. These included hexadecyltrimethylammonium bromide (CTAB) extractions and benzyl chloride reactions with modifications. The aim of such modifications was to reduce the amount of contaminant carryover that is problematic with these chytrids. With the combined use of benzyl chloride and chloroform-phenol approaches, contamination could be greatly reduced, but no approach managed to completely remove it. Even so, JGI was able to use the DNA we provided to sequence the genome of G. variabilis. The next step in this research is to examine the DNA sequence for unique degradative enzymes and test for industrial applications.

## Buchanan Building - BUCH B 303

## Time: 5:00pm - 6:30pm

### Investigating the Human Conception of Animal Welfare

**Andie Walterhouse**

Animal welfare scientists and ethicists have not yet settled on a definition of animal welfare. One popular account suggests that welfare has to do with three broad factors, the animals': Health, Affect, and Naturalness. According to this definition an animal has good welfare when it is physically healthy, feels good, and is able to express its' species-typical nature. Other experts have argued for a less complex theory whereby the only thing that ultimately matters for welfare is how the animal feels. Additionally, these definitions have been created by animal welfare experts, without any research as to whether or not lay people concur. This study examined whether an animal welfare definition including only the animal's affect reflects the way lay people understand welfare. Amazon Mechanical Turk subjects ($n$ = 80) were randomly assigned to one of two conditions where we manipulated non-psychological features (i.e. physically healthy and living a natural life or physically *un*-healthy and living an *un*-natural life), while keeping constant how the animal was described as feeling. Subjects were then asked to rate the hypothetical animal's happiness on a seven-point Likert scale. Despite acknowledging that animals in both conditions shared the same psychological states, ratings of welfare differed significantly between conditions. This suggests that the lay concept of animal welfare is not purely psychological and that factors beyond how an animal feels appear to constitute the lay concept of welfare. This study shows how science can be used to deepen our understanding of complex philosophical questions in animal welfare.

### Algal Colonization of Seagrass Meadows on BC's Central Coast

**Gwendolyn Griffiths**

Ecological communities vary in space at a variety of scales. In marine communities dramatic changes in composition can occur across a small spatial distance, and this has consequences for the large scale community landscape. Through an experimental manipulation of epiphytic seagrass communities, I examined the potential processes that drive community structure. I conducted an investigation into the controls of the zonation of an epiphytic algal species in Zostera marina (seagrass) meadows on the central coast of British Columbia. Epiphytic algae grows on the surface of other algae or seagrasses. Smithora naiadum is a common red algal epiphyte found in central coast seagrass meadows. Using a reciprocal transplant I addressed the question of whether Smithora load was affected by location. I found that there was a significant effect of location on Smithora load. Uncolonized blades were colonized when placed in a high Smithora environment, while colonized blades did not lose their existing Smithora when moved to a Smithora free environment. This indicates that spatial processes could be shaping the distribution of Smithora in seagrass meadows. Using illumina sequencing, I determined the bacterial species richness on each shoot before and after transplant and compared bacterial communities between seagrass shoots with and without Smithora. We collected invertebrate communities from seagrass samples and community composition analyses show that shoots with Smithora have a higher species richness and invertebrate abundance. This research hopes to shed light on what is driving epiphytic community composition in seagrass meadows in order to better understand marine metacommunity dynamics.

## Biological sex is a critical determinant of stress responses in Drosophila

**Nazde Edeer**

In the wild, animals encounter stresses (eg. starvation), and must mount an appropriate physiological response to survive. One factor that controls survival in many animals is biological sex. My research uses Drosophila melanogaster as a model to identify the molecular and physiological mechanisms that cause sex differences in starvation sensitivity. I found that both mated and unmated females outlive males when starved of nutrients. Thus not all sex differences in survival are due to reproduction. Instead, they may be the result of sex differences in metabolism. We therefore characterized protein, carbohydrate and lipid levels at different times after starvation, and found differences in lipid metabolism between sexes. Specifically, lipid levels decreased upon starvation in males, but remained stable in females. Investigation of gene expression changes led to the identification of male-female differences in transcript levels and protein isoforms in brummer (bmm), the Drosophila homolog of adipose triglyceride lipase in mammals. Brummer has a known role in starvation survial (Grönke et al., 2005). We then asked how sex differences in bmm are regulated, and identified a role for sex determination gene transformer (tra). Normally, Tra is only expressed in females. We found that tra mutant females expressed the male isoform of bmm. Remarkably, tra mutant females survived a shorter amount of time following starvation, suggesting that Tra controls male-female differences in starvation survival via regulation of bmm. My future studies will test this model, and determine the molecular mechanism by which Tra controls bmm by looking at Tra's targets, doublesex and fruitless.

## Sex Differences in Drosophila Body Size is Controlled by the Conserved Insulin Signaling Pathway

**Marcus Narsaiya**

In all animals, biological sex is a key determinant of body size. In mammals, sex differences in body size are caused by sex hormones. However, sex differences in body size also exist in animals without sex hormones, such as insects. Our lab uses the fruit fly Drosophila melanogaster as a model to study the sex hormone-independent regulation of body size in males and females. We found that sex determination gene transformer (Tra) controls sex differences in growth via regulation of the conserved insulin-signaling pathway (IIS). Since IIS controls growth by activating five downstream pathways: TOR, PI3K, Myc, Ras, Lnk, I hypothesize that IIS controls sex differences in size by activating different pathways in males and females. To determine which pathways are involved, I measured body size in flies overexpressing Tra but missing one copy of a gene specific to each pathway. If that pathway is required for Tra-induced growth, the lower gene dose will block Tra-induced growth. When I tested animals with loss of single dose of PI3K, Ras, Lnk, Myc or other insulin pathway genes, this only partially reduced the ability of Tra to drive growth. This suggests multiple pathways downstream of IIS contribute to sex differences in body size. I found that both intracellular and extracellular components are involved in growth processes, and that the pathway is used differently between the sexes. Together, my studies will provide important insights into the molecular mechanisms behind sex differences in growth in animals without sex hormones.

## Manual removal efforts of invasive English holly (Ilex aquifolium) may contribute to its spread

**Morgan Haines, Thomas Hughes, Claire Cameron**

English holly (Ilex aquifolium) is an invasive species that has rapidly increased its distribution in Pacific Northwest forests and has the potential to alter the structure, processes, and biodiversity of the areas it invades. Currently, the management method used in Pacific Spirit Regional Park in Vancouver, British Columbia is manual removal. Manual removal is mainly carried out by volunteers and includes a combination of uprooting trees whenever possible and pruning. The effectiveness of manual removal as a long-term management solution is evaluated by comparing the density of holly in three 1 ha plots, each with different management histories. Plot 1 has never had holly removed, plot 2 had holly removed in 2011, and plot 3 had holly removed in 2007. Within each 1 ha plot, we sampled holly in five 20m x 20m quadrats, and recorded information on height, canopy size, diameter, GPS location, type of spread (vegetative or seed), and determined age using dendrochronology. Mean abundance per 400m2 was not significantly ( $\alpha = 0.05$ ) less in either Plot 2 (37 +/- 34) or Plot 3 (386 +/- 226) compared to Plot 1 (87 +/- 52) and instead was significantly greater in Plot 3. There was also a significant ($\alpha = 0.05$) increase in the mean density of vegetative trees sprouting two years after removal in Plot 2, and three and four years after removal in Plot 3. These data suggest that manual removal is not an effective long-term management solution, and may instead contribute to its spread.

## A temporal comparison of the benthic community around the southern British Columbia coast, before and after a sea star wasting event

**Jake Dytnerski**

Sea stars have been deemed a keystone species through numerous localized studies due to their ability to control benthic marine diversity. A huge outbreak of a disease along the coast of western North American first appeared in 2013, decimating sea star populations. Sea Star Wasting Syndrome (SSWS) continues to kill sea stars all along the BC coast. This presents us with an opportunity to examine how sea stars affect marine diversity on a much larger scale. Using SCUBA, I have assessed the impacts of SSWS at sites around Southern BC; including Barkley Sound, Victoria, the Sunshine Coast, Nanaimo and the Indian Arm. These sites all have pre-existing data on the relative abundance of benthic invertebrates from the Reef Environmental Education Foundation's (REEF) datasets. I have quantified presence and relative abundance of benthic invertebrates in sub-tidal waters and will compare current community diversity and composition to surveys conducted before the 2013 outbreak of SSWS. I will be looking to see if there are, in fact, fewer sea stars present, and whether any decreases in sunflower star abundance – a voracious predator - are accompanied by increases in other invertebrates such as red and green sea urchins, which are prey for the sunflower star. My data will show how sea star populations and the community composition of BC's coastal benthic environment have changed following an unprecedented disease outbreak and will allow for comparisons between small-scale experiments and a large-scale natural perturbation.

## Buchanan Building - BUCH B 304

## Time: 5:00pm - 6:30pm

### How perfectionism affects therapeutic alliance in psychodynamic group treatment

**Joanne Zhou**

This study provides empirical evidence of the components of patents' perfectionism that negatively influence therapists' judgments. It has implication for development of therapeutic alliance which can influence psychotherapy outcomes.

A positive therapeutic relationship has been consistently linked to good psychotherapy treatment outcomes (e.g., Horvath & Symonds, 1991). Perfectionism, a maladaptive personality style in which a person requires absolute perfection of the self and others, has been thought to undermine therapeutic relationships. In a re-examination of data from Hewitt et al. (2008), 90 clinical patients participated in a clinical interview before which perfectionism measures were completed. After the interview, therapists rated how much patients were liked and whether therapist wished to work with the patients. Results suggested that several perfectionism components were negatively correlated with therapist ratings. Also, patients' likability mediates the relationship between perfectionism and patients' desirability. Such findings indicate that individuals who score high on certain dimensions of perfectionism are less liked by therapists and therefore less desirable to therapists as patients. This study provides insight on the nature of perfectionism that interferes with therapeutic alliance and perhaps subsequent treatment outcomes.

### Health advice in a digital world: Quality and content of online information about Alzheimer disease

**Tanya Feng**

As the number of older adults turning to the Internet for health information increases, so does the potential for this information to have a substantial impact on the patient-physician relationship and on patients' health. Inaccurate information may weaken patient-physician relationships or result in increased physician visits and health-anxiety, while high quality information may allow Internet users to become better informed about their health. Previous work from our group has demonstrated that an extensive conversation about dementia is taking place online, and that websites hosting dementia-related information receive up to several million visitors per month. However, to date, there has been little research on the content and quality of freely available information about Alzheimer's disease. In this study, to further our understanding of online information on Alzheimer's disease, we aim to assess the content and quality of available online resources on the treatment of Alzheimer's disease. Our results showed that: 1) different types of evidence are used to support claims in high- and low- quality articles, 2) lower quality articles tend to make stronger recommendations, 3) lower quality articles are more likely to endorse a product or service, and 4) articles of higher quality tend to focus on pharmacological interventions, while articles of lower quality emphasize nutrition as a form of treatment.

## Using a rodent model of postpartum depression to examine paroxetine efficacy

**Robin Richardson**

Postpartum depression (PPD) affects approximately 15% of women. Untreated, it can lead to undesirable consequences for both the mother and her offspring. While prescribed antidepressants are the first-choice treatment for PPD, it is not currently clear which specific antidepressant yields the greatest efficacy. This study seeks to examine the efficacy of paroxetine, a selective serotonin reuptake inhibitor, using a rodent model of PPD developed by our lab. In this study, rats were randomly assigned to receive daily postpartum injections of either corticosterone (CORT; to induce a depressive phenotype), or sesame oil (as a control for CORT), and concurrent paroxetine or saline (as a control for paroxetine). Maternal depressive-like behaviour was measured using the forced swim test, and maternal anxiety-like behaviour was measured using the elevated plus maze and the open field test. Results demonstrate that paroxetine is ineffective at reducing depressive symptoms, as shown by the forced swim test, and may in fact act have anxiogenic effects, as shown by the elevated plus maze and open field test. Thus, it appears that paroxetine may not be the best treatment option for depression in the postpartum period. Future potential treatment options for PPD are explored. This research represents an important step toward understanding which antidepressant treatments are most effective in treating PPD.

## Iconic faces are not real faces

**Quentin Raffaelli**

In psychological research examining the perception of emotion in humans, it is common to use iconic faces in lieu of real faces for stimuli because they can be more precisely controlled. However, recent research suggests that iconic faces may differ from photographs substantially in how they are processed. The present experiment aims at determining whether faces are processed differently as they become more schematized. Participants were asked to determine the emotion displayed by faces at three levels of schematization: photos, cartoons, and a transitional type between the two, rotoscope, as they underwent electroencephalography (EEG). For each face stimulus, data was averaged to obtain an event-related potential (ERP), a brain response resulting from a specific sensory stimulation. Called the N170, this face-sensitive ERP component was examined to determine whether the processing of each face stimulus differed from each other. Activity in two electrodes sites typically examined in N170 studies, P9 and P10, revealed that each site varied across stimuli. Processing cartoon faces resulted in higher amplitude in P10 while early latency was observed for both cartoon and rotoscope in P9. Those results suggest each process a different dimension, featural complexity and contrast, respectively. Overall results allude that schematic faces may be processed as qualitatively different stimuli than real faces, hence calling into question the generalizability of research based on schematic faces to real faces.

## Behaviour Concerns in Children with Neurodevelopmental Disorders and Disabilities

**Louise Harding**

Neurodevelopmental disorders and Disabilities (NDD/D) are a group of brain-based conditions (e.g., autism, cerebral palsy, intellectual disability), which compromise children's ability to acquire various speech-language, motor, cognitive, and adaptive skills. Behaviour problems occur more frequently in NDD/D children than among typically developing. Although current NDD/D treatment is often structured by diagnosis, rather than individual profile, some concerning behaviours may occur across conditions and therefore not be adequately addressed by this approach. This exploratory project aims to: 1) Measure the frequency and types of behaviour concerns that caregivers report to subspecialist pediatricians in the course of developmental consultations; 2) Quantify the distribution of these concerns across a range of diagnosis-based clinics; and 3) Describe the nature of these reported concerns. We conducted a retrospective review of developmental pediatrician and pediatric physiatrist reports (N=198) across four clinics, which assessed children between three and eight years of age. A total of 910 behaviours reported as concerning to parents were extracted verbatim. A multidisciplinary team of three members then iteratively classified the concerns into 58 thematic categories using a consensus-based concept sorting approach. A similar method was then employed to up-aggregate these categories into nine second-order groupings. Next, frequency and correlation measures will analyze the distribution of the behaviours across children, clinics, and clinicians. Preliminary results will be reported.

## Reduction in left-ventricular dimensions induced by spinal cord injury assessed by magnetic resonance imaging

**Emilia Amiama**

Spinal cord injury (SCI) causes maladaptive changes in cardiac structure. Previous studies using echocardiography (ECHO) have demonstrated a reduction in left ventricular dimensions after SCI. However, in clinical settings, magnetic resonance imaging (MRI) is considered the gold standard for assessing cardiac structure due to superior spatial resolution. Moreover, in rodent models MRI images can be acquired at multiple slices throughout the heart, thus providing a more robust estimation of cardiac structure (i.e., volumes) than ECHO, which is taken at only a single slice of the heart. Here, we investigate cardiac structural measures including left ventricular chamber volume and left ventricular wall volume at the end-diastolic and end-systolic time points of the cardiac cycle using MRI which is novel in the SCI field. 10 male Zucker Diabetic Fatty (ZDF) Lean fa/+ rats were evenly assigned to an uninjured control (CON) group or to a SCI group. The SCI group underwent complete transection of the spinal cord at the $T_3$ spinal level. At 12 weeks post-SCI, and the same time-point in uninjured rodents, cardiac structure was assessed using in vivo MRI. We show for the first time that compared to controls, SCI exhibited a significant reduction in left-ventricular end-diastolic volume, stroke volume, as well as end-diastolic and end-systolic wall volume (all $P < 0.05$). We found that SCI was associated with a reduction in left-ventricular chamber and wall volume, which confirms and extends our previous work conducted with ECHO but with a superior and more clinically relevant method.

## Buchanan Building - BUCH B 306

## Time: 5:00pm - 6:30pm

### Exploring The Post-Concussed Adolescent Brain: A Graph-Theory Based Approach To Understanding The Trajectory Of Recovery In Functional Networks In The First 6 Months Post Injury

**Vrinda Munjal**

Concussions are a growing concern, especially with younger athletes, because they can cause long-lasting structural and functional changes in the brain. The purpose of this study is to evaluate how the brain recovers from a single concussion over a 6 month period. We assessed 10 healthy young athletes and 8 concussed athletes at 1 week, 1 month, 3 months and 6 months following concussion using Sports Concussion Assessment Tool (SCAT3) and recorded their brain activity using an electroencephalogram (EEG). The EEG was recorded for 5 minutes while participants were at rest. These recordings were subsequently analyzed using measures derived from graph theory, which allowed us to evaluate brain network properties. Total symptom, balance and coordination scores from the SCAT3 were correlated with global (whole brain) and local (specific brain regions) metrics of the structural properties of the graph in each group. Changes in functional connectivity with time were also analyzed during the recovery period. The results showed a significant increase in clustering coefficient, a measure of functional connectivity, in areas that correspond to the (R) and (L) dorsolateral prefrontal cortex (DLPFC) one week post-concussion. Between 1 month and 6 months we found increased connectivity in the (R) DLPFC and decreased connectivity in the (L) DLPFC. At 6 months, the connectivity continued to differ from the healthy controls, despite the reported symptoms having returned to control levels by 1 month post-concussion. These preliminary results suggest that athletes recovering from concussion show altered functional connectivity in frontal regions of the brain.

### Targeting Lactate Transporters for the Treatment of Urothelial Carcinoma

**Craig Stewart**

Cell membrane lactate transporters have been shown to be of utmost importance for regulation of metabolism in highly glycolytic cancer cells. A significant proportion of ATP in urothelial carcinoma (UC) cells is derived from anaerobic glycolysis, even in the presence of adequate oxygen (i.e. Warburg effect). The role of lactate transporters MCT1 and MCT4, and their chaperone protein CD147 (Basigin), was assessed in three UC cell lines. In vitro transient silencing of MCT1, MCT4, and CD147 expression was performed using small-interfering RNA (siRNA). Cell viability was assessed in varying concentrations of oxygen and glucose, along with cell apoptosis, intra- and extracellular lactate concentrations, and extracellular acidification and oxygen-consumption rates, to determine the functionality and therapeutic relevance of the three target proteins. In vivo effects of stable silencing of MCT4 were assessed in an orthotopic xenograft model. In vitro silencing of MCT4 led to a significant reduction in cell growth of all three UC cell lines, whereas silencing CD147 or MCT1 did not result in consistent growth reduction. The proportion of apoptotic cells was significantly higher in MCT4 silenced cells compared to controls. Inhibition of each of the three proteins led to a significant increase in intracellular lactate and significant decrease in extracellular lactate. Inhibition of MCT4 induces intracellular accumulation of lactate and results in decreased tumor growth in vitro and in vivo. Targeting lactate metabolism via MCT4 therefore provides a promising therapeutic approach for invasive UC.

## Changes in resting heart rate and blood pressure during and after breast cancer chemotherapy, concurrent to exercise training

**Erin Lee**

Breast cancer is the second leading cause of cancer deaths in women after lung cancer. Research has shown that breast cancer patients are more likely to die from cardiovascular disease due to toxic effects of breast cancer chemotherapy on the heart. Therefore, identifying early and clinically assessable markers to prevent these complications is important. Abnormally rapid heart rate (tachycardia) and high blood pressure (hypertension) are well known risk factors for cardiovascular disease development and mortality. In the normal human population, exercise-training can reduce these risks. In the Clinical Exercise Physiology Lab, we aimed to assess whether exercise-training can improve resting heart rate and blood pressure during and after chemotherapy treatment in breast cancer patients. Early stage breast cancer patients were enrolled in an aerobic and resistance exercise intervention within the first half of adjuvant chemotherapy. During chemotherapy and radiation, patients exercised thrice weekly, then twice weekly after treatment for 10 weeks, followed by once weekly for 10 weeks. Resting heart rate and blood pressure were measured once a week during treatment, then at 20 weeks after chemotherapy and radiation completion. During chemotherapy, resting heart rate consistently elevated with increasing number of treatments and tachycardia occurred in one-third of breast cancer patients despite exercise training. However, resting heart rate returned to baseline with 20 weeks of consistent exercise training after chemotherapy. Blood pressure decreased during chemotherapy, but systolic blood pressure and hypertension prevalence increased at 20 weeks post treatment. These results are a significant interest to cancer treatment and rehabilitation research.

## Contribution of Vascular Smooth Muscle Cells to Foam Cell Formation in Atherosclerotic Lesions

**Malcolm McDonald, Andrew Jeong, Shamim Hortamani, Roxanna Yan**

Atherosclerosis, a disease characterized by plaque build ups inside arteries, is a dangerous condition that can result in serious health problems including heart attack, stroke, and even death. Foam cells, the fat laden cells that make up the fatty streaks in the arterial build-up within atherosclerosis, were all thought be macrophage-derived until recent evidence suggested the presence of an underestimated amount of smooth muscle cell (SMC)-derived foam cells. In this study, Fluorescence-Activated cell sorting (FACS) technology was used in order to obtain more accurate information about the makeup of human atherosclerotic lesions. FACS is able to analyze the composition of the entire lesion instead of the cross-sectional area of lesions determined in past studies. Fresh human coronary artery samples obtained from bypass surgery containing atherosclerotic lesions were digested using Liberase TM into cell suspensions prior to FACS. As most SMCs in the lesion lost their specific differentiation markers, CD45, a pan-leukocyte marker, were used to probe all macrophages and BODIPY (a dye used to mark foam cells) was used probe all the foam cells by labeling their intracellular lipids. SMC-derived foam cells were determined and quantified as BODIPY+ CD45- cell population. Results from FACS showed that more than 60% of foam cells from the atherosclerotic lesion were SMC derived. Further studies could be directed at determining the differences between macrophage and SMC-derived foam cell and how they contribute to the pathology of atherosclerosis, which can be used to develop new therapeutics for treatment of this disease.

## Sequencing of liquid biopsies in patients with metastatic prostate cancer to identify the spectrum of germline and somatic mutations in DNA damage repair genes

**Evan Warner**

Prostate cancer is one of the most commonly diagnosed cancers in men but despite decades of progress there remain no cures for metastatic disease. Therapies that deprive the cancer of androgenic hormones are initially effective but patients inevitably progress to lethal "castration-resistant" prostate cancer (CRPC). In recent years there have been an explosion in the number of therapies available for CRPC but there is an urgent unmet need for more personalized care; better understanding of each patient's unique cancer would allow clinicians to prescribe the most effective therapies and avoid unnecessary medication. Our lab at the Vancouver Prostate Centre is studying the role of DNA damage repair (DDR) genes in prostate cancer progression, and we and others have recently demonstrated that a large proportion of patients with CRPC have mutations in these genes, either in their germline DNA and/or in their tumor. Since DDR gene mutations are rare in early state prostate cancer, these findings suggest that they are present only in a highly aggressive subset of cancers. Our lab has developed a next-generation "liquid biopsy" protocol, which enables us to sequence the circulating tumor cell-free DNA (cfDNA) found in blood samples taken from men with CRPC. Our goal is to reveal the spectrum of germline and somatic mutations in DDR genes in men with CRPC. This will identify patients who, should they have loss of both copies of a DDR, are candidates for novel therapies that exploit such defects.

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## Incidence of infective endocarditis in patients with bovine jugular vein valves compared to other right ventricle to pulmonary artery conduits: a systematic review and meta-analysis

**Ashutosh Sharma**

Certain structural abnormalities in the heart may require the replacement of a patient's pulmonary valve, present at the exit of the right ventricle, to allow for proper blood flow. Catheter-based implantation of bovine jugular vein (BJV) valves has recently gained widespread acceptance for pulmonary valve replacement (PVR) as surgery is not required. Infective endocarditis (IE), the inflammation of the soft tissue in the heart, is an important clinical problem for patients that that have undergone PVR. Recent small case series have reported an incidence of IE higher in those who have undergone catheter implantation of a BJV compared to other valve types, however, the data from the literature have not yet been systematically evaluated. The purpose of this study is to determine whether the risk of IE is increased in the presence of BJV valves compared to other valve types and whether there is a difference in IE incidence between surgical and catheter-based BJV valves.

A systematic review and meta-analysis was conducted by pooling data from articles reporting the IE incidence of patient populations that have undergone PVR. Literature searches were conducted using electronic databases.

50 studies were included representing 7,063 patients. The incidence of IE was higher for BJV than all other valve types (5.4% vs. 1.2%, $p<0.0001$). For patients with BJV valves, the incidence of IE was not different between surgical and catheter-based implantation ($p>0.9999$).

This suggests that the substrate for future infection is related to the tissue comprising the valve rather than the method of implantation.

## Buchanan Building - BUCH D 304

## Time: 5:00pm - 6:30pm

### Are "New" Terrorists Old News? Testing Electoral Terrorism from 1970-2014

**Parmida Esmaeilpour**

Terrorism figures prominently in the news and recent research in international relations. The unprecedented proliferation of the Islamic State has evidenced the growing strength and sophistication of terrorist networks. Politicians, political commentators and mass media have capitalized on the fear generated by the threat of terrorism, provoking alarmism and xenophobia in pursuit of profits and power. Terrorism scholars have also exacerbated existing anxieties surrounding terrorism by theorizing that "new" terrorists are fundamentally and qualitatively different from terrorists in preceding decades. New terrorists have been popularly described as apocalyptic absolutists with insatiable blood-lust and maximalist, non-negotiable demands. Using a time-series cross-section analysis of all sovereign states from 1970-2014, I test an alternate hypothesis — that today's terrorists are not significantly different from "old" terrorists. My paper specifically examines the relationship between the timing of terrorism and national-level elections. Through a linear model of electoral terrorism, I depict that approaching elections lead to an increase in the volume of terrorism. Although terrorist networks have multiple, concurrent goals, I suggest that the attractiveness of elections as a target for terrorism is evidence of the enduring political objectives of terrorist networks.

### Effect of Antipsychotic Drugs on C-reactive Protein in Rat Serum, Liver and Brain

**Saman Fouladirad**

Antipsychotic drugs have remained as the standard treatment for patients with schizophrenia despite their serious side effects including increase in fat concentration, cardiovascular disease (CD) and involuntary muscle movement. Research on antipsychotic drug effect on the inflammatory marker C-reactive protein (CRP) has received little attention. This is a concern since elevated CRP levels have been linked to CD and cognitive impairment for patients with schizophrenia. This study examined the effects of antipsychotic haloperidol and clozapine on rat CRP levels in serum, liver and brain. We asked whether these drugs increase the level of the protein and whether this is tissue specific. Thirty rat samples were divided into control (n=10), haloperidol (n=10) and clozapine (n=10) groups and the serum, liver and brain protein level of each rat sample was quantified using western blotting. There was a significant increase in liver and serum CRP of the clozapine treated group whereas no significant change was noted in the haloperidol group. Brain CRP levels following haloperidol treatment was not altered while a certain trend towards significance was observed in the clozapine treated group. As evident from the data, monitoring of patients under clozapine medication may be needed to prevent liver toxicity or other biological complications. Future studies should aim to investigate the effects of other antipsychotics drugs on CRP. More importantly, we must also investigate whether these drugs are tissue specific, a factor that could ultimately lead to development of different therapeutic interventions.

## A new variant in International Education: Internationalization 2.1

**Stefanie Yap**

International education is not a new phenomenon. However, institutions' strategies of recruiting international students have been evolving. While traditional recruitment is still employed, institutions are developing new recruitment strategies as new players emerge on the international education market. This research seeks to explore the development of international higher education strategies. First, we assess several phrases of internationalization initiatives in higher education between the Middle Ages to the present, identifying the shifting rationales behind each phase. We note that more recently, international education has taken a more economic role for institutions as they recruit foreign students in the face of dipping domestic enrollments and reduced government funding.

The proliferation of English as a medium of instruction in non-traditional English-speaking countries also signals a motivation to internationalize higher education. Globally, institutions are offering pathway programs that offer academic English preparation designed to help transition qualified students to university. We draw on explicit attention to this new wave of internationalization, a phenomenon commented upon very sparely in research literature. We are currently conducting semi-structured interviews (in-person and via Skype) with professional education leaders across 12 different institutions in Canada, US, UK and Australia to explore how this new strategy is rolling out. Our preliminary findings suggest that institutions are expanding the pool of students they can recruit from by diversifying their recruitment bases. That is, admitting bright, qualified students who lack English language proficiency.

## Translation as Reflection: Contemporary Approaches to Virgil's Aeneid

**Sophia Ly**

The archetype of classical Roman epic, Virgil's Aeneid has enjoyed incredible literary attention since its initial appearance in the first century BCE. At least eighty English translations of the Aeneid have been published since the beginning of the sixteenth century, of which almost thirty have been written in the last hundred years. The purpose of this study was to examine how the attitudes, experiences, and socialized preferences of contemporary translators could contribute to new and divergent translations of the Aeneid in spite of its well-established literary tradition. By contrasting the approaches taken by translators Cecil Day Lewis (1952), Allen Mandelbaum (1961), Robert Fitzgerald (1981), Robert Fagles (2006), and Sarah Ruden (2008) to a single fifteen-line excerpt of the Aeneid (IV.615-629), this study reveals how a translator's social and historical milieu can manifest in subtle differences of grammar, syntax, vocabulary, metre, and tone, culminating in a unique reading of the text. What emerges through the course of this analysis is a plurality of interpretations that exposes the polysemous nature of the Aeneid and accounts in no small part for its continued ability to find meaning among audiences today.

## Long-term Effects of Prenatal Alcohol Exposure and Chronic Unpredictable Stress on Depressive-Like Behaviour

**Lily Takeuchi, Vivian Lam, Charlis Raineki, Joanne Weinberg**

Fetal Alcohol Spectrum Disorder (FASD) describes the wide range of adverse effects of prenatal alcohol exposure (PAE) on the offspring. These effects may include an increased risk for mental health problems -- in particular, depression. The hypothalamic-pituitary-adrenal (HPA) axis is a neuroendocrine system that plays a critical role in responding to stress and maintaining homeostasis, and it has been implicated to play a role in depression. Given that PAE causes similar alterations to HPA axis function as those seen in depression, we hypothesized that HPA dysregulation by PAE may increase sensitivity to the adverse effects of stress and result in increased depressive-like behavior. We used a rat model of PAE to test this hypothesis. Pregnant females were assigned to one of three diet groups: PAE, pair-fed and ad libitum-fed control. In adulthood, male and female offspring were either exposed to 10 days CUS or left undisturbed, and were then tested 24-hr or 14 days after CUS to assess, respectively, their immediate or delayed behavioural responses. Depressive-like behaviour was assessed using the Forced Swim Test (FST), which involved a 15-min pretest on day 1 and a 5-min test on day 2 of testing. Results indicate that following CUS, depressive-like behaviour, measured as immobility, decreased in males on both the pretest and test days, but increased in females on the test day only. This increase persisted, and was augmented after 14 days in PAE females. These findings suggest that PAE alters behavioural responses to stress in a sexually-dimorphic and time-dependent manner.

## Scientists Find God: Religiosity and Spirituality in Scientists' Conceptions

**Sibyl Song**

The relationship between science and religion has been widely discussed. Previous scholars have researched scientists' attitudes toward religion and found that scientists are less religious than the general public (Leuba, 1916; Mayer, 1959) and conversely more religious than might be expected (Ecklund, 2010). However, there has yet to be an analysis of the underlying dynamics explaining scientists' religiosity; nor has there been a detailed discussion of the nature of religious scientists' beliefs. By analyzing essays written by and interviews with eleven eminent scientists on their understanding of science and religion, I aimed to identify possible reasons for scientists' religiosity and spirituality, and their implications for the interaction between science and religion. My finding is that the religiosity and spirituality of these scientists are induced by the wonder and beauty of the natural laws and scientific theories, parallels between science and religion, human instinct, difficulties of finding meaning and purpose through science, and factors such as religious upbringing and cultural background. Some scientists find that science enhances their religiosity and spirituality, while others do not experience this effect. However, while being "religious" or "spiritual," some scientists are still inclined to scientific rationality. Some reconcile the potential conflict by separating science and religion, while others believe science and religion are mutually inclusive. The religious side of science and scientific side of religion identified by this research have the potential to expand our understanding of both religion and science, and facilitate the future development of, and interaction between, them.

## Buchanan Building - BUCH D 314

## Time: 5:00pm - 6:30pm

### Green roofs: seismic-alarming or -appreciating?

**Rachel Diao**

Green roofs offer many benefits, including, longer roof lifespan, improved sound insulation, reduced heating and cooling requirements, reduced and slowed stormwater runoff, capture of gaseous and particulate pollutants, alleviation of urban heat island effects, and increased biodiversity. In this context, supporting structures have to carry all the loads associated with the vegetation, its supporting medium, and the waterproofing and protective layers beneath - plus any live loads from people using the roof. However, the knowledge in how they behave under severe earthquake excitation, and the influence they have on the structures is visibly inadequate in the literature. Therefore, the aim of this study is to numerically examine the response of extensive green roofs on a mid-rise building's structural performance subjected to 9 in-situ ground motion (GM) realizations. Results indicated that given some measures, green roofs can get more appraisal due to adding more damping capacity that helps the building to outperform under sever mainshocks.

### Sensitivity of mountain glaciers to climate change with the use of a block model

**Eviatar Bach**

Despite comprising a small fraction of the Earth's total ice volume, melting of mountain glaciers due to climate change constitutes a significant contribution to sea level rise. Mathematical models of volume evolution of mountain glaciers are thus important in projecting sea level into the future. While state-of-the-art ice-flow models for glaciers exist, these rely on detailed data about the bed and surface of the glacier, data that is available for only a few glaciers worldwide since acquisition of the data must be done manually. Other models have the disadvantage that they cannot distinguish between climatic and geometric factors affecting a glacier's sensitivity to climate change. We derive and analyze a new model, extending previous work on a simple block model for glacier volume response to make it more physically realistic. We then apply it on a global scale with data from the Randolph Glacier Inventory in order to estimate the regional sensitivity of glaciers to different geometric and climatic parameters.

## The Last Plague: Investigating the Lethality of Pandemics Under Simulated Parameters

**Li Qing Wang, Uma Wu**

The scientific community is no stranger to the dangerous and volatile nature of viral pandemics. Currently, numerous models have been developed to investigate transmission process and vaccination against and of viral diseases respectively. This project takes a holistic approach in investigating the effects of seven parameters on the spread of viral epidemics: infectivity, infectious period, mobility, incubation period, mortality, immunity and recovery period. Two algorithms are created to simulate the effects of the disease on the health status of individuals in a population – one stochastic, and one deterministic. While the deterministic model simulates the spread through regulating the flux between compartments with differential equations, the stochastic model simulates the spread by applying the parameters as a set of probabilities and tracking the spread of the disease from person to person.The models are calibrated with current data on SARS and Ebola from the World Health Organization. Parameter values for each disease found through literature search were compared to those found by the program. The parameters with high lethality were analyzed for their components. Although we are working with simulated diseases, the combinations of parameters that define a pandemic is important because any combination may present itself in a future pandemic. By adjusting the parameters and observing their effects on the lethality of the disease, we can predict the threat posed by a disease before it develops into a pandemic.

## Assessing The Mining Industry: The Development Of A Mining-Centered Rating System Based On Environmental, Economic, and Ethical Standards

**Daniel Lim, Jess Chen, Liam Crozier, Jay Ko**

The mining industry suffers from a perception problem, one which is not entirely undue. While many mining companies take great effort to publish and emphasize their adherence to high ethical, environmental, and economic standards, it is pictures of the Mount Polley and Bento Reodrigues disasters that make headlines. The result is a paradox of practice in the mining industry. Developing a system on which to comprehensively assess the mining industry's actors off of impartial ethical, environmental, and economic is a potential solution to clarifying this paradox and providing a clearer picture of the mining industry's performance. That is what this research project will focus on. Using the established standards for corporate governance created by B-Corp and progressive regulatory from a number of governments as inspiration, this research project will seek to develop a rating system on which to assess mining companies' and mine developments' commitment to high ethical, economic, and environmental standard. This rating system will consist of five categories: finances, environment, community, governance, and labour. Performance will be assessed on a determined numerical scale for each category, and an overall score for a company or development will be aggregated from the results in the five categories. Utilizing this rating system to assess mining companies and mine developments will allow us to develop a clearer of the industry's overall performance as well as who its best and worst performers are. From these results, it will hopefully be possible to develop strategies for improving the state of the mining industry.

## Microwave oxidation treatment of sewage sludge: A pilot-scale study

**Cristina Kei Oliveira**

The growth in population in cities and the development of more stringent regulations of wastewater discharge quality has led to higher volumes of wastewater sludge. Sewage sludge is a residual semi-solid material that is a bi-product of wastewater treatment. Its processing and disposal incur substantial capital and operational costs for treatment plants and if done improperly, can be harmful to the environment. However, sludge is also rich in carbohydrates, proteins, lipids and metals, which can be recovered as bioenergy through anaerobic digestion or as struvite - a mineral composed of nutrients that are readily able to serve as a slow release fertilizer. Treating sludge is thus advantageous for treatment plants and for the environment. Various techniques using conventional heating have been investigated in sludge treatment; however microwave heating has captured recent attention. Past studies at the UBC Pollution Control and Waste Management research group have shown that high temperature microwave heating combined with hydrogen peroxide is very effective for treating sludge. The purpose of this study was to investigate the relationship between temperature and hydrogen peroxide dosage on the efficiency of the UBC designed continuous-flow 915 MHz microwave system. Seven experimental sets were carried out with combinations of two temperatures (90 and 110°C) and six dosages (0.2, 0.4, 0.6, 0.8, 1.0, and 1.2 %$H_2O_2$/%Total Solids). Treatment effectiveness was analysed based on solids disintegration, nutrient solubilisation and physical properties. The clear solution after high temperature and mid-high dosage treatments were found to be ideal for struvite crystallization and anaerobic digestion processes.

## Measuring Perceived Relatedness with Auditory Cues

**Kathleen Currie Hall, Veronica Letawsky, and Alfred Ko**

Language users' perceptions of words as being "related" is important within linguistic research. The task to determine whether two words are related can be difficult and may be influenced by the medium through which the words are presented. For example, there may seem to be a clear relationship between "face" and "faced", but what about "face" and "resurface"? What do speakers know about measures of relatedness, and does this knowledge and relatedness differ based on whether words are seen or heard?

This experiment used auditory cues and builds on a prior study conducted using visual cues. Using an AXBX discrimination task, speakers were asked to make similarity judgments about pairs of words. On every trial, participants heard two pairs of words, with one word within each pair being the same. Participants were asked to judge which pair of words was more similar. Results were compared with measures of similarity based on word meaning, spelling, transcription, and acoustics.

Thus far, the results from this study are closely in line with our predictions based on the results from the prior study using visual cues. Words that linguists suggest are etymologically related tend to be judged as most similar. Interestingly, in the visual-cue experiment, the next most similar words were thought to be meaning-related words, followed by sound-related words. But when the words are presented auditorily, sound- and meaning-related words were judged approximately equally similar.

## Buchanan Building - BUCH D 323

## Time: 5:00pm - 6:30pm

### Determining Key Regulators in Cerebellar Development Using a Gene Expression Database

**Cody Lo**

Development of the brain depends on the differential expression of various genes over time. The FANTOM5 (Functional Annotation of the Mammalian Genome) project has analyzed gene expression in numerous cell types, thus offering one of the most robust time series data sets available to date. Using the FANTOM5 time-course data, we aim to identify key regulators in cerebellar development and experimentally validate our results to confirm the reliability of such large-scale transcriptome analyses. The first step in determining candidate genes included finding differentially expressed transcription factors (TFs) in the FANTOM5 time course data. These genes were sorted by maximum expression and were eliminated if they had a known knockout phenotype. The candidate gene selection process produced 10 potential regulators for further analysis. Expression profiles of the 10 candidate genes were determined using qRT-PCR and compared to profiles predicted by the FANTOM5 database. We saw that expression profiles for the candidate genes produced by qRT-PCR were similar to those predicted with the FANTOM5 data set. Using in utero shRNA transfection, all 10 candidate genes were knocked down and the developmental phenotype was observed. The shRNA transfection showed that 3 of the candidate genes ($ATF_4$, $SCRT_2$, $RFX_3$) displayed a developmental phenotype. The phenotype for all three genes included a reduction of tissue size and delay in overall development, this result suggests they are key regulators in cerebellar development. Our findings demonstrate the utility of gene expression databases for deepening our understanding of the genetic basis of cerebellum development.

### Measuring transcript level changes upon CrPV infection by 4sU-labeling

**Clarence Yeung**

What if someone hacked into your bank and depleted your possessions? That's what viruses are capable doing. Our information for our bodies is stored in a library called DNA. DNA encodes for instructions needed for replication and for making proteins. Proteins are made when DNA is copied into RNA, much like making a Xerox copy in a process called transcription. RNA can then be translated into function units called proteins.Viruses are obligate parasites that cannot survive or reproduce outside a host cell. Almost every living organism is susceptible to viral infection. Why this is pertinent to us as researchers is because viruses have evolved many ingenious mechanisms to take over the cell and ultimately cause death within the cell. What I am interested in studying is how the family of Dicistrovirus can change transcription levels upon infection by using pulse-labeling techniques. Newly transcribed messages can be differentiated from pre-existing copies and be biotinylated. Upon enrichment of biotinylated transcripts, I can use RT-qPCR to measure transcript levels. These findings will likely give us a better idea of what how this family takes over cellular machinery to benefit their replication.

## Activity-Independent Mechanisms of Dendritic Filopodial Outgrowth

**Jodi Wong, Sina Safabakhsh**

Neurons communicate through connections called synapses to cooperatively give rise to behavior and thought. Synapses occur between neuronal structures called dendrites (information-receiving) and axons (information-sending). Dendrites contain protrusions called filopodia that can act as synaptic sites. These structures undergo constant refinement through addition or subtraction from their parent dendrite. Changes in filopodia have been shown to correlate with synaptic changes. For example, an animal's visual experience contributes to filopodial changes by maintaining important synapses and pruning those that are not. The experience-dependent mechanisms contributing to this refinement are known. However, the mechanisms by which a dendrite triggers the addition of filopodia without external influence are unknown. Understanding the mechanisms underlying the activity-deprived change in filopodial growth will provide fundamental information for morphological neuronal development under normal and pathological conditions such as autism or schizophrenia. Here, we set out to investigate the mechanisms by which neurons independently trigger the formation of filopodia. Using Xenopus laevis tadpoles as a model organism for a developing neural circuit, we performed Single-Cell Electroporation to isolate neurons with fluorescent dyes. Then, we employed rapid time-lapse two-photon imaging in vivo to study the structural changes of dendrites in the awake-tadpole brain during normal and activity-blockade conditions. Activity-deprived dendrites, removed of all external influences, will unmask the intrinsic mechanisms of filopodial addition. Preliminary results suggest an increase in filopodia retraction, yet require further quantitative analysis.

## Identification of Gene Candidates involved in a Mammalian-Fungal Dual Organism Interaction Model

**Luka Culibrk, Carys Croft**

Background: Aspergillus fumigatus is a ubiquitous fungus that disseminates in the air through the release of conidia (spores). Upon inhalation, these spores are capable of interacting with human airway cells. Elucidation of key genes involved in the initial stages of this dual organism interaction is an active area of research. Methods: Microarray data from previous research investigating the transcriptional responses of human and fungal cells upon co-incubation (6 hours) was analyzed. Microarrays are a common tool used to assess the gene expression of thousands of genes within a biological sample. Using a variety of statistical methods, we identified correlated pairs of genes between the human and fungal cells. We compared this list of genes to another experiment, in which human-fungal co-incubations (6 hours) were separated to yield human cells directly associated with spores and cells unassociated with spores. Results: Of the human genes, 108 were identified as up-regulated and 66 down-regulated ($P < 0.05$). Of the A. fumigatus genes, 35 were identified as up-regulated and 81 down-regulated ($P < 0.05$). Our correlation analysis yielded 81 gene pairs ($R^2 > 0.95$). One human gene, MOP-1 (function unknown) was found to be up-regulated in both experiments. This gene was negatively correlated with a number of A. fumigatus genes which are believed to be associated with cellular metabolism. Conclusion: We have identified a number of candidate genes which may play a role in this interaction, and demonstrate a procedure for analysis of data obtained from a dual organism study.

# Creation and Implementation of a BC Registry for Familial Hypercholesterolemia

**Aria Shokoohi**

Cardiovascular disease (CVD) is now the leading cause of death worldwide. Atherosclerosis is the most common pathological change underlying CVD, with high cholesterol levels proven as a major risk factor for its development. Familial hypercholesterolemia (FH), a common autosomal dominant genetic disease, causes high cholesterol levels in the bloodstream, leading to premature CVD. With a prevalence of 1:500 in the population, approximately 13 million people worldwide and around 8000 in British Columbia are carriers of one of the genes for FH. Although more common than type 1 diabetes mellitus, vast majority of FH cases still remain undiagnosed, which implies that health professionals lack awareness of FH, its diagnostic features, and consequences. The purpose of this project is to create a registry with the diagnosis of FH in British Columbia to simplify education and treatment, ultimately reducing morbidity and mortality from CVD through early diagnosis and effective disease management. Patients with FH were identified based on their family history, physical examination, and laboratory results and stratified as definite, probable, or possible FH according to their final score on The Dutch Lipid Clinic Network FH critera. Cascade screening was used to to track the mode of inheritance of the disease to identify affected family members. Thus far, we have identified 1000 individuals with FH based on chart review, with 434 consented to join the registry. Further research will aim to identify and educate FH individuals, their families, and their physicians regarding the appropriate management of hypercholesterolemia using lifestyle measures and medications.

# POSTER PRESENTATION OVERVIEW (2)

DAY 2 PROGRAM - MARCH 30, 2016

## Irving K. Barber Learning Centre - 2nd Floor Foyer

## Time: 6:45pm - 8:00pm

| *Research Topics* | *Presenters* |
|---|---|
| Using Eye-tracking to Quantify the Impact of Prostate Cancer Treatments on Male Libido: A Pilot Study | Vivian Tsang |
| Education's Impact on Healthy Seniors' Attitudes and Health Care preferences Regarding Different Stages of Alzheimer's Disease | Oscar Lu |
| Estimating Changes in Ocean Ecology by Monitoring Changes in Prochlorococcus and Pelagibacter Ecotypes | Herbert Hsia<br>Jonathon Zajonc |
| UBC Thunderbots | Michaela Ragoonath |
| Zebrafish show evidence of group-level differences in behavioral lateralization | Mari Kondoh |
| Effects Of Intravenous Lidocaine Infusions On Pain And Opioid Consumption After Pediatric Scoliosis Correction Surgery | Michelle Lee<br>Shana Yeung |
| A Microfluidic "lab-on-a-chip" Platform for the Study of Antimicrobial Susceptibility of Salmonella enterica serovar Typhimurium in a Dual-species Biofilm | Wen Liao |
| Cardiac DCD: Establishing Metrics of Damage by Inflammatory and Ischemia-Reperfusion Gene Quantification | Stephanie Wong<br>Sally Miller |
| Assessing the Community Impacts of Large Heterotrophic Protists | Cole Larsen |
| Response of Mycobacterium tuberculosis to copper stress in a hypoxic environment | Lawrence Tu<br>Kate Jiang<br>Veena Lin<br>Tommy Huang |
| Differential gene expression of Hormone replacement therapy on breast cancer | Cristiana Pan |
| Public Perception of the Relative Harm of Electronic Cigarettes Compared to Traditional Cigarettes among Smokers and Non-Smokers in the United States | Summer Shan<br>Angela Phan<br>Yi Min Ng<br>Aydan Kesici<br>Leo Chen |
| Schizophrenia-associated DHHC5 and substrate mutants in the development of neural circuits | Vincent Tang |
| Quantum Entanglement and the Loss of Information | Nishad Jamaldeen |

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| Mental Toughness and Optimism In Coping | Janzen Hui<br>Hanno Southam<br>Jennifer Liu |
| Alcohol and Stress: Effects of Prenatal Alcohol Exposure and Chronic Mild Stress on Stress Coping Behaviour | Lisa Wang |
| Gulag, garrisons, and ordinary towns: The historical landscape of North Russia visualized. | Felipe Alfaro<br>Maria Gladkikh |
| The Role of IGF-1 in Programming of Offspring Adiposity by Maternal Folate/ Vitamin B12 Imbalances | Nolan Chem |
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| Validation of a quality evaluation tool for online health information | Jessica Jun |

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| Harnessing the power of a miracle: exploring the potential of a plant protein to change sour into sweet | Trevin Wong |
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# POSTER PRESENTATION ABSTRACT (2)

MARCH 30, 2016

## Irving K. Barber Learning Centre - 2nd Floor Foyer

## Time: 6:45pm - 8:00pm

### Using Eye-tracking to Quantify the Impact of Prostate Cancer Treatments on Male Libido: A Pilot Study

**Vivian Tsang**

Background: Eye-tracking research has demonstrated that heterosexual men with normal testosterone levels attend visually to features of women associated with fertility. As such, eye-tracking data can serve as an implicit measure of a man's libido. Many treatments for prostate cancer (PCa)—in particular androgen deprivation therapy (ADT)—depress sexual interest in men, but there is no objective measure of the intensity of this effect. Here we explore whether eye-tracking can be used to quantify the impact of PCa treatments on men's libido. Methods: We used an approved deception protocol using eye-tracking technology to explore and assess the level of sexual interest of PCa patients and normal controls. Three age-matched groups of heterosexual men aged 50 years and older were recruited. They were: PCa patients using ADT (n=8), PCa patients not using ADT (n=13), and healthy controls (n=7). Unaware that their eye movements were being tracked, all were exposed to photographs of models, either fully clothed or minimally clothed. Number and duration of eye fixations on target areas of the female models' bodies were recorded. Results: observed in our preliminary data suggest that men on ADT exhibit differential patterns of visual attention to sexual stimuli compared to men in the other two groups. Conclusions: Eye-tracking technology may provide an objective technique for measuring the libido of cancer patients. Such data could help patients be better informed about psychological side effects when making treatment decisions and lead to ways to both study and reduce the impact of PCa treatments on men's sexual interest.

### Education's Impact on Healthy Seniors' Attitudes and Health Care preferences Regarding Different Stages of Alzheimer's Disease

**Oscar Lu**

Alzheimer's disease (AD) and behavioral and psychological symptoms of dementia (BPSD) are not well- known publicly. Studies have yet to explore whether education about both AD and BPSD has an effect on healthy seniors' knowledge, beliefs and healthcare preferences. As a pilot study, twenty-four female and eight male healthy seniors were quantitatively assessed at three time-points (pre-education, post-education and one month follow up) using AD knowledge and health belief questionnaires as well as treatment decision-making grids. Qualitative analysis was conducted on data from focus groups about subjects' reasons for their decisional preferences and any changes over the educational time period. After receiving education about AD, subjects performed on average 10% better on the AD knowledge questionnaire. Of the subjects whose knowledge improved overall during the focus group, one quarter chose less active interventions upon gaining AD knowledge in the severe stage. One month following, this association strengthened with one-third of the subjects whose knowledge improved choosing fewer active healthcare interventions. The majority of both genders chose Alzheimer's disease as a more concerning condition compared to cancer and heart failure. Aggressiveness and psychosis were the most troubling BPSD symptoms for subjects. Medications were the most preferable intervention to manage BPSD symptom, while physical restraints were least preferable. This pilot study highlights that education about AD and BPSD can impact seniors' choices about healthcare interventions. This will inform the design of a larger study focusing on seniors with mild cognitive impairment or early AD where decision-making for care is more time sensitive.

## Estimating Changes in Ocean Ecology by Monitoring Changes in Prochlorococcus and Pelagibacter Ecotypes

**Herbert Hsia, Jonathan Zajonc, Roland Wilhelm**

The rate of current climate change, estimated at 20-fold faster than previous global climatic events, may exceed our capacity to monitor widespread environmental change. Monitoring environmental change is necessary for understanding and adapting human-managed systems. Oceans are vast ecosystems and are the second largest reservoir of microbial biomass, necessitating simple and effective monitoring tools. We propose using the ubiquitous Pelagibacter and Prochlorococcus as proxies to monitor the effects of climate change across geographic region, season and time.

With the advent of high-throughput sequencing, measuring the response of microbial population with a global scope became possible. Numerous large-scale efforts have been made to map the microbial features of Earth's Oceans, such as the Tara Expedition. These efforts uncovered a diverse and complex ocean microbial environment, that was, however, also populated by ubiquitous species Prochlorococcus and Pelagibacter. These two genera possess some of the smallest genomes (< 2 Mb) of free-living organisms recorded to date. Their ubiquity and limited ability to adapt to drastic environmental changes, due to their smaller genome size, recommend them as indicator taxa for monitoring broad changes in our ocean ecosystems.

To test our proposition, we quantified the relative abundance of various Prochlorococcus and Pelagibacter species across broad spatial and temporal distributions to identify species indicative of changes in temperature. We downloaded over 200 samples from public repositories and correlated various Prochlorococcus and Pelagibacter species with environmental parameters. We aim to enable researchers to rapidly and easily monitor future changes in ocean ecology.

## UBC Thunderbots: Autonomous Soccer Playing Robots

**Michaela Ragoonath**

UBC Thunderbots is a student driven engineering design team at the University of British Columbia.We design, prototype and build autonomous soccer playing robots to compete in the annual RoboCup Conference. Our team consists of 45 members enrolled across the engineering disciplines and in Computer Science. We take an interdisciplinary approach with mechanical, electrical, software and administrative sub-teams, each of which offer opportunities for leadership and mentorship. Our greatest motivation is our passion for robotics and we use the platform of RoboCup to drive us. Since our initial qualification in 2009, we have competed in RoboCup and our team of six robots has maintained top ten finishes for the past five years. We hope that through our work we are able to promote research in robotics and artificial intelligence.

## Zebrafish show evidence of group-level differences in behavioral lateralization

**Mari Kondoh**

Behavioural lateralization—the preferential use of one side of the body over the other—has been proposed as a mechanism by which animal groups can enhance cohesion and coordination. Group-level behavioral lateralization is a form of behavioral synchrony which is one method of assessing welfare in group-living species. Zebrafish are commonly used for studying individual-level lateralization; however to our knowledge, group-level behavioral lateralization in this species has not been described. Zebrafish are known for their highly social and shoaling behaviour and discovering a new form of synchronous behavior in them may be a hallmark of a well-functioning group and indicative of good animal welfare. We assessed the presence of group-level lateralization by exposing 6 tanks of zebrafish (10 fish/tank) to 30 different novel objects and recorded the lateralization of their inspection behavior (left-eye vs. right-eye) during the first 100 seconds. Our results suggest that tanks of zebrafish vary in the degree to which they engage in group-level lateralization. Some tanks showed evidence of consistent behavioral lateralization across the entire month-long experiment, while other tanks were less lateralized (i.e. not favoring one eye over the other) or inconsistent in their lateralization pattern (i.e. sometimes favoring right eye inspections, sometimes favoring left-eye inspections). Determining whether these differences in behavioral synchrony relate to variability in group welfare suggests an exciting avenue for future research. As such, this study provides preliminary evidence that investigating group-level lateralization in zebrafish could contribute to our understanding of the relationship between behavioral synchrony and welfare.

## Effects of Intravenous Lidocaine Infusions on Pain and Opioid Consumption after Pediatric Scoliosis Correction Surgery

**Michelle Lee, Shana Yeung**

Scoliosis, a spine deformity, usually affects adolescents. Patients undergoing scoliosis correction surgery experience severe post-operative pain. This pain is typically controlled with high doses of intravenous opioid, which can cause side effects including nausea and respiratory depression. Decreasing opioid consumption, while sufficiently numbing pain, might improve patient recovery. The administration of intravenous lidocaine has been shown to reduce post-surgical opioid consumption in adults, without causing major adverse effects. This study aims to investigate whether lidocaine infusions are beneficial to pain management after pediatric scoliosis correction surgery. With written informed consent, and ageappropriate assent, adolescents are randomized into three groups: a) A control group and two intervention groups, where an initial lidocaine dose of 1.5 mg/kg is administered intravenously at start of anesthesia. Lidocaine is continuously infused at 2-2.5mg/kg/h and terminated at either b) the end of the procedure, or c) 24 hours post-operatively. Pain will be measured using the color analogue scale (CAS) in a 2-hours interval, for up to 72 hours. Postoperative opioid consumption will be measured as the sum of continuous rate and patient controlled analgesia (PCA), in 12-hours intervals, for up to 72 hours. Data will be plotted as box plots and compared using pair-wise Wilcoxon rank-sum test. Based on previous data in similar types of surgery, we expect lidocaine infusions to decrease post-surgical pain severity and opioid consumption by 35%. Preliminary results from a small retrospective review in children confirm this hypothesis.

## A Microfluidic "lab-on-a-chip" Platform for the Study of Antimicrobial Susceptibility of Salmonella enterica serovar Typhimurium in a Dual-species Biofilm

**Wen Liao**

In food processing facilities, environmental and foodborne microorganisms (e.g. Pseudomonas aeruginosa (P. aeruginosa) and Salmonella enterica serovar Typhimurium (S. typhimurium), respectively) can often be attracted to, survive, grow and develop biofilm on the soil that was left on the food contacting surfaces (FCS). Biofilm formation is one of the major reasons for the post processing contamination of food products. Biofilm forms when a group of microorganisms (usually multi-species) sticks onto a surface and aggregates. It provides three-dimensional matrices that can protect encased cells, making the cells more resistant to antimicrobial treatments. Traditional static methods for biofilm cultivation and subsequent antimicrobial study usually fail to mimic the natural environment, where the formed biofilm and activities of encased bacterial cells are less representative of how they are in their natural habitat. Thus there is a need to explore a low-cost but much more natural environment-mimicking alternative for biofilm study. This research explores the use of microfluidic "lab-on-a-chip" platform, for a natural environment mimicking biofilm cultivation, to investigate tetracycline (an antibiotic) susceptibility of S. typhimurium in a Salmonella-Pseudomonas dual species biofilm. The Salmonella-Pseudomonas "early-stage" biofilms were cultivated on the platform for 16, 20 and 24 hours. Different concentrations of tetracycline have been applied. Current results have indicated a 100-fold increase in tetracycline resistance of biofilm-encased S. typhimurium on the microfluidic platform. The microfluidic platform allows close stimulation of proper environmental condition, allowing increased accuracy for antimicrobial studies of encased bacterial cells in a biofilm.

## Cardiac DCD: Establishing Metrics of Damage by Inflammatory and Ischemia-Reperfusion Gene Quantification

**Stephanie Wong, Sally Miller**

Background : Over the past decade, waitlisted heart recipients have continued to outnumber heart donations. Donation after circulatory death (DCD) candidates are a possible source of hearts to correct this supply and demand imbalance. Unlike braindead donors, tissues of DCD candidates are subjected to periods of oxygen and nutrient starvation during donor death, thus progressively reducing the heart's viability as a transplantable organ. However, there are currently no clear predictors that define the upper limit of damage. Purpose: To more accurately predict transplant viability of DCD hearts, we aimed to establish a gene expression profile associated with DCD hearts in response to varying warm ischemic times (WIT) and exvivo heart perfusion (EVHP). Hypothesis : Known inflammatory and ischemiareperfusion injury genes demonstrate transcriptional changes in response to DCD protocols, and their profiles are potentially useful markers of viability. Methods : For the experimental DCD protocol, rats were subjected to varying nonbeating heart intervals (5, 30, and 60 minutes). Half of the treatment groups underwent EVHP. RNA was isolated from left ventricles, and the expression of 30 genes were quantified. Results : Twelve genes were differentially expressed between the treatment groups. Interestingly, the majority of changes were driven by EVHP, rather than the WIT itself. Four genes in particular were capable of discriminating between controls and hearts exposed to DCD protocols (HO1, Hsp90, cJun and cMyc). Conclusion : The differential expression of selected genes, like HO1, Hsp90, cJun, and cMyc are potentially valuable in determining whether or not a heart is damaged beyond use for transplant.

## Assessing the Community Impacts of Large Heterotrophic Protists

**Cole Larsen**

Microbial communities play an important role in structuring the marine ecosystem, forming the base of most major trophic webs. These communities are rich in species rather than dominated by a few competitive autotrophic organisms thus indicating processes of internal regulation that prevent competitive exclusion. I hypothesize that large predatory protists are a powerful regulating force within these communities that prey on dominant autotrophs thus preventing the exclusion of other organisms. To test this hypothesis large protist predators will be filtered out from field samples and subsequent changes in community composition will be compared to unaltered samples. I predict that predator removal will lead to a decline in community biodiversity due to the unrestrained growth of a few dominant autotrophic protist species; if my hypothesis is correct. The food web dynamics within the plankton is poorly described, thus the goal of this study is to better understand the ecological principles that internally regulate microbial communities. A better understanding of planktonic communities will create a more complete model for aquatic food web interactions and be useful for assessing the health of ecosystems. Results show that while the length of the food chain may influence overall stability, interactions both within the plankton and without are likely responsible for community structure. There is not conclusive evidence to support a singular keystone protist which implies that the stability seen within planktonic microcommunities spans multiple trophic levels and biological sources.

## Response of Mycobacterium tuberculosis to copper stress in a hypoxic environment

**Lawrence Tu, Kate Jiang, Veena Lin, Tommy Huang**

Tuberculosis disease, caused by the bacterium Mycobacterium tuberculosis, results in the death of approximately 1.3 million people each year. M. tuberculosis is passed person to person via airborne transmission, and into lungs where it infects alveolar macrophages. Due to the ability of M. tuberculosis to thrive inside these macrophages, host immune response is limited. Once inside the macrophage M. tuberculosis faces multiple sources of stress, including: nutrient deficiency, limited oxygen, and changes in metal ion availability. Metals such as copper and zinc are required for bacterial survival, but can be lethal in high amounts. This characteristic is taken advantage of by macrophages, which combat bacterial infections with excess copper. The mechanisms of copper toxicity and resistance in M. tuberculosis under oxic conditions are well known. However, M. tuberculosis typically faces hypoxic conditions inside macrophages, and copper resistance in low oxygen environments have not yet been investigated. We hypothesize that under copper stress and oxygen limiting conditions M. tuberculosis will respond by altering transcription of copper responsive genes and changing its metabolomic profile. We propose to measure these changes in vitro using a combination of RNA-sequencing analysis for gene transcript abundance, and mass spectrometry analysis of metabolite abundance. We expect to observe transcript changes in known copper responsive genes, but may identify new genes as well. These results will provide new insights into the behavior of M. tuberculosis in vivo and may lead to development of new copper-utilizing drugs.

## Differential gene expression of Hormone replacement therapy on breast cancer

**Cristiana Pan**

Hormone replacement therapy is a form of hormone therapy where female hormones are given to women undergoing menopause to alleviate associated symptoms. Estrogen monotherapy, and estrogen–progestogen therapy are the two most common types of hormone therapy for this purpose. Estrogen-progestogen therapy, with the addition of progestogen, provides endometrial protection leading to a decrease incidences of uterine cancer. However, numerous studies have shown that patients who received combined estrogen-progestogen therapy may have a higher risk of developing breast cancer or more aggressive forms of cancer when compared to patients who received estrogen monotherapy alone. In order to understand the reason for this difference we used transcriptome microarray to compare the difference in gene expression in breast tissue between people who have received no hormone therapy, estrogen alone, and combined estrogen-progestogen therapy. Our data provided a list of genes that is differentially expressed in each breast tissue, which can help understand the underlying biological changes associated with the difference in the behavior of the cancers. We will further investigate any candidate genes by looking at protein expression in tissue samples using Immunohistochemistry (IHC) to compare the features of normal breast tissue and cancerous breast tissue derived from hormone therapy. Transcriptome Microarray and IHC provided the basis for identifying any markers involved in increase breast cancer risk for women that undergone hormone replacement therapy. Our data can help make sense of how other forms of breast cancers may behave. We hypothesize that breast cancer from women who have undergone hormone treatment may be genetically distinct from other types of breast cancers.

## Public Perception of the Relative Harm of Electronic Cigarettes Compared to Traditional Cigarettes among Smokers and Non-Smokers in the United States

**Summer Shan ,Angela Phan, Yi Min Ng, Aydan Kesici, Leo Chen**

Background: Electronic cigarettes (e-cigs) are a novel nicotine delivery system introduced in 2003 as a harm-reducing substitute for traditional cigarettes. Public health and health policy experts claim that e-cigs offer the most feasible policy option to reduce tobacco-attributable illness and death, however public perceptions remain mixed. This study investigates the public perception of e-cigs' relative harmfulness compared to traditional cigarettes. Method: The Health Information National Trends Survey (HINTS) is a nationally representative survey collected by the National Cancer Institute to investigate the use of cancer-related information by the American public. This study uses HINTS 4 Cycle 4, collected in 2014 from 3,677 respondents, to assess the prevalence of accurate perceptions towards e-cigs' relative harm compared to cigarettes in the US population. Logistic regression analyses were used to test all associations. Results: Most respondents (57.1%) believed incorrectly that e-cigs were as harmful as or more harmful than traditional cigarettes. Younger age, being employed, increasing annual income, having more children, and higher education attainment were associated with believing e-cigs were less harmful. Interestingly, current and former smokers were 118.7% ($p<0.001$) and 25.6% ($p=0.005$) more likely to accurately believe that e-cigs were less harmful than traditional cigarettes. These trends remained significant ($p<0.001$) after adjusting for age, employment, education, race, income, and number of children.Conclusion: This study found that accurate perceptions of e-cigs' decreased relative harm compared to traditional cigarettes were most prevalent among current and former smokers. These findings further support the feasibility of harm-reducing health policies to substitute cigarettes with e-cigs.

## Schizophrenia-associated DHHC5 mutants in the development of neural circuits

**Vincent Tang**

Neurodevelopmental disorders are multifaceted conditions that are characterized by impairments in cognition, communication, behaviour, and/or motor skills and which arise as a result of abnormal brain development. Intellectual disability, autism spectrum disorder (ASD) and schizophrenia are all neurodevelopmental disorders that share many characteristics and lack precise boundaries. This is further supported by the observed overlap in genes and molecular pathways associated with these three disorders. The palmitoyl acyl transferase enzyme, DHHC5, together with its known substrate, the cadherin adhesion complex protein δ-catenin, has been genetically associated with neurodevelopmental diseases such as schizophrenia and ASD. Recent work from our lab has shown that DHHC5 palmitoylates δ-catenin in an activity dependent manner, and that the palmitoylation of δ-catenin increases its localization to the synaptic membrane where it interacts with N-cadherin. In the present work, we seek to further examine the role of DHHC5 in neural function. Primary rat hippocampal neurons were cultured and transfected with various DHHC5 constructs. Following immunocytochemical labeling, individual neurons were imaged and analyzed. Here we show that DHHC5 plays a key role in the development of neural circuits and that disruption of DHHC5 function causes a reduction in the density of excitatory synapses formed onto neurons. These changes occur without affecting the complexity of dendritic arbours or total dendritic length, suggesting a more focused role of DHHC5 in formation or maintenance of synapses. Examining the molecular basis of key proteins at neuronal synapses helps researchers gain valuable insight into the mechanisms regulating synapse plasticity. Understanding these mechanisms may help in the development of therapeutics and treatments for mental illness and neurodevelopmental disorders.

## Quantum Entanglement and the Loss of Information

**Nishad Jamaldeen**

In 1935, Einstein, Podolsky, and Rosen conjectured a thought experiment proposing that the position and momentum of an object could be measured in a way that seemed to violate the Copenhagen Interpretation of quantum mechanics and questions the absoluteness of a wavefunction. Equally perplexing is the idea of wormholes, or Einstein-Rosen bridges, which can connect vast regions of space. The two concepts, while distinctly different, were united by Susskind and Maldacena in what is known as the ER=EPR correspondence. The correspondence relates maximally entangled particle-antiparticle pairs as mirroring the activity of two particles connected by a wormhole.

The proposed relationship between spacetime geometry and quantum entanglement was explored in Baez and Vicary's paper. In their work, entangled pairs are related to the formation of a space-time "handle," and exploring this argument is among our goals. We use this conceptual framework in exploring the means and mechanism(s) of entanglement through quantum mechanics and how entanglement can account for the discrepancy in information travel that appears to violate special relativity.

## Understanding mental toughness and optimism in athletes coping with injury

**Janzen Hui, Hanno Southam, Jennifer Liu**

Optimism and mental toughness have been associated with adaptive coping in high professional athletes (Nicholls et al., 2008). Coping is an effort to manage demands that exceed a person's resources, contributing to their overall well-being (Lazarus, 1991). Mental toughness is an athlete's ability to cope with the stressors associated with competition, training, and lifestyle demands, while staying focused and confident under pressure (Jones, 2007), whereas optimism is the ability to interpret a situation with the possibility of future success (Scheier & Carver, 1985). Little is known about athletes' perceptions and experiences of optimism and mental toughness, and their influence on the coping strategies adopted during and post-rehabilitation from injury. The purpose of this study is to examine how athletes who have sustained an injury perceive and experience mental toughness, optimism, and coping during and post-rehabilitation. A series of semi-structured interviews will be conducted with twenty professional athletes. Participants will be asked about their perceptions and experiences of mental toughness and optimism, and their role in coping with injury over time. Data will be analyzed using thematic analysis (Braun & Clarke, 2006). We anticipate that athletes who experience mental toughness and optimism during the rehabilitation process will engage in more adaptive coping strategies in the face of difficulty. Findings will provide a better understanding of the roles of mental toughness, optimism, and coping in athletes who are injured, and will have the potential to inform future interventions focused on enhancing the well-being of athletes who are recovering from injury.

## Alcohol and Stress: Effects of Prenatal Alcohol Exposure and Chronic Mild Stress on Stress Coping Behaviour

**Lisa Wang, Vivian Lam, Charlis Raineki, Joanne Weinberg**

Fetal Alcohol Spectrum Disorder (FASD) encompasses the broad range of adverse effects resulting from prenatal alcohol exposure, which include cognitive, behavioral and physiological deficits. Among the physiological effects, alcohol causes changes to the hypothalamic-pituitary-adrenal (HPA) axis, an integral part of the stress system. This may increase, in a sex-specific manner, sensitivity to effects of stress and subsequently increase vulnerability to mental health problems such as depression. The effects of chronic mild stress (CMS) and downstream susceptibility to depressive-like behaviour following prenatal alcohol exposure were examined in this study using a rat model.

Pregnant rats were fed a liquid ethanol diet (PAE) or a pelleted control diet (Control). To account for ethanol-induced reductions in food intake, a third group received a liquid control diet in an amount matched to a PAE partner (Pair-fed). Half the offspring were exposed to ten days of CMS in adulthood while half were left undisturbed. As clinical depression is associated with altered stress coping, all animals were then tested in the Forced Swim Test (FST) to measure their coping behaviour.

Results show that there were differences in stress-coping behaviour between PAE males that underwent CMS and those that did not. CMS PAE males exhibited more passive coping behaviour (immobility) and less active coping behaviour (swimming) than their non-CMS counterparts. In females, there were no differences among groups. These results suggest that there are sexually dimorphic effects of PAE on behaviour, with a potentially greater impact on coping behavior in males but not females.

## Visualizing and understanding the development of Northwestern Russia

**Felipe Alfaro, Maria Gladkikh**

Russia is remarkable for its efforts to develop its Northern territories despite the extremely cold climate that makes life difficult there. The Soviet governments have been the ones that have mainly pushed the idea of advancing to the North and settling there because of its richness in raw resources in particular oil, natural gas and coal. These raw resources are all significant inputs for an industrial economy. Our research visualizes the spatial politics of the Soviet Governments in regards to its Northwestern territories. We are looking at economic and population dynamics in Northwestern Russia in its historical context. To do this we will construct maps depicting the population, gulags and railways before the formation of the USSR, after the USSR was established in 1926, in 1939, in 1959, when the Berlin Wall fell in 1989 and present day Russia.

## The Role of IGF-1 in Programming of Offspring Adiposity by Maternal Folate/ Vitamin B12 Imbalances

**Nolan Chem**

Introduction: Grain products in Canada are fortified with folic acid (FA) . Folate, is closely linked to vitamin B12 (B12). It is estimated that 1 in 20 Canadians are B12 deficient. Population studies report mothers with adequate folate/ low B12 status during pregnancy have children with greater insulin resistance and adiposity. The mechanisms for this relationship are not understood. Rationale: The Devlin Lab developed a mouse model of maternal folate/B12 imbalance during pregnancy and reported sex-specific programming of adiposity and glucose homeostasis in adult offspring. Maternal B12 deficiency during pregnancy affects offspring growth hormone (GH)/insulin-like growth factor-1 (IGF-1) axis. We hypothesize that the GH/IGF-1 axis may be involved in programming of offspring adiposity by maternal folate/B12 imbalance. Methods: Male and female offspring mice from dams fed a control, high FA with adequate B12 (HFA+B12), or high FA without B12 (HFA-B12) diet were studied. Offspring were weaned onto a control or western diet. Serum IGF-1 concentrations were quantified by ELISA and hepatic Igf1 mRNA was quantified by RT-PCR. Results: Female HFA-B12 offspring fed the postweaning control diet had lower ($p \pounds 0.01$) serum IGF-1 than control and HFA+B12 offspring. Female HFA-B12 offspring fed the postweaning western diet had lower ($p=0.08$) IGF-1 than HFA+B12 offspring. HFA+B12 female offspring fed the postweaning western diet had higher ($p<0.01$) hepatic Igf1 mRNA than control offspring. These differences were not observed in male offspring. Significance: These findings suggest a role for Igf1 in programming of female offspring adiposity by maternal folate/B12 imbalance.

## Improving Access to Safe Drinking Water in BC First Nation Communities: Highlighting the importance of Multi-faceted Partnerships

**Stephanie Yim, Cristina Oliveira, Robin Ball**

In Canada, there is a growing concern for access to safe drinking water in Aboriginal communities. One way to address the issue is to increase public expenditure. Despite significant increases in funding, First Nation communities in British Columbia have not made drastic improvements in their drinking water systems. Currently, over half of all high-risk water contaminations within FN communities in Canada exist in British Columbia.

In our research, we explore how the principles of rights recognition and purposeful technology can play a role in tackling the barriers to implementing drinking water systems by contributing to a multifaceted approach involving First Nations communities, government and engineering bodies. We incorporate academic literature with government frameworks to help understand how an improvement in rights recognition and purposeful technology between the Crown and Aboriginal groups can help advance both parties' agendas. Re-establishing the importance of these elements in the context of current Canadian Government frameworks will allow us to understand the ways in which collaborative efforts can help to optimize Indigenous economic growth and development. An understanding of how the dynamics of these three actors are informed is crucial for the successful implementation and long-term maintenance of water treatment projects in British Columbia.

## The response of adductor muscle strength in mussels (Mytilus sp.) to ocean acidification

**Kelsey Flynn**

Mytilus sp. is a keystone species in the intertidal zone. Formation of mussel beds provides important habitats for a variety of intertidal organisms. Factors affecting mussel populations are therefore of particular interest because of mussels' importance as ecosystem engineers. Predation by seastars such as Pisaster ochraceus is a strong control on mussel populations. Under the context of climate change, interspecies relationships such as predation are subject to change. Feeding rates by P. ochraceus increase as both mussels and seastars are acidified. A possible explanation for this is the weakening of mussel's adductor muscles as a result of acidification. I examined how the adductor muscle were affected by increased $pCO_2$, and how this changed with increased acclimation time. I measured the time it takes for Mytilus sp. to open while under a constant force, as a proxy for adductor strength. This was done by placing individuals in an Instron 5500R testing system. Mytilus sp. individuals were expected to take less time to be pulled open when exposed to acidified conditions, with time taken to open their shells decreasing with increased exposure to elevated $pCO_2$. If muscle strength weakens, then mussels are more vulnerable to predation, which could result in change in a key predator-prey relationship. It is important we understand the species interactions that shape mollusc populations are subject to change. By measuring the response of Mytilus sp. adductor muscles to elevated $CO_2$, we can begin to make predictions on how an important predator-prey relationship will be affected by climate change.

## Using a Heuristic Evaluation for LBGTQ Health Cyberspaces

**Torr Chow, Saraswathy Nadanasabapathy, Keni Ng**

Geographers are furthering their critical engagement on (un)healthy interactions occurring in virtual spaces amongst LGBTQ youth. This early scholarship demonstrates that further investigation is required regarding these interactions in relation to health information seeking for sexual, physical, and other everyday health needs. For this presentation, we are reflecting on key themes that were produced from a heuristic evaluation of virtual health spaces, which are targeted for LGBTQ youth health and wellbeing. To complete this evaluation, we took an evaluation model previously used for online men's health promotion, and adapted it for LGBTQ youth health and wellness. For our sample (n=11) we chose websites that were targeted for the broader LGBTQ youth population. After we used our measure on each website, the data was then further analyzed with content analysis to produce general themes associated with the websites. The current results from these virtual spaces continue to indicate that, further investigations are required regarding what happens in these spaces. Some of the websites were not very inclusive and appeared to target a primarily white and abled-bodied population. Furthermore, some websites were better than others at providing accessible information and preventing information overload. As virtual spaces have become more easily accessible and geographers engage in LGBTQ virtual spaces, it is necessary to understand them from a health-based perspective. LGBTQ youth nowadays typically rely on these spaces. By evaluating these virtual health spaces, it offers geographers an opportunity to observe the virtual form of interactions amongst LGBTQ youth.

## A novel universal vaccine design using CD74 mediated antigen presentation in dendritic cells

**Rysa Zaman**

Our ability to mount a timely immune response to viral infections is dependent on the chance and spontaneous event of cross presentation within a rare subpopulation of immune cells known as dendritic cells. Inside dendritic cells, the molecule responsible for mounting a response (MHC Class I) is transiently given access to antigens responsible for the infection 1 in order to alert the adaptive immune system. If this does not occur during the initial stages of an infection, the immune system fails to respond until extensive damage has already occurred such that dendritic cells have been directly infected. The molecule which gives access to the antigens for MHC Class I, CD74, displays an attractive candidate vaccine adjuvant. An adjuvant is a component within a vaccine that increases the immune response to target antigen. We characterized the ability of CD74 to artificially induce cross presentation by fusing the molecule with influenza 2 within a g ene delivery system already approved by the WHO for vaccines 3. Combining a range of clinically relevant antigens with CD74 in a vaccine design already in use, this study will have far reaching and immediate relevance to vaccine design.

## Mind Wandering Increases Sensitivity To Affective Stimuli

**Rachel Wong**

Despite the negative consequences often associated with mind wandering, such as deficits in neural processing, uncoupling our thoughts can be beneficial. Mind wandering, like brain rest, has been shown to activate areas of the brain used for consolidating cognitive processing. Therefore if mind wandering is similar brain rest, this might refresh the minds and allow increased sensitivity to subsequent stimuli. We therefore hypothesize that individuals are more sensitive to affective stimuli after mind wandering. Event-related potentials (ERPs) were recorded as participants viewed images of either painful or pain-neutral conditions. They were interrupted at random periods to indicate whether they were mind wandering or not. The ERPs after self-reports of either being on-task or mind wandering will then be compared. We expect to find that the ERP amplitudes of the $P_3$ component will be greater after reports of mind wandering. While mind wandering has previously been shown to decrease sensitivity, these expected findings would indicate that after mind wandering, sensitivity to stimuli increases.

## The Scent of Social Support

**Hanne Collins**

Close physical contact with loved ones lowers psychological and physiological responses to stress. However, many stressful situations must be faced alone. What if social support could be communicated even in the physical absence of a loved one? This research examines whether the scent of a loved one can communicate social support and reduce stress even when someone is not physically present. In the current study, scent samples – in the form of worn t-shirts - were collected from males in heterosexual romantic relationships. Subsequently, their female partners came to the lab alone and completed a stressful task while being exposed to the scent of either their romantic partner, a stranger, or no scent. Women reported their stress levels at several points during the stressful lab visit including before induction of stress, during the stress task and after a recovery period. Preliminary results suggest that exposure to a partner's scent during a stressful task promotes more rapid recovery from stress compared to exposure to a stranger's scent or no scent. These results support the stress buffering model of social support and provide further insight into the importance of scent in human social interactions.

## Reconciling Relativity and Electrodynamics through Lorentz Transformations

**Jenny Xie**

Electrodynamics is the study of existing magnetic fields, and how charged and moving particles act on them. This theory appears, at first glance, to be incompatible with the notion that the law of physics should be the same in every reference frame. One problem that arises from trying to reconcile the two is that while a charge in a "moving" frame generates a magnetic field, one in a "stationary" frame does not. However, this apparent paradox can be resolved with a careful analysis of Lorentz transformations. Specifically, in the case of a parallel plate capacitor, special relativity not only determines how E&M fields transform, but it also accounts for changes in the lengths of the plates. Reconciling how two different reference frames view parallel plate capacitors requires special relativity and Gauss' Law from Maxwell's Equations. Such a reconciliation is important as Einstein based his theory of special relativity on Maxwell's Equations and electrodynamics. Introductory literature on electrodynamics and special relativity was reviewed. The mathematical background necessary was vector calculus. The goal of this project is to eliminate the apparent paradox through a visualization of how fields that appear electric in one frame will appear magnetic in another through Lorentz transformations. In resolving such a contradiction, it becomes clear that the idea of electrical and magnetic fields being related by Lorentz transformation is consistent with the idea of relativity, and they imply each other independently.

## Radial-Patterned bFGF-Infused Hydrogels for the Treatment of Ruptured Eardrums: An Alternative to Myringoplasty

**Stevens Qiu, Jake Wong, Iris Yim, Arya Aavani**

An eardrum rupture, which is a tear in the membrane that separates the middle ear from the ear canal, can leave the middle ear vulnerable to infection or injury, as well as potentially leading to hearing loss. Currently, the most common treatment for serious eardrum ruptures is myringoplasty, an invasive procedure that involves removing a patient's own cartilage and grafting it to the rupture site through an incision in the back of the ear. However, recent studies have shown that these ruptures can be treated by supplying basic Fibroblast Growth Factor (bFGF), which is a signalling molecule that promotes the healing process. However, the healing observed is relatively slow and may take up to 30 days to heal, while the quality of hearing is also at risk due to uneven tissue growth. Other researchers have implemented hydrogel cell scaffolding materials with a radial pattern, which mimics the naturally occurring architecture of the eardrum, an approach found to improve healing rates and functional outcomes. However, these synthetic polymer scaffolds possess inferior biocompatibility compared to proteinbased hydrogels. The objective of this proposal is to employ a radial patterned proteinbased hydrogel infused with bFGF, a novel construct that has not been previously investigated. Since both of these approaches promote the healing process through different mechanisms and function on different time scales, there is the potential for a beneficial interplay that warrants further investigation. The method proposed here is less invasive and may offer improved outcomes compared to the current gold standard of treatment.

## A Prospective, Randomized, Double-Blinded Assessment of Unilateral Thalamic Deep Brain Stimulation on the Vocal Dysfunction of Spasmodic Dysphonia

**Vivian Braithwaite**

Spasmodic dysphonia (SD) is a focal dystonia of the laryngeal muscles that causes affected patients to lose their ability to speak due to uncontrollable dystonic contractions in their larynx. Deep Brain Stimulation (DBS) is a neurosurgical procedure involving the implantations of electrodes to deliver electrical stimuli to focal regions of the brain. DBS is a widely accepted treatment modality for movement disorders such as Essential Tremor (ET). Scattered reports exist on the positive effects of thalamic DBS on SD symptoms in patients who are diagnosed with both SD and ET and receive DBS to treat their tremor. We set out to quantify the effects of DBS on SD by evaluating voice improvement in a 79-year old female patient with ET coincident SD who has had DBS electrodes implanted to control her tremor. Using the Unified Spasmodic Dysphonia Rating Scale (USDRS) and Voice-Related Quality of Life (VR-QoL) survey, we found that bilateral thalamic stimulation of the ventral intermediate nucleus (Vim) significantly improved vocal dysfunction and quality of life compared to no stimulation ($p<0.05$). A Wilcoxon Signed-Rank test was used to study the pre- and post- treatment effect of DBS on voice.

While only a single case, this marks the first time the effects of DBS on SD have been quantified and, due to the positive effect shown in this patient, our team is currently undertaking a Phase 1 pilot trial to evaluate the safety and preliminary efficacy of DBS in SD.

## Demonstration of the Use of Immunofluorescence for Differentiating Microglia and Macrophages in Stroke Model

**Olivia Li, Dinushi Wickrama Arachchi, Edward Kim, Aysha Ayub, Brendan Liaw**

Stroke is the fourth leading cause of death among Canadians, and more than 140,000 Canadians live with long-term stroke disability. Stroke occurs when blood flow within the brain is reduced or blocked. Following a stroke, macrophages and microglia initiate inflammatory processes that modulate recovery. This may also weaken the blood-brain barrier and intensify inflammatory symptoms, thus delaying stroke recovery rate. Because there are no specific microglial markers that can identity a microglial cell from peripheral macrophages, researchers have yet to identity the definite role of microglia following a stroke. This study demonstrates an immunofluorescent technique using specific marker proteins that can differentiate between microglia and newly invading peripheral macrophages in a lesioned brain region in a stroke model. Stroke was induced in mice via Rose Bengal-induced photothrombosis. The brains were then collected at various time points and sliced in thin sections. Using immunofluorescent methods, the slices were stained with antibodies targeted to the proteins IBA-1, P2Y12, and coronin-1A to identify microglia; CCL12, CD45, and CD68 to identify macrophages. Cells were imaged with a Zeiss multiphoton microscope or with a Leica confocal microscope. The expected experimental outcome is to promote immunofluorescence as an effective technique in differentiating microglia and macrophages in the brain after a stroke, as it enables experimenters to track microglial activity, thereby contributing to the development of cell-targeted therapy for stroke patients.

## A Novel adjuvant immunotherapy to promote an increase in inflammatory cytokines to combat Mycobacterium tuberculosis

**Chae Young Shin, Maria-Elizabeth Baeva, Ian Chok**

Mycobacterium tuberculosis (Mtb) is an intracellular bacterium that causes tuberculosis and primarily affects the lungs. It generally infects the macrophages and forms lesions, which are organized structures of immune cells called granulomas, which contain the bacteria. In 2014, Mtb killed 1.5 million people worldwide, and it is estimated that 2 billion people are currently infected. Unfortunately, the only vaccine available to reduce these numbers is the BCG vaccine, which was first used medically in 1921. However, the effectiveness of the BCG vaccine has been called into question several times, as in some populations, it only protects 20% of children from getting infected, and protects under half from developing the disease. Mtb prevents the immune system from being able to destroy the pathogen by inhibiting Th1-specific cytokines and increasing IL-10 and other anti-inflammatory cytokines. To develop a more effective immune therapy, various adjuvants, substances that help to stimulate a stronger and more specific immune response, have been used in the recent past against many diseases. Here we propose a novel adjuvant combination of MPL, ovalbumin and L-tyrosine against Mtb, which induces both a strong Th1 response and a high antibody titre. This leads to increased production of IL-12, TNFα, IFNγ and other Th1 specific cytokines, which would help in stronger immune clearance of the bacterium. We speculate that the observed increase in inflammatory cytokines would overcome high IL-10 levels in the granulomas and promote Th1 differentiation to produce more pro-inflammatory cytokines to combat the infection.

## A Proposed Study of the Effects of Dietary Selenium Supplementation on Salmonella Typhimurium Gut Colonization

**Stacey Young, Sarzana Hossain, Jawairia Atif, Jackson Moore, Grace Tsang**

Salmonella Typhimurium is a bacterial strain that is annually responsible for approximately 450 deaths in the United States and more than 100,000 worldwide. S. Typhimurium infection induces gastroenteritis, a condition that causes inflammation of the intestinal tract. This often leads to diarrhea and vomiting, resulting in dehydration and fever. Intestinal inflammation presents S. Typhimurium with a selective advantage over competing microbiota (the bacteria that are native residents of the intestine) due to elevated concentrations of tetrathionate, a product of the inflamed intestine. S. Typhimurium can use tetrathionate as an alternative terminal electron acceptor, while microbiota species cannot, conferring S. Typhimurium with an advantage in respiration. Thioredoxin reductase 1 (TR1) is a type of selenoenzyme found in mammals that can reduce various biological substrates including tetrathionate. Increasing TR1 activity may allow it to limit the amount of tetrathionate available to S. Typhimurium and thus minimize S. Typhimurium infection. The aim of the proposed study is to establish a murine model that will allow us to monitor the effect of selenium supplementation on mammalian TR1 activity and consequently S. Typhimurium intestinal colonization. Previous studies on rats show that thioredoxin reductase activity increases with a high selenium diet. We hypothesize that increased selenium concentrations in the diet will promote greater activity of thioredoxin reductase and thus reduce levels of tetrathionate present during gut inflammation, limiting S. Typhimurium colonization within the intestine. If successful, selenium supplementation could become a new method for treating S. Typhimurium infection in animals, and potentially humans.

## Validation of a quality evaluation tool for online health information

**Sera Bao, Silken Kleer, Annie Wang**

Introduction: The Internet is rapidly reshaping healthcare, and over 80% of Internet users report searching for health information online. The increase in the use of the Internet as a source of health-related information may allow for the rapid dissemination of information and can be beneficial to Internet users by allowing them to become better informed about their health and promoting their independence and autonomy. However, inaccurate information may weaken patient-physician relationships and result in inappropriate use of health services, such as an increased number of physician visits and requests for unnecessary tests or treatment. It is therefore critical to establish efficient means through which the scientific community and the lay public can evaluate the quality of online health information to maximize the health benefits of this new medium. To this end, a 6-item quality evaluation tool for online health information was previously developed in the Robillard lab and tested for reliability. The aim of the current project is to evaluate the validity of this tool. Methods: A review of the literature was conducted to identify established tools and validation methods. A randomized sample of websites on the treatment of Alzheimer disease will be evaluated. The results will be compared across tools using ranked correlational statistical methods. Convergence of scores obtained using the Robillard tool with results of existing tools (i.e. significant convergent validity) would indicate that the application of the tool results in an accurate reflection of the quality of online health information.Preliminary results: In a preliminary analysis of four websites evaluated using three different tools – the Robillard lab tool, DISCERN, and Health on the Net's HON Code – all three tools generated identical rankings. The DISCERN tool generated a narrow range of scores compared to the other tools. Significance: The resulting valid, reliable tool will serve as a resource for patients, caregivers, and healthcare providers to narrow down the vast amount of information available online to evidence-based, practicable sources.

## Optimization of Quantum States

**Jessica Jun**

In a system of two coupled qubits, a desired entangled state can be prepared from an unentangled ground state. Though the adiabatic theorem states that a ground state will eventually transform into an excited state over an infinite amount of time, changing the external magnetic and exchange coupling factors can reduce the time necessary for the ground state to evolve into the desired state. The purpose of our research was to identify this optimal combination of external variables for a model Hamiltonian. An optimized protocol was determined that reached the desired state within t=1, whereas the original, biased linear protocol required an infinite amount of time.

## Ice Nucleation by Lead Iodide

**Matthew Ma, Eugene Shen**

Ice nucleation is the process by which water freezes, and is aided by microscopic particles in the atmosphere. Without these particles, water can exist in a supercooled liquid state until it freezes homogeneously at -40°C. The dispersal of these particles into the atmosphere is the basis of cloud seeding, an important method to temporarily increase air quality, reduce fog around airports, or increase precipitation in drought-affected areas. Furthermore, ice nucleation is a critical consideration for climate modelling and even cryopreservation. However, despite ice nucleation's importance, it is poorly understood. The classical theory of ice nucleation predicts the size of critical embryos, but does not describe how ice is heterogeneously nucleated nor determine which particles are effective nucleators. Recent advances in computer simulations of molecular dynamics have found that the atomic structure of the particles plays a key role. Much of the literature has focussed on silver iodide, the most commonly used cloud seeding agent. In contrast, little or no simulation work has been done on lead iodide, despite its effectiveness as a nucleating agent. A comparison of the ice nucleation process between these two similar compounds will help develop a deeper understanding of the underlying mechanisms. We propose to model ice nucleation by lead iodide using molecular dynamics simulations as has been used on silver iodide, and then compare the processes by which ice nucleates on lead iodide to silver iodide.

## Harnessing the power of a miracle: exploring the potential of a plant protein to change sour into sweet

**Trevin Wong**

The protein Miraculin, found in the plant Synsepalum dulcificum, has the ability to causeschange the taste of sour foods to to taste sweet by binding to sweet-taste receptors on the tongue (in low-pH environments). This is , an appealing prospect for diabetics and others looking seeking to reduce their sugar intake. It works by binding to sweet-taste receptors on the tongue in low-pH environments. Previous short-term studies suggest that consumption of Miraculin does cause harmful side effects. But while the mechanism-of-action of Miraculin has been explored, it is unknown howHowever, long-term use may affect the intensity and duration of its effectsthe manner in which long-term exposure . This study aims to investigate the effect of long-term exposure to Miraculin on affects its taste modifying properties has not been previously studied. We will recruit ### hHealthy human subjects will beand randomize themed into one of six treatment groups stratified on the basedis on thef frequency of Miraculin intake (daily or weekly) and change in dose (from the 350mg initial dose) over the six-month study period (no-change and increasing or decreasing by 50mg/month). At the start of the study, and every 30 -days following, subjects' perceived sweetness will be measured by rating the sweetness of an acid after using Miraculin according to a scale of pre-sampled sugar solutions. It is anticipated thatIf, despite increases in the dose and duration of exposure to Miraculin, subjects' levels of perceived sweetness will does not change over the study period and . Furthermore, drawing from previous, short-term studies, it is also expected that no adverse effects will be observed with long-term consumption are observed, . This would mean that it seems likely that diabetics and sugar-sensitive individuals could safely use Miraculin on a regular basis without fear of building up a tolerance to this product, or needing to purchase it in increasingly large amounts.

## Rural Vertical Farming: A Feasibility Study

**Arthur Chen**

Food security is a major concern of international development. Estimates of current food production capacity demonstrate that agrarian areas in developing countries will face challenges in satisfying the rising global food demand. Even in present time, large populations of people, in Asia particularly, lack food security and financially-sustainable farming livelihoods. A potential method of addressing these problems is by developing vertical farming in rural regions, which can dramatically improve crop yields for smallholder farmers.

Vertical farming exists as an emerging agricultural technology that stacks crops atop each other in large buildings, useful for growing large quantities of food in urban and space-limited areas. Applied to the countryside, it can not only increase food production per unit area, but also allow crops to be situated inside greenhouses for protection against harsh weather, among other potential benefits. To be appropriate for the rural setting, vertical farms must be energy non-intensive, low cost, and low maintenance, while remaining capable of growing economically viable crops.

This study will examine how a rural vertical farming system may be engineered in order to create and sustain a livelihood for farmers in Asia, and whether it would be a feasible technology. The current iteration of the vertical farm involves a small farming unit with three layers for crops. Used in bulk, the units can increase usable farm area by a large factor; preliminary calculations yield a 171% increase. However, numerous problems, such as limited sun exposure, accompany the system, which may decide its ability to be successfully implemented.

## Analysis of the Lung Microbiome in Idiopathic Pulmonary Fibrosis

**Tom Jin**

Idiopathic pulmonary fibrosis (IPF) is a serious progressive disease of the lung that involves abnormal accumulation of interstitial tissue in the lungs resulting in impaired respiration. IPF tends to affect older adults particularly those who have been exposed to cigarette smoking but has no known definitive cause. While multiple genetic and environmental risk factors for IPF have been previously identified, the role of bacteria that normally reside in the lung tissue, collectively called the lung microbiome, has not been extensively studied. Although the microbiome does not usually elicit an immune response in healthy humans, it is possible that changes in the microbiome composition may be associated with an immune response in IPF patients. This research looks at 16S rRNA bacterial marker data from IPF and control lung samples to identify the presence of different bacteria species and its association with disease severity, lung location, and immune response. It was determined that the microbiome composition is more dissimilar between IPF samples when compared with that of the healthy control samples. In particular, certain species of bacteria including possibly pathogenic bacteria were enriched in IPF samples. However, no species in particular was identified as being elevated in every IPF lung suggesting a multi-faceted role of the microbiome in IPF. Further research will attempt to identify any properties common to the enriched bacteria that might contribute to the progression of IPF.

## Expression of CXCR2 on recruited neutrophils and gMDSCs enhances invasion and lung metastasis of chemoresistant CXCL1/2 breast cancer cells

**Zeki Ekmekci**

Cancer cells often develop chemoresistance, marked by disease recurrence. Specifically, treatment of mammary tumors leads to systemic inflammation, upregulation of CXCL1/2 chemokine expression by tumor cells, recruitment of specific immune cells, including myeloid-derived suppressor cells (MDSCs) to the tumor, cell survival and lung metastasis (Acharyya et al., 2012). Phagocytic immune cells—neutrophils—express the receptor, CXCR2, which aids in recruitment to inflamed sites and strengthens neutrophil-blood vessel cell adhesion, facilitating escape from circulation (Hertzer et al., 2013). Because tumors express CXCL1/2 and CXCR2, adhesion may, likewise, promote tumor cell escape. Our objectives are to characterize interactions between CXCR2 on neutrophils/ granulocytic MDSCs with CXCL1/2 at tumor sites, and to determine whether these interactions support immune cell recruitment, adhesion, and cancer invasion. We hypothesize that chemotherapy-induced inflammation increases CXCL1/2 expression, thereby recruiting gMDSCs and neutrophils via CXCR2. This CXCL1/2-CXCR2 interaction may strengthen immune cell adhesion to tumor and endothelial cells, driving an invasive epithelial to mesenchymal transition (EMT). Using a mouse model of chemoresistant breast cancer, co-culture and invasion assays, we will address our aims. We expect CXCR2-positive neutrophils and gMDSCs recruitment to the tumor site; inhibition of CXCR2 and CXCL1/2 will decrease recruitment. Furthermore, co-culture of tumor cells with CXCR2-expressing immune cells or endothelial cells will increase cell-cell adhesion, dependent upon CXCR2-CXCL1/2. Finally, CXCR2 pathway activation may enhance tumor invasion and drive tumor-intrinsic EMT programs. By describing a CXCL1/2-CXCR2-based mechanism of enhanced cell motility, we target two cancer hallmarks that can help overcome the barrier of chemoresistance in disease treatment.

## Computational Analysis of miRNA-212 and miRNA-132 expressions in human tumor samples

**Kendrix Kek, Ceylin Ozdemir, Cassie Purcka, Emily Fung, Tiffany Alim**

Following chemotherapy, cancer cells often develop immunity-associated chemoresistance, marked by disease recurrence. Specifically, treatment of mammary tumors leads to systemic inflammation, upregulation of CXCL1/2 chemokine expression by tumor cells, recruitment of myeloid-derived suppressor cells (MDSCs) to the tumor, cell survival and lung metastasis (Acharyya et al., 2012). Neutrophils express the receptor, CXCR2, which aids in recruitment to inflamed sites and strengthens neutrophil-endothelial cell adhesion, facilitating escape from circulation (Hertzer et al., 2013). Because tumor cells express CXCL1/2 and CXCR2, adhesion may, likewise, promote tumor cell escape. Our primary objectives are to characterize interactions between CXCR2 on neutrophils and granulocytic MDSCs with CXCL1/2 at tumor sites, and to determine whether these interactions support immune cell recruitment, adhesion, and cancer invasion. We hypothesize that chemotherapy-induced inflammation increases CXCL1/2 expression, thereby recruiting gMDSCs and neutrophils via CXCR2. This may strengthen immune cell adhesion to tumor and endothelial cells, which drives an invasive epithelial to mesenchymal transition (EMT). Using a mouse model of chemoresistant breast cancer, co-culture and invasion assays, we will address our aims. We expect CXCR2-positive neutrophils and gMDSCs recruitment to the tumor site; inhibition of CXCR2 and CXCL1/2 will decrease recruitment. Furthermore, co-culture of tumor cells with CXCR2-expressing immune cells or endothelial cells will increase cell-cell adhesion, dependent upon CXCR2-CXCL1/2. Finally, CXCR2 pathway activation may enhance tumor invasion and drive tumor-intrinsic EMT programs. By describing a CXCl1/2-CXCR2-based mechanism of enhanced cell motility, we target two cancer hallmarks that can help overcome the barrier of chemoresistance in disease treatment.

## Expression of thermostable Thermochromatium tepidum photosynthetic protein complexes in Rhodobacter sphaeroides for applications in biophotovoltaics

**Shraavan Raveendran**

In the scope of renewable energy, microbiology research has focused on photosynthetic bacteria, in particular their photosynthetic proteins for use in bio solar cells. These technologies are structured around extracting electricity from photosynthetic protein complexes of certain bacteria, upon exposure to light. To further downstream applications involving more robust proteins, genes were isolated from Thermochromatium tepidum, a heat stable photosynthetic bacterium. The aim of this project is to streamline the expression of these genes that code for the photosynthetic reaction center (RC) and light harvesting 1 complex (LH1), by producing these heat stable photosynthetic proteins with the use another photosynthetic bacterium Rhodobacter sphaeroides. R. sphaeroides simplifies the production of RC and LH1 proteins, as it is easier to study genetically and to cultivate compared to T. tepidum. This production of T. tepidum RC-LH1 photosynthetic complexes in R. sphaeroides has not been reported in literature previously. This is significant as the production of heat tolerant photosynthetic proteins, capable of withstanding higher temperatures for extended periods of time; could lead to the development of renewable energy that is green, efficient, and environmentally sustainable.

## Tense in Ktunaxa

**Trevor McAllister-Day**

Ktunaxa (a.k.a. Kutenai) is a language isolate (i.e. has no "sister" languages) spoken in southeast BC, Idaho, and Montana. It is an endangered language, with roughly 30 speakers remaining in both Canada and the USA. Literature on the Ktunaxa tense system is conflicting: It has historically been described as lacking a past tense, as well as possessing a past tense particle, "ma."

Data have confirmed the existence of "ma" and its simple past meaning. "Ma" is obligatory with stative verbs like "to be sick" or "to be short," but it is optional with eventive verbs like "saw" or "read." In those cases, it is inserted on occasion, but removing "ma" does not change the meaning of the sentence. Likewise, sentences where the speaker has chosen not to use "ma" are also acceptable with it. This research attempts to describe what conditions the use of "ma."

"Ma" has been found to not mark how long ago the event occurred, or to mark habitual action.

Ktunaxa also possesses markers for future time: "ɛ̓" and "ɛ̓xaɬ," which are obligatory. However, "ma" and "ɛ̓" or "ɛ̓xaɬ" can be used together, indicating the precise meaning of "ɛ̓"/"ɛ̓xaɬ" is not quite FUTURE. UBC research has described them as modals of varying strength, indicating how likely a future event is to occur.

Forthcoming data will attempt to describe the distribution of "ma", provide insight into "ɛ̓" and "ɛ̓xaɬ," and describe the Ktunaxa tense system, including the unmarked "default" tense.

## Developing a Drug Screen to Discover Inhibitors of Nonsense-Mediated Decay

**Trisha Barnard**

Rare genetic diseases affect more than 300 million people worldwide, but lack effective treatments since investing in the development of therapies for rare diseases is not economically viable. Nonsense mutations, which cause 11% of all rare genetic diseases, produce an early "stop" signal in a gene, so the protein encoded by the mutated gene is shortened. However, instead of synthesizing a shortened protein from the gene with a nonsense mutation, a process called nonsense-mediated decay (NMD) prevents the mutated protein from being made altogether by destroying the RNA template from which the protein is produced. Finding a way to rescue the production of the mutated protein might result in treatments for the subset of rare genetic diseases that are caused by nonsense mutations. Current drugs which can rescue nonsense-decayed RNAs work by causing read through of the early stop signal, allowing the cell to make a full length protein. However, these drugs have severe side effects, and therefore are unsuitable for use in patients. Drugs which inhibit NMD are thought to be more suitable for treating genetic diseases because they may have fewer side effects. This study evaluates the use of a fluorescent reporter as a drug screen to identify novel inhibitors of NMD. The expression of the reporter under different conditions is analyzed at the protein and RNA level in order to verify its function. Preliminary results suggest that inhibiting NMD can increase protein levels of a reporter gene with a nonsense mutation.

## Understanding the Mechanisms of DNA Damage and Repair: Effect of Doxorubicin on Saccharomyces cerevisiae

**Marissa Lee**

The aim of this research was to investigate the mechanisms of DNA damage repair by studying the effects of a chemical treatment on DNA integrity in Saccharomyces cerevisiae. For the chemical treatment, we studied how yeast cells became resistant to the DNA alkylating agent, doxorubicin, by examining the mutations they acquire using a whole-genome-sequencing revertant assay. Doxorubicin is an anthracycline-based anticancer treatment that is used (often in combination with other drugs) to treat cancers of the bladder, breast, lung, and many other organs. Although doxorubicin is one of the most effective anticancer drugs used, after repeated exposure, many patients become resistant to doxorubicin rendering it ineffective. Our hypothesis was that by genome-wide sequencing analysis, spontaneous mutations that were acquired during doxorubicin exposure could be identified. In order to test the effects of doxorubicin on yeast, a screening assay was conducted by exposing two parental yeast strains to lethal doses of doxorubicin and isolating resistant mutants. Using next-generation sequencing (NGS), it was possible to identify spontaneous mutations in genes involved in doxorubicin resistance. In total, five missense mutations were discovered that resulted in a change in residue in PDR1, PLM2, STO1, SOG2, and VPS16 genes. In conclusion, this mutant assay combined with NGS technology, are powerful tools for drug discovery and research; we were able to predict candidate pathways and genes responsible for drug resistance, which will have clinical implications for the design of future drug therapies.

## A new European approach to refugee policy: The shifts experienced by Germany's refugee policy since 2011

**Maria Gladkikh, Majeed Malhas**

The objective of this project is to examine and analyse the policy shifts Germany has enacted since opening its borders to Syrian refugees fleeing the Revolution in 2011. Our research indicates that Germany's "open-door policy" gradually and quietly abandons EU policy requiring asylum-seekers to apply for refugee status in the first EU country they arrive in. However, despite Germany's comparative advantage for absorbing asylum-seekers in Europe, its recent struggles with the ever-growing flow of refugees has led it to reshape its "open-door policy" attitude towards refugees (here you might want to summarize how it is being reshaped in a few words). This project draws on speeches given by German politicians, news articles, and policy documents.

## Carbon Sequestration Potential of Oak, Maple, and Cedar Trees in Vancouver, BC

**Elgan Moses**

As levels of atmospheric carbon dioxide continue to rise, it is increasingly important to implement plans to mitigate these changes in climate as suggested in the Kyoto Protocol. Carbon can be sequestered by terrestrial plants, such as trees. The focus of this study is to measure the photosynthetic rate of oak, maple, and cedar trees on UBC's Vancouver campus, as well as measure the chlorophyll content of the leaves to determine how it influences the ability to uptake carbon, if at all. Each species relative ability to act as a carbon store under certain environmental conditions will be elucidated. Since our climate is changing, it will be valuable to project which tree species will do best under increasing concentrations of atmospheric carbon dioxide to project trends in future performance, and also to know which tree is sequestering the most carbon under current environmental conditions. Data collected to date show that while the maple and oak leaves exhibit a higher net photosynthetic rate in the summer months, their overall ability to act as a carbon sink throughout the year is limited when they lose their leaves in the fall. Cedar trees have a lower net photosynthetic rate, but continue to act as a carbon sink throughout the year. I will also be comparing the data collected to the environmental conditions when the samples were taken, to see if there exists any relationship between abiotic factors such as minimum and maximum atmospheric temperature, relative humidity, and total precipitation, and the ability for each tree species to sequester carbon. I will be measuring net photsynthetic rate using a CID Inc CI-340 photosynthesis machine, and will also produce a SDS-PAGE gel and perform a western blot to see if there are major differences in concentrations of key proteins in photosynthetic pathway that can help explain the photosynthetic rates we measure. This study is valuable in providing long-term information that can be used for future tree planting and land development projects whose focus is to be sustainable and help mitigate increasing concentrations of atmospheric carbon dioxide.

# ORAL PRESENTATION OVERVIEW (3)

DAY 3 PROGRAM - MARCH 31, 2016

## Time: 4:30pm - 6:00pm

## Irving K. Barber Learning Centre - Dodson Room

| *Research Topics (Abstracts page 107-110)* | *Presenters* |
|---|---|
| The Systemic Limitations of Linguistic Witness Protection in Canadian Criminal Court | Kaelin Hickford |
| Social Media Theatre: A New Form of Theatrical Presentation | Howard Dai |
| The role of accents and names and our memory for individuals' voices | Brianne Senior<br>Jobie Hui |
| Mobilizing Language Data: An Endangered Language Dictionary App | Aidan Pine |
| Accessing Outdoor, Public Space at UBC Vancouver Campus | Glenn Mendonsa |
| When Anomie meets the label: Vicious Cycle in Homelessness | Kennedy Wong |
| Analysis of Family Structure and its Relation to Academic Success | Jackie Almario |

## Irving K. Barber Learning Centre - Lillooet Room

| *Research Topics (Abstracts page 111-113)* | *Presenters* |
|---|---|
| Examining Cardiorespiratory Interaction in the Pacific Spiny Dogfish; Squalus suckleyi | Neha Acharya-Patel |
| Seeing stars? Concussion ethics in peer-reviewed literature | Aaron Sihoe |
| Effects of Vitamin B Complex Supplementation on Lactation Performance in Dairy Cattle | Charlotte Donnan |
| Friends forever? The development of affiliative relationships among group-housed dairy calves | Nicola Adderley |
| Closing the Implementation Gap? A Systematic Review of Implementation of the Aichi Biodiversity Targets in Canada | Ricardo Pelai |
| Vitamin B Complex Supplementation and Ketosis in Transition Dairy Cows | Poonam Dattani |

## Irving K. Barber Learning Centre - IBLK 461

| *Research Topics (Abstracts page 114-116)* | *Presenters* |
|---|---|
| Morphological adaptations to the lungs of high altitude birds | Emily Smith |
| Evaluation of the Anti-Glucotoxic Effects of Leech Saliva Extract (LSE) on Mouse and Human Pancreatic Islets | Michelle Ebtia |
| Caspase-3 Modulation of Synaptic Plasticity | Shannon Tang |
| Efficacy of EZH2 Inhibitors in Suppressing Luminal A Breast Cancer | Kirk Chen<br>Rachel Tandun<br>Alice Su<br>Jennifer Chen |
| Early Onset Alzheimer's Disease: A Need to Increase Awareness and Inclusive Attitudes around Ageism. | Simran Parmar<br>Monica Yip |
| The role of accents and names and our memory for individuals' voices | Brianne Senior,<br>Jobie Hui |

## Irving K. Barber Learning Centre - IBLK 185

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| Morphometry and Frequency Mapping Predictions of the Inner Ear of a Beluga Whale | Cassandra Girdlestone |
| A Comparison of EEG Power Spectral and Wavelet Features in Concussed Cohorts Using Support Vector Machine | Arnold Yeung |
| Implications of uncertainties in quake locations made with a (future) single seismometer on Mars for correlating seismicity and geology. | Arvin Boutik Karpiah |
| On the Use of Multiple Planetary Boundary Layer Parameterization Ensembles for Forecasting Temperature and Precipitation in Complex Terrain | Timothy Chui |
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# ORAL PRESENTATION ABSTRACTS (3)

MARCH 31, 2016

## Irving K. Barber Learning Centre - Dodson Room

## Time: 4:30pm - 6:00pm

### The Systemic Limitations of Linguistic Witness Protection in Canadian Criminal Court

**Kaelin Hickford**

This paper purports to augment pre-existing legislation pertaining to the linguistic protection of witnesses during criminal court proceedings in Canada. Currently, no federal framework exists to protect witnesses who do not speak English or French as their primary language. Subsequently, Canada's judicial system lacks the capacity to protect witnesses of the court, a concerning predicament that many countries have previously combatted. Although the Official Languages Act of 1969 mandates witnesses have the right to their hearing in official language of choice, this right is limited to speakers of either French or English. The Canada Evidence Act of 1983 also did not address this limitation, speaking only to the protection of witnesses with respect to marriage, physical disabilities, and mental constraints. By failing to implement legislation pertaining to multilingualism, Canada places its judicial system at risk. A criminal court system is designed to utilize state authority against a single individual; if witness validity is called into question, the entire system becomes undermined. Therefore, this paper will introduce a set of of linguistic witness protection protocols, designed to ensure security and transparency for both the witnesses and the Canadian criminal court system. The protocols will draw on both the UNODC's "Good Practices for the Protection of Witnesses in Criminal Proceedings Involving Organized Crime," and "Ideologies Across Nations: the Construction of Linguistic Minorities at the United Nations" by Alexandre Duchen, bearing in mind the constraints of inquisitorial recommendations with the current Canadian adversarial system.

### Social Media Theatre: A New Form of Theatrical Presentation

**Howard Dai**

As more people are becoming users of social network sites, theatre companies have begun to include social media in their projects. However, no research addresses the impact of social media on emerging styles of theatre that may result. This paper examines successful examples of social media's integration into theatrical projects in three stages: in the creation process, during the performance, and post-performance. Common advantages of these applications include promoting participation and larger scope of engagement from audience members with the help of a virtual platform. A proposed definition for Social Media Theatre performance refers to a theatrical work that relies heavily on social media and includes applications in the creation stage or during the performance; post-performance applications are disregarded for this genre as being only a continuation of the other categories. In addition, audience and performers must be present, virtually or physically, at the time of the performance to settle the controversy around the liveness of theatre. As theatre must evolve to keep up with the modern generation, Social Media Theatre may be a promising new form of performance.

## The role of accents and names in our memory for individuals' voices

**Brianne Senior, Jobie Hui**

Listeners are better at remembering voices from familiar languages and accents. Previous research suggests our ability to remember voices (voice memory) relies on experience with how speech is pronounced in different languages and accents. While we know listeners' expectations affect how they perceive speech, it is unknown how these expectations affect voice memory. These voice memory studies have not tested whether the names used with the voices also affected listeners' performance. In our study, we compared Mandarin-accented English voices to native English voices in a voice memory task. Listeners were presented with a sentence read by one of the speakers and asked to identify the name of the speaker. The voices were paired with both traditional Chinese names and stereotypical North American names to create congruent and incongruent name/accent conditions. After familiarization with the voices, listeners were quizzed on how well they could remember the pairings. Overall, we found listeners performed better on the native English voices regardless of which name they were paired with. There was an interaction between name/accent, which indicated native English voices were disproportionately affected by incongruent name/accent pairings. That is, listeners performed worse when native English voices were paired with traditional Chinese names than when Mandarin-accented English voices were paired with stereotypical North American names. These results suggest that voice memory does not rely solely on listeners' familiarity with certain languages and accents, but also depends on expectations. Non-native sounding names may bias listeners to perceive a native voice as unfamiliar. Our continuing research addresses this hypothesis.

## Mobilizing Language Data: An Endangered Language Dictionary App

**Aidan Pine**

Of the estimated 7000 languages in the world today, upwards of 90% of them may cease to be spoken by the turn of the 21st century (Krauss 1992). In the Canadian context, there are nearly a quarter million people who speak roughly 60 Indigenous languages. Through the tenacity of the communities that speak them, these languages have persisted despite over a century of colonial oppression. Still, many of these languages are only spoken by older generations and severely endangered. Revitalization efforts are also often underfunded and lack sufficient pedagogical resources. These sparse resources are further divided when considering the linguistic diversity of a province like British Columbia, with 32 Indigenous languages coming from 7 distinct language families, leaving it difficult to reach the levels of success of language revitalization programs seen in more linguistically homogenous contexts such as for Maori language revitalization in Aotearoa (New Zealand).

My research set out to widen the technological resource bottleneck that exists across many language revitalization projects. My presentation will demonstrate the product of my research: a mobile phone application framework, named Waldayu Mobile, designed to allow language communities with existing lexicographic documentation to rapidly deploy a contemporary visualization of their data to both Android and iOS platforms. Waldayu Mobile is unique in that it is an open source, language agnostic, multi-platform, modular dictionary app built specifically to accommodate a variety of needs that specific to endangered language communities and their writing systems, without prescribing what these accommodations should be, allowing for maximum extensibility of the app.

## Accessing Outdoor, Public Space at UBC Vancouver Campus

**Glenn Mendonsa**

'Place' refers to a material space made meaningful by the lived and felt experiences of people. Considerable theoretical and practical work, as conducted through the endeavors of academics, urban planners, designers and architects, have grounded the study of 'place' in the human experience, highlighting the affective relationship that forms between people and the spaces they inhabit. While much has been done to conceptually analyze the significance of 'place' and processes of 'place-making,' as implicated by the built environment of university campuses for instance, little has been done to bridge theoretical and practical understandings of access to place. In order to unpack some of the fundamental connections between accessibility to public space, and opportunities for social congregation, place-making, and community development, this study is primarily concerned with the ways in which various student-led groups/ organizations at the University of British Columbia (UBC) experience and negotiate outdoor, public space on campus. Through the combination of an online survey and in-person focus group discussions, conclusions from 35 study participants suggest that the level of access to outdoor space and thus the opportunities for place-making that accompany it, influences: (1) perceived group reputation, (2) overall group-use of space, and (3) a sense of student community and belonging. Consequently, finding ways to promote the cultivation of such opportunities should figure among the priorities informing the regulation and development of use for outdoor campus space, and public space more generally.

## Homeless with hopeless: where Anomie meets the label

**Kennedy Wong**

Drawing on Labelling theory and Anomie Theory, this research hypothesizes homelessness would fall into a vicious cycle. In Hong Kong, a city without unemployment pensions, and where homelessness is negatively stigmatized, the homeless population increased considerably after the 2009 financial crisis. In the situation, homelessness fell into an anomic state, a state lacking legitimate means that makes the social goal become unachievable (Merton, 1938). Also, in the city, homelessness is stigmatized as lazy, drug abusers, mental illness etc. These labels limit homeless people's ability to find jobs, as employers are not inclined to hire homeless workers. I conducted in-depth interviews with over 20 homeless people in Hong Kong in 2014. The interviews found that some people began taking drugs when they became homeless as a way to escape the negative emotion and the social isolation situation. Hence the situation further strengthens the negative labels and creates a vicious cycle. Viscious cycle is critically reducing the life motivation and shaping the stigmatized identity of homelessness. Research founded even the society proceeded to an economic recovery stage with more job opportunities, homelessness still could not get rid of the viscious cycle once they fell into it.

# Analysis of Family Structure and its Relation to Academic Success

**Jackie Almario**

Through the years, there have been an increasing number of mental health challenges in for college and university students. There are is also a growing number of literatures publications that investigateding the relationship between a student's educational outcomes and his/her family structure (Ginther & Pollak, 2004). With rising divorce rates, repartnering rates have also increased leading to greater blended family formations and a newer family structure that may affect a child's academic success (Portrie & Hill, 2005). The purpose of this research is to identify the relationship between family structure, parenting styles, and the academic success and mental health of university students?. Through the use of questionnaires, we will determine the academic success of youth from different family structures such asincluding single-parent and step-families. The factors we will consider will be (a) grades, (b) test anxiety, (c) procrastination, (d) and thoughts of dropping out. The focus will be towardsStudy participants will include undergraduate students of at UBC. The study and will be conducted over four academic terms. We hope thisThis study may provide insights, which can lead to increased support forwill help thosestudents, who may be at risk of dropping out of univesrity, from non-traditional families as well as to university recruiters ies, who wish to increase retention rates.

# Irving K. Barber Learning Centre - Lillooet Room

## Time: 4:30pm - 6:00pm

### Examining Cardiorespiratory Interaction in the Pacific Spiny Dogfish; Squalus suckleyi

**Neha Acharya-Patel**

Elasmobranchs are a group of cartilaginous fish that include sharks, dogfish, skates and rays. This class has many characteristics that distinguish it from other classes of vertebrates. One of the most unique features is their mechanism of cardiorespiratory control. In most vertebrates heart rate is controlled through inhibitory innervation by the parasympathetic nervous system, and through excitatory innervation by the sympathetic nervous system. However, in elasmobranchs the lack of direct sympathetic innervation of the heart and gills suggests that their main method of cardiorespiratory control is through inhibitory parasympathetic influence via the vagus nerve. We investigated the role of the vagus nerve in mediating a cardiorespiratory response to changing environmental oxygen conditions in the pacific spiny dogfish; Squalus suckleyi. Across vertebrates the cardiac and respiratory systems work together and communicate in order to maximize oxygen uptake. Increasing heart rate when the concentration of oxygen flowing over the respiratory surface is high often accomplishes this. Sometimes the degree of communication between these two sytems is so extensive that a 1:1 beat to breath ratio occurs. Investigating the causes of these phenomena in the evolutionarily distinct elasmobranchs will help us with general understanding of cardiorespiratory interactions across all vertebrates.

### Seeing stars? Concussion ethics in peer-reviewed literature

**Aaron Sihoe**

Concussion has recently gained significant traction as a public health risk affecting millions of athletes who participate in youth, high school, collegiate, professional and recreational sports every year. Recent high profile events such as the NFL concussion lawsuit and the injury of many prominent athletes have led to the increased public awareness of the issues surrounding sports concussion through news media. Little is known about the discourse in professional circles however. To this end, we examined the peer-reviewed literature for ethics content related to sports concussion, focusing on authors, their backgrounds and funders, and ethical stance. Methods: To identify ethics content within concussion literature published in peer-reviewed journals between the timeframe of June 1, 2004 – June 15, 2015, we used a detailed search of Medline, Embase, Sportdiscus and Academic Search Complete databases. A content analysis was conducted on a final set of 78 articles meeting our inclusion criteria. Results and discussion: The custom search yielded 78 unique publications for analysis. Preliminary Analysis reveals a diverse group of authors professionals contributing to the discussion surrounding the ethical concerns of sports concussion. 51 of the 78 publications do not specify a funding source. Emergent themes include the tensions inherent in sports culture, conflicts of interest, and issues of justice. Overall, this study will reveals relationships, gaps and strengths in the written ethics discourse around sports concussion among investigators and scholars from different professional backgrounds.

## Effects of Vitamin B Complex Supplementation on Lactation Performance in Dairy Cattle

**Charlotte Donnan**

B complex vitamins, termed as such due to their interdependent nature, possess a myriad of functions, primarily involving energy metabolism and the electron transport chain. Provision of B complex vitamins has been hypothesized to increase milk production likely due to their role in metabolism. However, the full effect of vitamin B complex supplementation on milk production in Holstein dairy cattle has yet to be fully elucidated. Previous experiments, often focusing on one or two vitamins, have shown mixed results. Thus the objective of this experiment was to determine the effects of rumen-protected vitamin B complex supplementation on the percent fat, protein and total milk yield of dairy cows. Naturally, the microbes present in the rumen degrade supplemented vitamins, so the vitamins were coated with fat to protect them. Fifty-one multiparous Holstein dairy cows at the UBC Dairy Education and Research Centre in Agassiz, BC, Canada were enrolled and milk production data was collected for forty-five cows. Cows were randomly assigned to either control (n=23) or treatment (n=22) groups. No significant results were found in daily milk production (p=0.9082), percent protein (p=0.3386) or percent fat (p=0.8602) between the two treatment groups. Further analysis is being completed on the effect of environmental temperature and feed intake on milk production.

## Friends forever? The development of affiliative relationships among dairy calves

**Nicola Adderley**

An affiliative relationship, or friendship, refers to a preferential bond between two individuals, irrespective of familial relationship. The existence of friendships between cows is suggested by the uneven distribution of socio-positive interactions. Social structure among dairy calves remains poorly understood and the stability of affiliative relationships has not been characterized. The aim of this study was to investigate the development and stability of friendships between young dairy calves. We measured and ranked affiliative relationships among group-housed dairy calves (n=8) at 30 days, 50 days, and 70 days of age using 24 hour continuous recording. We observed social resting (resting in physical contact or close proximity), social feeding (eating hay/grain and drinking milk), playing (mock fight and locomotor play), and allogrooming (sniffing and licking) behaviours. We ranked preferences for social partners based upon the frequency of socio-positive behaviours; preferred partners were assessed separately for each behaviour class. Affiliative partnership order was relatively stable between 50 days and 70 days of age for allogroming (Rs=0.51), resting (Rs=0.49) and playing (Rs=0.42). Partnership order established using one behaviour was well correlated with the order based on another behaviour (e.g. order based on allogroming versus social resting at 30 d, Rs=0.56; at 50 d, Rs=0.60; and at 70 d, Rs=0.57). These results suggest that affiliate interactions increase in frequency, and relationships become more stable as calves age. Since social support is a known means of coping among domestic animals, the existence of affiliative relationships among dairy calves should be taken into account for herd management.

## Closing the Implementation Gap? A Systematic Review of Implementation of the Aichi Biodiversity Targets in Canada

**Ricardo Pelai**

Biodiversity plays an important role in sustaining the systems of the biosphere and in sustaining human lives. Yet, biodiversity is being lost at unprecedented rates. Multi-lateral environmental agreements, such as the Convention on Biological Diversity's Aichi Biodiversity Targets, arrange rules and regulations that parties commit to. They are widely regarded as important instruments for global environmental governance, a key component towards addressing biodiversity loss. While significant attention has been paid to progress at the global level, very little is known of the state of implementation and engagement with the Aichi Targets across sectors and scales in Canada. We examined implementation measures associated with the Aichi Targets at the national level mid-way through the implementation period by conducting a systematic review and content analysis of policy documents focused on the Aichi Targets in Canada between 2010 and 2015. We developed and applied a typology to explore the types of measures being pursued, actors involved, ecological context, and implementation status. Across a spectrum of 7 types of measures, less than 25% are being implemented, with uneven representation across the individual 20 targets. The Federal Government and Non-governmental organizations were the actor groups associated with the highest toal number of measures (implemented and aspirational.) Public participation was associated with the least number of implemented measures. This study identifies current gaps in attention and progress towards implementing the Aichi Targets in Canada that can be used to inform subsequent efforts. It also offers lessons for closing the implementation gap in biodiversity governance more broadly.

## Effects of Vitamin B complex supplementation on BHBA levels in transition dairy cows

**Poonam Dattani**

After calving, lactating dairy cows experience a period of high, energy deficiency that can lead to many health problems including ketosis – a metabolic disorder characterized by elevated plasma levels of ketone bodies commonly referred to as β-hydroxybutyric acid (BHBA). B vitamins function as important coenzymes in energy metabolism and hence may reduce incidences of negative energy balance. Our aim was to determine if supplementation of a rumen-protected vitamin B complex, in cow feed, could decrease BHBA levels in transition dairy cows. 51 Holstein cows, from the UBC Dairy Education and Research Centre, were enrolled and randomly assigned to two groups: control (n=24) and treatment (n=27). Treatment cows were supplemented with a vitamin B complex at 100g/cow/day throughout their transition period, from 21 days before calving to 21 days after calving while control cows received 50g of hydrogenated fat to maintain isoenergetic diet balance. Blood samples from both groups were collected weekly, and measured for BHBA levels with the Precision Extra Ketone Meter. Statistical analysis of the data showed no difference ($p = 0.79$, $\alpha = 0.05$) in BHBA levels between treatment and control groups. Therefore, supplementing transitioning dairy cows with vitamin B complex showed no effects on BHBA levels. Future research should focus on studying the effects of different doses of vitamin B complex supplements, and body condition score on BHBA levels. Preventing the development of ketosis will negate its detrimental metabolic effects and thus decrease economic losses of dairy farmers and improve the overall health of dairy cattle.

# Irving K. Barber Learning Centre - IKBLC 461

## Time: 4:30pm - 6:00pm

## Morphological adaptations to the lungs of high altitude birds

**Emily Smith**

A lack of environmental oxygen, known as hypoxia, is detrimental to organisms that require oxygen for ATP synthesis. This is particularly so for birds during metabolically expensive behaviors such as flight. To address this challenge, birds have evolved a unique respiratory system with enhanced gas exchange capacity. High-altitude flight exacerbates this challenge, and some avian species have adapted additional respiratory and cardiovascular to support this function. High altitude migrants have higher ventilation frequencies and breath volumes in hypoxia. Heavy breathing, however, is expensive. High-altitude residents are therefore hypothesized to adapt structurally rather than functionally. To investigate possible structural differences between high and low-altitude residents, I studied the lung morphology of four bird species (Andean, Chloephaga melanoptera; Greylag, Anser anser; Barnacle, Branta leucopsis; and Bar-headed geese, Anser indicus). Andean geese are high-altitude residents. Greylag and Barnacle geese reside and migrate at low altitudes, and are not exposed to extreme hypoxia. Bar-headed geese reside at lower elevations and alter their ventilation to migrate transiently at high altitudes. I used scanning electron microscopy for qualitative comparisons, and light and transmission electron microscopy for stereological analysis. Andean geese were found to have larger lungs and blood-gas surface areas per unit lung volume, a thin blood gas barrier relative to body mass, and greater pulmonary vascularity, all leading to a greater morphological diffusion capacity for oxygen than all other birds. This supports the hypothesis that chronic hypoxia leads to structural rather than functional adaptations in high altitude residents.

## Evaluation of the Anti-Glucotoxic Effects of Leech Saliva Extract (LSE) on Mouse and Human Pancreatic Islets

**Michelle Ebtia**

Background: In Canada, over 9 million people are diabetic or pre-diabetic. The main culprit in the pathogenesis of Diabetes Mellitus is chronic exposure to supraphysiologic glucose concentrations. Leech Saliva Extract (LSE) has been shown to improve a variety of medical conditions including diabetes.

In this study, our goal was to evaluate antiglucotoxic effects of LSE, derived from Hirudinaria manillensis, on mouse and human pancreatic islets in vitro.

Hypothesis: Treatment of pancreatic islets with LSE will prevent/reverse detrimental effects of glucotoxicity.

Results: Incubating mouse and human islets in high glucose conditions significantly decreased their viability and function compared to those cultured in normal glucose concentrations. Qualitative assay revealed a 20% increase in the viability of human islets treated with high concentrations (1ug/ml) of LSE under glucotoxic conditions, compared to low or no LSE treatments. Similarly, mouse islets treated with high concentrations of LSE showed showed ~15% increase in viability.

Conclusion: LSE partially prevents the effects of glucotoxicity on pancreatic islets, in a dose dependent manner. With further research, LSE may serve as a novel approach to prevention of diabetes mellitus progression, namely at the pre-diabetic stage.

## Caspase-3 Modulation of Synaptic Plasticity

**Shannon Tang**

Synapses between neuronal cells allow for the transmission of chemical and electrical information, and are crucial for physiological function. These synapses can be strengthened and weakened over time, and this is known as synaptic plasticity. Over longer time frames, from minutes to hours, synapse strengthening is known as long-term potentiation (LTP), and synapse weakening is known as long-term depression (LTD). LTP and LTD mechanisms during brain development are crucial for the formation of appropriate neuronal circuits, and the elucidation of their molecular pathways allows for clinical manipulation to treat developmental disorders such as schizophrenia and autism. Caspase-3, a protein activated when cleaved, and well-studied for its role in cell death, has been implicated as part of the LTD cascade, along with other proteins in the mitochondrial programmed cell death, or apoptosis, pathway. Yet, the role of caspase-3 on LTP and LTD are not well understood. In this study, we will visualize caspase-3 activation by imaging 3D neuronal structure while inducing neuronal plasticity in vivo. In the visual tectum of Xenopus laevis tadpoles, we will induce synaptic plasticity with specific visual stimuli that promotes LTP and LTD in neurons involved in the visual circuits of the tadpoles. To measure caspase-3 activation while recording intracellular calcium levels in a 2-photon microscope, we will introduce plasmids containing a caspase-3 cleavage indicator (CA-GFP) and a nuclear-localized genetic-encoded calcium sensor (NLS-gCaMP6m) using electroporation in Xenopus laevis tectal neurons. We expect to find local variations of caspase-3 activation levels in dendrites and filopodia of neurons undergoing LTP and LTD.

## The role of accents and names and our memory for individuals' voices

**Brianne Senior, Jobie Hui**

The role of accents and names and our memory for individuals' voices
Listeners are better at remembering voices from familiar languages and accents. Previous research suggests our ability to remember voices (voice memory) relies on experience with how speech is pronounced in different languages and accents. While we know listeners' expectations affect how they perceive speech, it is unknown how these expectations affect voice memory. These voice memory studies have not tested whether the names used with the voices also affected listeners' performance. In our study, we compared Mandarin-accented English voices to native English voices in a voice memory task. Listeners were presented with a sentence read by one of the speakers and asked to identify the name of the speaker. The voices were paired with both traditional Chinese names and stereotypical North American names to create congruent and incongruent name/accent conditions. After familiarization with the voices, listeners were quizzed on how well they could remember the pairings. Overall, we found listeners performed better on the native English voices regardless of which name they were paired with. There was an interaction between name/accent, which indicated native English voices were disproportionately affected by incongruent name/accent pairings. That is, listeners performed worse when native English voices were paired with traditional Chinese names than when Mandarin-accented English voices were paired with stereotypical North American names. These results suggest that voice memory does not rely solely on listeners' familiarity with certain languages and accents, but also depends on expectations. Non-native sounding names may bias listeners to perceive a native voice as unfamiliar. Our continuing research addresses this hypothesis.

## Efficacy of EZH2 Inhibitors in Suppressing Luminal A Breast Cancer

**Kirk Chen, Rachel Tandun, Alice Su, Jennifer Chen**

Epigenetic mutations in cancer has been the recent focus for cancer treatment due to high cancer cell specificity. The overexpression of EZH2, a histone methyltransferase is found in several cancers including breast. It has been demonstrated that EZH2 promotes cancer cell development via two different pathways: PRC2-dependent and PRC2-independent. The PRC2 complex catalyzes the methylation of the lysine 27 on histone 3 ($H_3K_{27}$), which silences more than 200 tumour suppressor genes, resulting in cancer cell proliferation. EZH2 also facilitates carcinogenesis via a PRC2-independent manner by upregulating NF-kB, a protein complex that stimulates cell proliferation and prevents apoptosis. We suspect that EZH2 in luminal A breast cancer facilitates cancer progression via the PRC2-dependent mechanism due to its high $H_3K_{27}me_3$ expression despite its relatively low EZH2 expression compared to other breast cancer subtypes. In this study, we propose to first do an in vitro test with luminal A, luminal B and basal cell lines to test for the efficacy of EZH2 inhibitors: GSK127, EPZ6438, and DZNep. If the cell lines perform as expected, we will then proceed to mice models. Using immunohistochemistry, we should observe a marked decrease in $H_3K_{27}me_3$ levels in luminal A breast cancer relative to other breast cancer subtypes. Our anticipated results should demonstrate that GSK127 inhibits xenograft tumour growth most efficiently in luminal A breast cancer. The possibility for estrogen-receptor positive cancer cells such as luminal A breast cancer to develop resistance against anti-estrogen drug treatments makes it vital to find other effective alternatives such as EZH2 inhibitors.

## Early Onset Alzheimer's Disease: A Need to Increase Awareness and Inclusive Attitudes around Ageism

**Simran Parmar, Monica Yip**

Ageism, the act of discriminating against individuals on the basis of age, can generate stigma around individuals with age-related health conditions. Often associated with old age, early onset Alzheimer's disease (EAD) is a form of Alzheimer's that occurs in individual's under the age of 65. With the unified support from social and health interventions, there is a greater chance of alleviating both the symptoms and the stigma that are commonly associated with EAD.

Our research stems from an interdisciplinary perspective, attempting to understand both the medical and social aspects of EAD. We hope to heighten awareness and increase our peers' scope of knowledge with regards to age related diseases through the lens of patients' illness narratives. Our findings have revealed knowledge gaps regarding healthcare teams treating this disease. Not only do current treatments fail to show clinical success but also, the Alzheimer's disease workforce lacks formalized social support systems for young adults. Our research acknowledges the patient's perspective as an essential factor in determining the direction of therapy. Healthy aging in individuals with EAD involves improving physician diagnosis, implementing nutritional calendars, enhancing patient-centered care by nurses, as well as expanding the support systems offered by social workers. It is through the roles of these healthcare professionals that we would most likely improve the quality of life of individuals living with EAD. The focus of future research should provide more comprehensive support for patients experiencing EAD by means of: emphasizing early intervention, building an integrated system of care for young adults, and strengthening the interdisciplinary workforce.

# Irving K. Barber Learning Centre - IKBLC 185

# Time: 4:30pm - 6:00pm

## Parametric Building Design at UBC

**Andrei Gavrilov, Zahid Ahmed, Mahdieh Eghtesad**

In modern building design processes, complex construction techniques are used in building design, aesthetics, and construction. A majority of buildings use these central aspects of constructability, building information modelling (BIM), and parametric design to assist in creating diverse, versatile, and environmentally friendly structures. The Orchard Commons building is well into its construction phase, and is scheduled to open to the residents of UBC and Vantage College in September 2017. A key aspect is the complex, recurring wave pattern on the facade which has been created through parametric design through the use of the computational design. The aesthetically pleasing look of the building and the construction of the concrete panels being used are cost effective; derived from a particular type of mold, with one recursive pattern which shifts vertically. This saves time and materials during the construction of the panels and makes the facade of the building more unique and environmentally friendly. This does not affect the vision of the stakeholders of the building, reducing the conflict of interest between the construction team and building designers. We can see all of the positive benefits that this method yields in terms of constructability. Through our research, we will seek to determine how such constructability methods and parametric design can be implemented into the construction of buildings without creating the impression of a simple design. By developing such modeling and design technologies, we believe that construction difficulties will be minimized, leading to building feasibility developments at UBC.

## Frequency Mapping Predictions of the Inner Ear of a Beluga Whale Based on Morphometrics

**Cassandra Girdlestone**

Analyzing the morphometry, or taking measurements, of the inner ear of mammals can provide information for frequency mapping. A frequency map is a species specific "map" of locations in the cochlea at which different sound frequencies are detected. The base of the cochlea is sensitive to high frequency sounds, while low frequencies are detected in the apex region. Various techniques are used physiologically and anatomically to create frequency maps in land mammals. The objective of this study was to show that the method used is viable in belugas as an alternative to techniques commonly used in land mammals, which are not transferable. This is the analysis of a single beluga whale (Delphinapterus leucas) cochlear sample. High resolution micrographs taken with a scanning electron microscope (SEM) were analyzed. In these micrographs, several variables were measured at five different positions around the cochlea. Multiple representative measurements were taken within each location. Preliminary results are very promising, as some morphometrics of the organ of Corti in beluga whales seem to follow the same pattern as in guinea pig ears. It is expected that, as in other species of mammals, it will be possible to compare the morphological features measured, among individuals. These anticipated similarities could be used to develop a frequency map for the species. Once a frequency map can be created for D. leucas and lesions are found due to acoustic trauma, it could be possible to extrapolate what frequency range of sound caused it and the potential source of that sound.neuropathophysiology. Finally, I propose how future treatments can target the host modifications identified.

## A Comparison of EEG Power Spectral and Wavelet Features in Concussed Cohorts Using Support Vector Machine

**Arnold Yeung**

EEG power spectral features, representing the average powers of EEG at different frequency ranges, and wavelet features, representing the non-stationarity of EEG, have independently shown changes in brain activity due to concussions. In this study, we compared the performances of these feature sets using a linear SVM classifier, an algorithm that solves for a best-fit separation line between 2 classes, in order to determine the optimal feature set for binary concussion classification. Our results show that the power spectral feature set had the higher sensitivity and the wavelet feature set had the higher specificity in classifying concussed subjects. When both feature sets were combined, the overall accuracy improved by 5% due to a higher sensitivity, suggesting the relevance of both feature sets.

## Implications of uncertainties in quake locations on Mars' seismicity-geology correlation

**Arvin Boutik Karpiah**

Quakes are not exclusive to Earth. Moonquakes have been observed and surface imaging of faults, together with thermal models for Mars' evolution suggests that it is very likely that Mars has seismic events too. However, there have been no in situ measurements of marsquakes. Images and elevation maps of the martian surface by different satellite missions have revealed faults in some detail but no evidence for plate tectonics, suggesting that marsquakes might be governed by tectonism and/or volcanism that occurs at particular regions or across the planet. Several studies have been done to estimate present day seismicity on Mars. Catalogues of martian fault locations and ages, together with measured seismicity levels on the Moon (where there is also no plate tectonics) and in intraplate regions on Earth (i.e. away from plate boundaries), have been used to estimate bounds on martian seismicity levels. These estimates suggest that Mars might be seismically active today. NASA's InSight mission is a project underway to deploy a modern seismometer and a heat probe on Mars to study the structure of Mars's deep interior. This would be the first ground based seismic measurement on Mars. We built probability distribution functions for likely marsquake locations based on fault data, InSight's seismometer location and anticipated measurement uncertainties. We use this probability function and surface geology maps of Mars to quantitatively assess how the inferred seismic events, including the errors in locations, would be interpreted in terms of the geological provinces from which they originate. For example, uncertainties in mars quakes locations that actually occurred on ancient terrain could allow us to interpret them having occurred on much younger terrain leading to an incorrect interpretation of the planet's seismicity. Understanding these trade-offs before obtaining actual data is thus important understanding Mars' tectonic/volcanic evolution.

## On the Use of Multiple Planetary Boundary Layer Parameterization Schemes for Forecasting Temperature and Precipitation in Complex Terrain

**Timothy Chui**

Modern weather forecasts predict the future state of the atmosphere by using powerful computers to solve a complex set of equations. A major source of uncertainty in these numerical weather prediction (NWP) models comes from the representation of turbulence, which refers to the fluctuations of atmospheric variables such as temperature and moisture. Turbulent exchanges of such variables are approximated in NWP models by planetary boundary layer (PBL) parameterizations. These parameterizations were originally formulated in flat terrain, even though they are used in weather models which can be applied to anywhere in the world. In particular, a comparison of the forecast performance of different parameterizations has not been conducted in the complex, mountainous terrain of western Canada. The focus of this research was to evaluate eight commonly used PBL parameterizations by verifying their point forecasts of hourly temperature and daily accumulated precipitation against surface observations at 31 stations in British Columbia and Alberta for one year. The results showed that choosing the optimum parameterizations to use depends on the forecast variable as well as the terrain conditions, not necessarily on the complexity of their formulation. The forecasts were also combined using a variety of linear methods. An ensemble of PBL schemes inversely weighted by their error produced hourly temperature forecasts that were just as good as the best individual bias-corrected member at each station, while an equally weighted ensemble of linearly regressed precipitation forecasts had only a slightly larger error on average than the best individual precipitation forecast. Daily forecasts of temperature and precipitation, which are variables of interest to both the general public and to industry, can thus be improved by the careful selection and combination of PBL parameterizations.

## Understanding the Black Hole Information Paradox

**Sam Leutheusser**

It is the goal of much research in theoretical physics to unite the two pillars of modern physics, general relativity and quantum mechanics, into a single coherent theory. However, when one attempts to explain black holes, the simplest objects of general relativity, using quantum mechanics, a paradox is found. Over time the black hole disappears completely leaving only radiation that cannot be used to deduce the state of the original black hole. This violates one of the most firmly held principles of physics: that information cannot be lost. Thus, the so-called "black hole information paradox" presents one of the most glaring inconsistencies between quantum mechanics and general relativity. It is therefore thought that the resolution of this paradox will provide significant insight into the nature of the unified theory of quantum gravity. The apparent loss of information when a black hole "evaporates" could be resolved by "hidden" correlations between the radiated particles. In essence, the information needed to reconstruct the original state of the black hole may never be lost, but rather must be extracted through careful study of every single radiated particle. Thus, only with great care can one carry out the reconstruction and ultimately avoid information loss. A toy model of black hole evaporation has been developed in order to study the behaviour of quantum information in an evaporation-like process. Understanding the role of quantum information in this toy model could provide significant hints as to the resolution of the black hole information paradox.

# POSTER PRESENTATION OVERVIEW (3)

DAY 3 PROGRAM - MARCH 31, 2016

## Irving K. Barber Learning Centre - 2nd Floor Foyer

## Time: 3:00pm - 4:30pm

| *Research Topics* | *Presenters* |
|---|---|
| Hookup initiation among lesbian, gay and bisexual young adults and associated outcomes | Yousef Shahin |
| Acceptability to children and their parents of participating in an investigation of ongoing and instigated pain during post-operative recovery | Kara Hawley |
| The social dynamics of zebrafish in semi-natural environments and in response to novel objects | Felix Cheung |
| Sexuality training for staff working with spinal cord injured patients: a systematic review | Christie Chan |
| The Unusual Suspects: Identifying the Schwann-like Remyelinating Cells Found In Demyelinated Areas of the Central Nervous System | Khash Hanjani |
| Site-directed Epimutation using the CRISPR-Cas9 System | Samantha Schaffner<br>Paula Morales |
| Cortical oscillations underlying working memory for ordered groups | Zoe Cheng |
| Tone Deafness in Developmental Prosopagnosia - Is There a Common Cause? | Jake Stubbs |
| Proof of principle of a stokes polarimetry probe for skin lesion evaluation | Daniel Louie |
| Cross Cultural Executive Functioning and Episodic Prospective Memory | Alice Lee |
| Do Surprise Quizzes Impair Memory? | Maryam Osman<br>Ayeesha Bhatara |
| The distribution and salinity tolerance limits of Diadumene lineata along the coast of British Columbia, Canada | Cassandra Konecny |
| Aiding the South Asian Community with PLEASED: Peer Led, Empowerment based, Approach to Self Management Efforts in Diabetes | Harvir Sandhu |
| Investigating alternative mechanisms for bypassing Frataxin function in yeast | Faith Cheung<br>Joyce Zhang |
| Establishing the China Central Reserve Bank - Struggle and Compromise | Lander He |
| Confocal laser endomicroscopy: application towards gastrointestinal diseases | Gary Jiang<br>Gloria Kwong |
| The effects of asthma medication use on lung health in individuals exposed to air pollution | Abnashi Randhawa |

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|---|---|
| Biochemical differences between chronically and acutely sleep deprived mice | Ronald Fung |
| Identification and characterization of genetic mutations in novel synapse patterning mutant (wy843) in C.elegans to elucidate the mechanisms that regulate age-dependent neurocircuit maintenance. | Kathy Lee |
| Efficacy of Peruvian Bilingual Education Program(EBI) | Sidd Gupta |
| Learning to stand with delayed feedback: A pilot study | Hasrit Sidhu |
| Involvement of the Cerebellar Endocannabinoid System in Schizophrenia | Preet Gandhi |
| PM2.5 Exposure Within The University Of British Columbia, Vancouver Campus | Connor Smith |
| Characterizing IRES elements that mediate reading frame selection. | Lauren Mak |
| PRENATAL ALCOHOL EXPOSURE ALTERS SEXUALLY DIMORPHIC PROTEIN EXPRESSION OF METHIONINE CYCLE ENZYMES IN THE FETAL BRAIN AT GD21 | Melissa Chiu |
| Medium-intensity physical activity improves sustained attention | Arash Ghanbarzehie |
| Structural and behavioural effects of Lumosity training | Hanna Dawood<br>Nicole Banting<br>Garbo Lam<br>Hyun Jae kim<br>Shalini Mohan |
| Effect of Ethanol Intoxication on Habituation of the Gαs/cAMP/PKA and the Gαo/DGK/DAG pathway of Caenorhabditis elegans | Shideh Mirhadi |
| The readability of online resources for dementia | Arlo Sporn |
| matLearn: User-Friendly Large-Scale Machine Learning | Jennifer She |
| CHOICES (Cardiovascular Health/Outcomes: Improvements Created by Exercise & education for SCI) | Marko Gavric |
| Lifestyle and cognition: The relationship between sleep, exercise, and exam performance | Kyle Gooderham |
| Cancer Associated Fibroblast (CAF)-mediated Cisplatin Drug Resistance in Bladder Cancer | Jessica Yu |
| Geophysical imaging using a high dimensional lookup table. | Jen Ling |
| Toxicity Analysis of Essential Oil Extracts in Cabbage Loopers | Alexander Cheng |
| Influence of stress on appetitive conditioning | Michelle Zhang |
| Driving Alveolar Macrophage Development Using PPAR-Gamma Agonist Rosiglidazone | Blair Hardman |
| Speech Perception for Second Language Speakers | Claire Allen |
| Current Assets: Sweet Liquid Economic Nectar | Hudhaifah Zahid |
| Resource consumption and population growth | Giorgio Viancha Sgarbi |

# POSTER PRESENTATION ABSTRACT (3)

MARCH 31, 2016

## Irving K. Barber Learning Centre - 2nd Floor Foyer

## Time: 3:00pm - 4:30pm

### Hookup initiation among lesbian, gay and bisexual young adults and associated outcomes

**Yousef Shahin**

Research on hookups has grown exponentially to keep pace with the sharp increases in the behavior; however, most of the hookup scholarship has been heteronormative, that is, rarely have scholars focused on lesbian, gay, and bisexual (LGB) individuals. This project aims to reveal whether differences in hookup initiation arise within groups (LGB) as well as show whether or not they differ dependent upon various initiation methods. To address our research questions, semi-structured interviews were conducted with 11 participants who hooked up at least once in the past year; they ranged from 19 to 25 and resided in the Vancouver community. Preliminary analyses indicated that within groups, gay males reported the most preference for using social media applications to initiate a hookup and bisexual females reported much more variety. Interestingly, some bisexual females described a preference for initiating hookups specifically through their dance groups, while others maintained preference for using online sources. Despite evidence that finds LGB young adults oftentimes report compromised sexual experience (e.g., gay men are more likely to report HIV), we found that hookup experiences of LGB young adults were more positive than negative. These results are important for various stakeholders: public health officials (nurses, counselors) should be aware of the unique challenges associated with hooking up for sexual minorities; they could also be utilized to better tailor risk prevention programs to specific LGB sub-groups.

### Acceptability to children and their parents of participating in an investigation of ongoing and instigated pain during post-operative recovery

**Kara Hawley**

Objective: To examine acceptability of participation in a study of spontaneous (ongoing) pain and instigated pain during recovery from laparoscopic appendectomy. While standards exist for participation in studies involving unobtrusive observation, less is known about children's and parent's self-reported experience when painful clinical conditions are exacerbated for research purposes. Precedents of instigated pain exist in studies of headache, abdominal pain, sickle cell pain, etc., but with limited attention to acceptability.

Methods: 54 children and their parents answered questionnaires separately to investigate reactions to a study that used experimental pressure applied to the incision area.

Results: 54 youth, aged 12(3) (M(SD)) years, and 54 adults, aged 39(8) (M(SD)) years participated. Overall, on a scale of 1 (very negative) to 10 (very positive), both parents 9.4(1.3) and children 7.9(2.4) rated their experience as positive. All children were positive about recommending participation to other children. Acceptability reports were comparable to that for children exposed to experimental cold pressor pain.

Conclusions: Parents and children both reported positive experiences participating in a clinical investigation involving assessments of spontaneous and instigated pain in the post-operative setting.

## The social dynamics of zebrafish in response to novel objects

**Felix Cheung**

Despite the widespread use of zebrafish (Danio rerio) as model organisms in scientific research, little is known regarding their behavior in semi-natural environments. In particular, studies documenting zebrafish social dynamics in such environments and how it may change in response to environmental stimuli are lacking. As an initial step towards filling in this gap, we filmed zebrafish (n = 60) housed in 6 tanks furnished with a sloping gravel substrate, plants, and rocks and we tested whether the presentation of novel objects would affect their social dynamics including inter-fish distances and polarity (the degree to which fish face in the same direction). Over the course of a month, we placed an array of novel objects into the hometanks (10 minutes for each object) and compared behavior during a control period one hour before object presentation to (i) the first and (ii) the last 100 seconds of object presentation. Our results show that the presence of novel objects decreased inter-fish distance during both the first 100 seconds ($P<0.01$) and the last 100 seconds ($P<0.05$). Novel objects also increased polarity during the first 100 seconds ($P<0.05$). These results provide insight regarding the social behavior of zebrafish in semi-natural environments and in response to novelty, which may help improve our understanding of their behavioral needs and eventually, their welfare.

## Sexuality training for staff working with spinal cord injured patients: a systematic review

**Christie Chan**

Objectives: Appreciate that education on sexuality is important for individuals after spinal cord injury and that staff training improves staff knowledge, comfort, approach and attitude towards sexuality.

Abstract: Spinal cord injury (SCI) is a devastating injury with significant secondary health consequences affecting the functioning of systems such as the bowel, bladder, and lungs. In the midst of these, education on sexual adjustment frequently goes unaddressed despite sexual health being consistently cited by people with SCI as a top priority. The literature suggests this may be because a large proportion of SCI health professionals have inadequate sexuality training.

This systematic review aims to analyze existing literature on staff SCI-sexuality training programs by comparing program format, content and outcome, and by evaluating their efficacy on staff ability to address sexual concerns of people with SCI. We searched for published articles describing implementation and results of a staff SCI-sexuality training program. The literature search was conducted in MEDLINE, CINAHL, EMBASE, PsycInfo, HaPI, and SportDiscus through 1966 to July 2015.

The search yielded 1745 articles, with 111 left after title review. After abstract and full text review, 5 articles met inclusion criteria. 2 RCTs were found: one group-based, interdisciplinary, multi-day program and one individualized, single-discipline, single-day program. The multi-day program found significant and sustained improvement in staff knowledge and comfort in addressing sexual concerns compared to control post-training, 3 months and 2 years after. The single-day program found significant improvement over the didactic lecture control group post-training. 2 pre-post papers also found significant improvement in outcomes after training.

These results support use of SCI-specific sexuality training programs for health professionals to foster staff ability in addressing sexual concerns of individuals with SCI.

## The Unusual Suspects: Identifying the Schwann-like Remyelinating Cells Found In Demyelinated Areas of the Human Central Nervous System

**Khash Hanjani**

Myelin is the insulating sheath that covers neurons in vertebrates, allowing faster signal propagation over longer distances. This makes myelin a crucial part of our nervous system, and its loss due to spinal cord injury or diseases like Neuromyelitis Optica (NMO) and Multiple Sclerosis (MS), devastating. However, demyelination is not necessarily permanent, and remyelination has been observed in the damaged nervous system. But the remyelination process is not perfect and the newly synthesized myelin expresses Schwann-like characteristics in some cases. This is surprising since Schwann cells are normally found in the peripheral nervous system(PNS) and exluded from the central nervous system (CNS).This begs the question: what is the origin of this peripheral-like myelin and what are its characteristics? We hypothesize that the Schwann-like cells found in the CNS can be divided into two sub-populations of different origin, with one sub-population being PNS derived, while the other is CNS derived. To test this hypothesis multiple peripheral and central-specific myelin protein antibodies were used to stain the peripheral-like myelin found in the spinal cord of MS, NMO and spinal cord injury patients. The presence of the proteins was then observed using immunofluorescence microscopy. Results show that while both CNS Schwann-like sub-populations differ from regular PNS Schwann cells one population shows characteristics more similar to Schwann cells, while the other shows similarities to oligodendrocytes, the myelinating cells of the CNS. These results indicate that these remyelinating Schwann-like cells have a more complex origin that previously thought. With further research we can more precisely identify the origin of these Schwann like cells and gain a better understanding of remyelination, why it fails in many cases, and how it can be improved.

## Site-directed Epimutation using the CRISPR-Cas9 System

**Samantha Schaffner, Paula Morales**

Carcinogens such as radiation can damage our DNA. The cell's DNA repair mechanism can alter the epigenetic state of genes surrounding the damaged area, leading to changes in gene expression. While many studies have associated cancer – in particular, Hodgkin lymphoma – with loss of epigenetic silencing, few models show that this alone can lead to cancer. I am developing a method of altering DNA silencing that will be used to examine effects on gene expression and disease as cells replicate.

This is accomplished by inducing a break in DNA of human embryonic kidney (HEK) cells expressing green fluorescent protein (GFP). HEK DNA is broken via CRISPR-Cas9, an in vivo method of "cutting" DNA at a specific site in the genome. After these cells have repaired the cut, I will determine the epigenetic state of their descendants by sorting cells based on GFP expression and performing bisulfite conversion and sequencing in order to determine the level of cytosine methylation. Once this technique has been established in HEK cells, it will be used to modify cancer-causing genes in Hodgkin lymphoma cells. I can then determine whether loss of gene silencing will lead to cancer. This technique will aid understanding of any process in the cell which is epigenetically regulated. Development, aging, and many human diseases are highly impacted by the pattern of gene activation and silencing in our cells. By altering gene expression in the lab, researchers will be able to understand how this pattern.

## Cortical oscillations underlying working memory for ordered groups

**Tzu-Han (Zoe) Cheng**

Short-term memory (STM) plays a critical role in many cognitive processes and in everyday life. A much- cited theory of STM posits that serial order is represented by the relationship between the phases of slow oscillations (i.e. ~5Hz theta) and faster oscillations (i.e. ~40Hz gamma). In this theory, each cycle of the slow oscillation corresponds to a new rehearsal of the set of remembered items, and each cycle of the fast oscillation corresponds to an individual item. This has yet to be tested empirically. If this theory about phase coupling of fast and slow oscillations is correct, a similar principle should apply to sub-groups within a set of items to be remembered. We tested this using a short-term memory task in which items were ordered into groups. The participants (N=20) were asked to remember either three groups of two letters (e.g. SD-FJ-KL) or two groups of three letters (e.g. SDF—JKL). After a 4 second delay, a single digit appeared, prompting the participants to recall either the first, second, or third group. The EEG (electroencephalography) of each participant was recorded during the task. Here we examined differences in peak frequencies between the conditions. We hypothesized that we would find an oscillation which was faster for the shorter groups. Our finding clarify the role of phase-coupling in STM and its link to behavior.

## Tone Deafness in Developmental Prosopagnosia - Is There a Common Cause?

**Jake Stubbs**

Developmental prosopagnosia is a congenital disorder of face recognition. Recent work has shown differences between those with prosopagnosia and controls in white matter connectivity in the brain. Amusia, commonly known as tone deafness, is another developmental disorder which has been shown to have both white and grey matter abnormalities. Based on anecdotal reports of some subjects, we hypothesized that there may be instances in which these two disorders overlap. Eight subjects with prosopagnosia were compared to healthy controls on three measures. The Montreal Battery of Evaluation of Amusia examined melodic organization, temporal organization, and memory. Subjects also completed pitch discrimination and beat perceptual threshold tasks. While the prosopagnosia group was not impaired on the pitch discrimination task, there was a group difference on the rhythm perception task and 4 of the subjects with prosopagnosia performed at least 2 standard deviations outside of the control mean. On the Montreal Battery of Evaluation of Amusia, the prosopagnosic sample was impaired relative to normative data on their overall score as well as pitch interval perception. At least some cases of developmental prosopagnosia also show deficits found in congenital amusia. This association could be explained by a common structural cause, or aberrant white matter connectivity. Whether this is a primary white matter disconnection syndrome, or secondary to a cortical migration disorder is not yet clear. Future work will include high resolution MRI to reveal neural substrates that are common between both disorders to determine the anatomic substrate of this behavioural observation.

## Proof Of Principle Of A Stokes Polarimetry Probe For Skin Lesion Evaluation

**Daniel Louie**

Skin lesions are often evaluated using optical diagnostic tools, especially in the field of cancer detection. However, optical modalities such as microscopy variants can require large and expensive equipment, and are slow to perform, making them difficult to integrate into a clinical setting. This project is on the development of a fast, portable, and low-cost optical probe that uses Stokes polarimetry to evaluate skin lesions. Polarization is a property of light waves that describes the orientation and shape of their oscillations. The polarization state can be described using Stokes parameters, and several measurements derived from these parameters such as the degree of polarization, the azimuth and ellipticity angles of the polarization ellipse, and the coordinates on a Poincaré Sphere. The probe shines low-intensity polarization-controlled laser light at a lesion, and analyzes the backscattered light in order to detect how the polarization has been changed due to the light-tissue interaction. Testing with skin phantoms has demonstrated a relationship between phantom roughness and the degree of polarization. Preliminary testing on an in-vivo lesion shows that lesion sites demonstrate a lower degree of circular polarization as compared to normal skin. In addition, circular polarization is shown to be more responsive than linear light in detecting changes. These results indicate that with further testing and refinement, this probe can become both a powerful and practical tool to assist skin lesion evaluation.

## Cross Cultural Executive Functioning and Episodic Prospective Memory

**Alice Lee**

This study tests for differences in executive functions and episodic prospective memory performance between individuals from different cultures. More specifically, those identified as collectivistic and individualistic. Executive functioning is a cognitive control system that manages inhibition, regulation, and other cognitive processes; episodic prospective memory is remembering to perform a planned action in the future, such as delivering a message to a friend at a later time. Participants were tested with subtests from the Delis-Kaplan Executive Function System (D-KEFS) for examining their cognitive skills. Episodic prospective memory performance was measured by two other tasks: video condition (repeat out loud the cue word whenever they hear it in the video) and task condition (clap hands twice each time a sub test has been completed). We hypothesize a relationship between executive functions and episodic prospective memory measured by the D-KEFS subtest, as well as differences in these abilities between participants affiliated with the two cultures under investigation. The current research will add knowledge to the previous inconsistent findings about the association between certain executive functions and prospective memory.

## Do Surprise Quizzes Impair Memory?

**Maryam Osman, Ayeesha Bhatara**

There is substantial research that suggests practice on small, low risks testing (like quizzes) improves students' learning on higher stake exams (like final exams) that often hold a heavier weighting. While multiple testing throughout a course has been demonstrated to improve long term memory, increase students' performance on final exams and is associated with higher final grades, there is a hidden and surprising consequence that testing can also cause: forgetting. Retrieval-induced forgetting occurs when the active remembering of an item from a category (e.g. cars) inhibits the remembering of other items in the same category that were not included in the practice tests. Contemporary research on retrieval-induced forgetting has revealed that participants remember the items that were not practiced from the same category less well compared to items from an unpracticed category that was not included in the practice test at all. The purpose of our study was to determine whether retrieval-induced forgetting can occur in the university classroom setting in connection to the material learned in the course. For the study, we identified eight distinct facts, four of them pertaining to episodic memory and four pertaining to semantic memory. Students in a memory course completed a surprise quiz which focused on two facts from one of these constructs, and after a one-hour delay, they completed a second test which probed memory for all eight facts. The results from our study will provide valuable information about how surprise quizzes should and should not be used in the classroom.

## The distribution and salinity tolerance limits of Diadumene lineata along the coast of British Columbia, Canada

**Cassandra Konecny**

Since the work of Charles Elton in 1958, biological invasion research has become increasingly important to conservationists and society. Anthropogenic activities have facilitated the introduction of non-native species by creating new vectors such as the bottoms of ships and ballast water. The orange-striped green sea anemone, Diadumene lineata, is thought to have been introduced to the western Pacific coast at the beginning of the 20th century from Japan, however, to our knowledge, there have been no recent records of this species in British Columbia. During December 2015, D. lineata was found on a rocky beach in Vancouver, British Columbia. Through current and on-going research, we will map the distribution of the orange-striped sea anemone along the west coast of British Columbia. In addition, we will perform experiments in the lab to compare the salinity tolerance limits of populations from different study sites. We believe that salinity may effect the establishment of D. lineata and therefore this study will allow us to predict potential changes in its distribution into the future. Although D. lineata is thought to have minimal ecological impacts on native marine ecosystems, little research has been done on how it may affect the intertidal shores of British Columbia.

## Aiding the South Asian Community with PLEASED: Peer Led, Empowerment based, Approach to Self Management Efforts in Diabetes

**Harvir Sandhu**

There is growing concern over an increase in Diabetes Mellitus Type II in the South Asian population, where their chances of developing diabetes are two to three times higher than the general population. They are also at a increased risk of complications relaed to diabetes. Previous studies on minority groups in the US have indicated that Diabetes Self Management Education (DSME) is a valuable asset in managing Type II diabetes. However, it is not known whether DSME is effective on South Asian populations. The PLEASED study, which stands for Peer Led, Empowerment based, Approach to Self Management Efforts in Diabetes, is addressing the question and is aiming to see how effective peer support will be on the South Asian population in the Lower Mainland on managing their Diabetes Mellitus Type II. This randomized control trial and quasi experimental study's primary outcome is to see a decline of HbA1c from higher numbers to a stable 7.0. Secondary clinical outcomes include a decrease in ApoB, blood pressure, BMI, and weight circumference. Secondary psychosocial outcomes include a decrease in stress, depression, increase in social support, and increase in patient activation. The pilot study conducted provided valuable information and informed what modifications needed to occur in the interventions, such as adding an exercising component and conducting interventions at community centers and only at temples when food isn't being served. The experience of conducting the study are worth a discussion to ignite interest in this said topic.

## Investigating alternative mechanisms for bypassing Frataxin function in yeast

**Faith Cheung, Joyce Zhang**

Friedreich's ataxia is a neurodegenerative disease that severely affects patient movement and coordination. It is caused by a deficiency of the mitochondrial matrix protein, Frataxin, which is essential for the assembly of iron-sulphur clusters (ISCs). Currently, the specific function of Frataxin is unknown and there is a lack of therapeutic treatment for Friedrich's ataxia. The yeast homolog of Frataxin is Yfh1 and it interacts with Nfs1 and the scaffold protein Isu1 to form a complex. Isu1 with an M141I mutation can successfully activate Nfs1 in the absence of Yfh1. However, it is not yet known how or why this mutation allows for activation of Nsf1 without Yfh1. We hypothesize that this mutation allows for direct interaction with Nsf1 or interaction with additional activators of Nsf1. We will use co-immunoprecipitation to show a direct interaction between Nsf1 and the M141I Isu1 mutant. If the interaction of wild-type Isu1 and Nsf1 is indirect, the two proteins will not interact in the absence of Yfh1. However, the interaction will be rescued by the presence of the Isu1 mutant. To identify additional interactors of the Isu1 mutant, we will use yeast two-hybrid (Y2H) with both WT and mutated Isu1 as prey in separate genome-wide Y2H screens. We expect to find a subset of proteins that interact exclusively with the Isu1 mutant. The study will show how Isu1 can fulfill the Yfh1 function through its M141I mutation and give insight into how a similar complex could be formed with human Frataxin.

## Establishing the China Central Reserve Bank - Struggle and Compromise

**Lander He**

The China Central Reserve Bank (CCTB) was established by the Reorganized National Government of the Republic of China in 1941. The bank's formation relied heavily on funding from a Japanese bank (almost 50%),-I would try to incorporate this in the text, not parantheses and was largely manipulated (by who? A bit vague). It has been Japan's important tool to control the finance in the occupied China. Led by Zhou Fohai, a dominant figure in the collaborationist government, CCRB (has?) funded both the government and Japan's operations in the occupied area. A lot of- Many scholars have also argued that it had inflated its own currency both under Japan's instruction and to strive to reign in its last days. This paper (poster?) will first (what is the second thing you'll be looking at? Your next sentence is more of a conclusion rather than an investigation. The last 2 sentnces can be rephrased to state your hypothesis and point out how your study has lead to your conclusion)look at the formation of the bank to find out how much Japan has participated (rephrase, awkward sentence) in terms of setting up protocols, funding and appointing members. It will thus show the bank's leadership is largely under Japan's influence and it has accelerated the fall of the government.

## Confocal laser endomicroscopy: application towards gastrointestinal diseases

**Gary Jiang, Gloria Kwong**

Diagnosis of diseases in the gastrointestinal tract such as Barrett's esophagus, celiac disease and cancer relies on conventional white light endoscopic imaging followed by physical biopsy. The procedure is time-consuming and costly to set up. Confocal laser endomicroscopy (CLE) recently emerged as a method for clinicians and researchers to visualize tissue cellular level in real-time. The CLE images provided details of live cellular structures for mucosa and carcinomas comparable to those provided using histo-pathological exams. Therefore, it greatly enhances the ability for clinicians to diagnose and identify gastrointestinal diseases in a timely fashion. In this presentation, literature on the workings of the CLE and its uses in diagnosis and study of gastrointestinal diseases are reviewed. The benefits and limitations of CLE technology are discussed along with research outcomes using CLE for in vivo diagnosis of human gastric diseases and on animal models. In summary, CLE is a promising technique for real-time diagnosis of gastrointestinal diseases. Further research is needed to investigate the effect of fluorescent contrast agents in humans as well as to regulate the safety dosage in actual clinical applications.

## The Effects Of Asthma Medication Use On Lung Health In Asthmatics Exposed To Air Pollution: A Systematic Review

**Abnashi Randhawa**

Due to increases in air pollution levels in many places around the world, it is important to conduct analyses to determine the effect of asthma medication on the lung health of asthmatics exposed to air pollution. It is widely accepted that the frequency of asthma medication use increases with increased exposure to air pollution in adults and children. However, fewer studies have been conducted on the effects of asthma medication use on the lung health of asthmatics exposed to air pollution. In a systematic review, studies on the effects of asthma medication on respiratory symptoms experienced in asthmatics during air pollution exposures were analyzed. Electronic databases (Embase, Medline, Web of Science) were searched. Initial screening consisted of the analysis of titles and abstracts, refining the number of records from n=156 to n=18. The second screening narrowed the number of eligible studies to n=10, by selecting studies investigating effects in asthmatics only. Half of the records (n=5) concluded that asthma medication was not able to prevent increases in respiratory problems (e.g. occurrence of cough/inflammation of airways). The remaining records (n=5) concluded that asthma medication protected against increases in respiratory problems. Therefore, no consensus exists on whether asthma medications prevent increases in respiratory problems in asthmatics exposed to air pollution. Further research must be conducted to determine if asthma medications exacerbate, prevent or have no effect on respiratory problems in asthmatics exposed to air pollution. This can be beneficial for deciding whether asthmatics exposed to air pollution should be prescribed asthma medications.

## Biochemical Differences Between Chronically And Acutely Sleep Deprived Mice

**Ronald Fung**

The importance of sleep cannot be understated, as cognitive function is dependent on sleep. Mice with 2 months of sleep deprivation exhibit increased production of a protein called amyloid-β 1-42 in the prefrontal cortex and hippocampus, two important brain regions for memory formation. Buildup of this protein can form plaques, which interfere with synaptic transmission. However, it is unknown whether the brain can become resistant to sleep deprivation, decreasing the detrimental effects on neurotransmission. This study will compare the biochemical differences between a mouse model for sleep deprivation and wild-type (WT) mice that are acutely or chronically sleep-deprived. DBA/2J mice exhibit symptoms of insomnia, including increased awake time and brief awakenings during sleep. To test the acute effects of sleep deprivation, one group of WT and DBA/2J mice will sleep freely, while another group will undergo 24 hours of sleep deprivation. To test for chronic effects, WT and DBA/2J mice will be allowed to sleep for just two hours per day for one month. The disc apparatus will be used to keep the mice awake. Memory tests using the T-maze alternation and radial arm water maze will be performed. Patch-clamp recordings of pyramidal neurons in the hippocampus and prefrontal cortex will be used to look at alterations on synaptic activity. Finally, brain slices will be examined for accumulation of amyloid-β protein and plaque formation.

# The Possible Role Of Insulin Signaling In The Maintenance Of Synapse Patterning

**Kathy Lee**

Aging is an inevitable biological phenomenon that is characterized by progressive neuronal dysfunction. Although it is has been suggested that insulin signaling is involved in aging, the underlying molecular mechanisms and genetics remain a major challenge to modern biology. Increasing evidence indicates that synaptic alterations contribute to the cause of neuronal dysfunctions during normal aging. However, the underlying molecular mechanism by which the lifespan regulatory pathways affect the maintenance of neural circuit remains largely elusive. Hence, in this study, we used daf-2, an insulin receptor, mutant C.elegans to investigate the role of aging in the maintenance of synaptic patterning. It has been discovered that single mutations in the daf-2 gene results in a more than twofold extension of life span. Motor neurons in C.elegans form "tiled" synapses. While the axons from the same neuron class overlap, each neuron innervates a specific segment of the muscle field by restricting its synapses within a distinct axonal segment. This phenomenon has been termed synaptic tiling. The wildtype animals exhibit age-dependent disorganization of synapse patterning. This phenotype is characterized by overlapping synaptic domains of the two neighboring cholinergic motor neurons, DA8 and DA9. By quantifying the number of worms exhibiting the synaptic tiling defect at different stages of adulthood in both the wildtype and daf-2 mutant worms, we found that daf-2 mutant worms show a much slower onset of synaptic tiling phenotype. Our results offer insight into the possible role of insulin signaling in the maintenance of neural circuit during aging.

# Efficacy of Peruvian Bilingual Education Program(EBI)

**Siddhartha Gupta**

Peru is a Latin American country trying to modernize itself. Peru's recent educational reforms is one example of the Peruvian government's attempts to address the country's history of social and economic disparities. The Peruvian Ministry of Education has initiated the Bilingual Education Program (EBI) in order to address the specific language needs of the country's indigenous populations, which include the Quechuas and several other groups. Ayacucho, a major city with many Quechua speakers, is one of the focal points for this educational scheme and, thus, is featured in this paper. The government maintains that the "innovative" EBI program encourages Quechua as an L1 (mother tongue) for young indigenous people while providing the Spanish language as an L2 (secondary language). The program has been encouraged by some Quechua parents, as a Spanish language education entertains higher paying job prospects. However, opponents of EBI claim that the program's main focus is to assimilate indigenous people into Hispanic society(Hornberger,2006), like previous educational programs and other policies conducted by the Spanish colonizers since Francisco Pizarro set foot in Peru in 1532 (Peru-explorer,2015). The majority of teachers only speak Spanish and are not fluent in Quechua. In addition, 75% of indigenous Quechua students claim they are forced to communicate in pure Spanish within classrooms (World Bank, 2002). This can be further seen by the common phrase, "Quecha at home, Castellano (Spanish) at school" (Hornberger, 1988). Due to this, the in-class interactions between Quechua students and teachers are not developed. This project aims at exploring the in-class interactions that occur between the Quechua-speaking students and the Spanish- speaking teachers participating in the EBI in Ayacucho by analyzing qualitative research studies( Teresa Valiente Catter, 2013) from 2000-2015.

## Learning To Stand With Delayed Feedback: A Pilot Study

**Hasrit Sidhu**

Balance is coordinated by a complex integration of sensory input from vision, proprioception and the vestibular system. In our study, we evaluated the effects of delayed feedback on standing balance by inducing a 400ms delay between body movements and visual, proprioceptive and vestibular feedback using a robotic balance simulator. Two subjects controlled the balance simulator: the ankle torque they applied to the force plate was transformed into whole-body motion based on the simulated physical property of their body. Subject 1 performed two 10-minute intervals with a 400ms delay and two 90-second control intervals. Subject 2 performed a control study with the same trial structure but no feedback delay was introduced. This protocol was repeated for five consecutive days to determine whether subject 1 improved his ability to maintain standing balance with a 400ms sensory feedback delay. By day five, subject 1 reduced the standard deviation of the backboard angle, the total distance moved by the backboard and the total range of the backboard by 26 to 29% while balancing with a 400ms delay. Additionally, subject 1 reduced his number of 'virtual' falls by about 35% during the same period. These pilot results indicate that we are capable of adapting to delayed feedback, allowing a novel balance environment to be learned. Further studies need to be conducted to determine what is learned during the adaptation as well as to determine the generalizability of this learning and how feedback from proprioceptive, visual and vestibular systems play a role in this adaptation.

## Involvement of the Cerebellar Endocannabinoid System in Schizophrenia

**Preet Gandhi**

Schizophrenia is a severe mental disorder, affecting more than 21 million people worldwide. Schizophrenia is linked to a lack of refinement of many neural pathways, including the disruption of the Cortico-Cerebellar-Thalamo-Cortical Circuitry (CCTC). Particularly in the last few years, scientists have become increasingly interested in the relationship between the Endocannabinoid (eCB) System and Schizophrenia. eCB receptors perform signalling tasks and regulate neurotransmitter release for the overall regulation of neural circuits, and are found in multiple cerebral structures, such as the pre-frontal cortex, amygdala, hippocampus, and cerebellum. To further understand the role of the eCB system in Schizophrenia, we will induce Schizophrenia in mice using the Phencyclidine model, and analyze the acute and chronic motor effects of increased eCB activity in the cerebellar cortex. After Schizophrenia induction, we will inject eCBs into the posterior cerebellar cortex, and compare schizophrenic tendencies between healthy mice, sham mice, mice that received eCB treatment for 1 week, and mice that received treatment for 3 months. We will incrementally use Rotarod testing to test motor function of the rats, then analyze synaptic activity of Purkinje cells in the cerebellum using patch clamp recording. Patch-clamp recording allows the measurement of synaptic activity in excitable cells, such as neurons. Determining the process of cell communication and the formation of abnormalities in the Endocannabinoid (eCB) system will allow us to better understand and treat Schizophrenia.

## PM2.5 Exposure Within The University Of British Columbia, Vancouver Campus

**Connor Smith**

Air pollution leads to negative health impacts, specifically particulate matter that is 2.5 microns or less in diameter (PM2.5). This field study collected PM2.5 data within different microenvironments, which represent the daily walking routine of students or staff members within The University of British Columbia Vancouver Campus (UBC). This is important because there has not been any mobile measured data collected within UBC regarding this matter. The designated study route consisted of five categorized regions and included ten areas of interest in total. PM2.5 concentrations were collected using a Dylos 1700 Optical Particulate Matter Sensor and GPS equipment. The results illustrated that the most polluted area of the campus is the bus loop and the cleanest area is Irving K. Barber Learning Centre. The highest peak PM2.5 concentrations found within campus are a result of idling vehicles (buses, cars, and trucks), smoking, and campus landscaping equipment (leaf blowers, gas-powered lawn mowers). Slightly elevated PM2.5 concentrations were found adjacent to the numerous construction sites located within campus. Fortunately, PM2.5 concentrations within the UBC campus are lower than the Canadian governmental baseline standard concentration of PM2.5 that is averaged over 24-hours. This field study has provided a focus for additional studies to be conducted within UBC in the future, specifically short-term human exposure to PM2.5 concentrations as a result of idling diesel buses within the bus loop.

## Characterizing IRES elements that mediate reading frame selection

**Lauren Mak**

Colony collapse disorder (CCD) affects millions of beehives worldwide, causing significant economic and agricultural losses. A large-scale sequencing study correlated the occurrence of CCD-affected hives and the presence of the Israeli acute paralysis virus (IAPV). IAPV is a member of the Dicistroviridae virus family, which is known to cause paralysis and death in a variety of insects. The process of translation, or protein synthesis, is initiated at specific locations in a ribonucleic acid transcript, where cellular machinery begins to read the instructions in three letter 'words'. The IAPV transcript features a 3D structure, called an IGR IRES (intergenic region internal ribosome entry site), which is capable of directing the machinery to initiate translation one letter downstream of the canonical start position. If canonical translation started at 'c' in, 'cat,' then alternate-frame translation is the process of reading three-letter words starting from, 'a 'instead, generating a completely different protein. Previous studies have identified distinct elements within the IGR IRES that mediate alternate-frame translation. The present work is being conducted to further characterize the necessary and sufficient IGR IRES structural and positional elements for alternate reading frame translation via the systematic insertion, deletion, or substitution of key nucleic acid bases. The IGR IRES allows the compact viral genome to generate a larger repertoire of harmful proteins than initially predicted. Characterizing IAPV translational activity is an important step towards understanding the consequences of IAPV infection within individual bees, and the eventually determining the molecular mechanisms behind the behavioural abnormalities seen in CCD.

# PRENATAL ALCOHOL EXPOSURE ALTERS SEXUALLY DIMORPHIC Protein Expression Of Methionine Cycle Enzymes In The Fetal Brain At Gd21

**Melissa Chiu**

Prenatal alcohol exposure (PAE) results in hypothalamic-pituitary-adrenal (HPA) hyperresponsiveness, increasing one's vulnerability to stress-related disorders, such as depression and anxiety-like disorders, later in life. The mechanism by which transient alcohol exposure during fetal life results in long-term effects on hypothalamic-pituitary-adrenal (HPA) regulation is not well understood. Adverse intrauterine environments may alter gene expression levels of neurotransmitters, steroid hormone receptors, and neurotrophic factors invovled in neuroplasticity during development via epigenetic modifications (environmentally induced changes in gene expression in the absence of changes to the underlying DNA sequence). Specifically, studies have shown that levels of methionine adenosyltransferase (MAT) and methionine synthase (MS), enzymes responsible for producing methyl donors for DNA methylation, which represses transcription and modifies gene expression, are altered in alcoholic liver disease. However, few studies to date have assessed tissue-specific epigenetic modifications and linked them to specific PAE outcomes, such as HPA dysregulation. Utilizing an animal model, we investigated how PAE may affect protein levels of MAT and MS in fetal brains on gestation day 21. We found that control male fetuses had higher levels of MAT and/or MS than control female fetuses in the amygdala and hippocampus. This sexual dimorphism was absent in both brain regions in PAE fetuses. In the amygdala, but not in the hippocampus, PAE fetuses also showed an absence of sexual dimorphism in protein levels of aromatase, an enzyme needed for aromatization of testosterone, which is responsible for establishment of sexual dimorphism in the developing brain. These findings suggest that PAE altered the sexual dimorphic expression of enzymes responsible for producing methyl donors in the fetal amygdala and hippocampus, and this effect was not directly related to the regional aromatase levels.

# Medium-intensity physical activity improves sustained attention

**Arash Ghanbarzehie**

Past research has shown a positive correlation between physical activity (PA) and cognitive performance. However, the nature of this relationship, its interaction with other lifestyle factors such as sleep, and its influence on attention and memory remain unclear. Studies have shown a performance increase on the Stroop Color task after an exercise session, suggesting an attentional benefit to physical activity. Cognitive benefits are most evident after bouts of medium intensity exercise, with low intensity physical activity conferring little benefit over baseline. The present study investigates the relationship between physical activity intensity and performance on a sustained attention task. Cognitive performance was measured using the Sustained Attention to Response (SART) task and self-reported physical activity/exercise, over the past seven days, was assessed using the International Physical Activity Questionnaire (IPAQ). Results show low intensity physical activity is not related to sustained attention. Moderate intensity physical activity is predictive of sustained attention and is most noticeable after poor sleep. High intensity physical activity, with high quality of sleep, shows benefits to sustained attention over poor sleep.

## Structural and behavioural effects of Lumosity training

**Hanna Dawood, Nicole Banting, Garbo Lam, Hyun Jae kim, Shalini Mohan**

Neuroplasticity, or the ability of the nervous system to reorganize its function, structure, and connections, is a key component to understanding how humans respond to stimuli and change as a result. One such stimulus is presented in the form of the interactive game Lumosity that claims to increase neuroplasticity through challenging online games. Much research has been conducted on the effect of Lumosity on the cognitive improvements of elderly individuals. Little is known, however, about the nature and permanence of structural and functional changes in the brain of middle-aged individuals. This controlled study investigates the structural and behavioural effects of Lumosity and how these effects continue to persist over time. Participants include healthy, middle-aged adults with similar intelligence and no prior experience with video games. Two groups, consisting of one experimental group who trained weekly and one control group who met with researchers weekly but did not undergo training, were measured for changes in cognitive ability before and after intervention. Long-term behavioural effects of the training were investigated through bi-monthly assessments after completion of training. Neuroimaging techniques such as Diffusion Tensor Imaging (DTI) and functional Magnetic Resonance Imaging (fMRI) were utilized to illustrate the structural changes occurring as a result of neuroplasticity. Based on previous research, we expect to find functional changes in the frontal lobe of the brain of the experimental group when performing tasks similar to those during training, as well as improvements in working memory, processing speed and general cognitive abilities.

## Effect of Ethanol Intoxication on Habituation of the Gαs/cAMP/PKA and the Gαo/DGK/DAG pathway of Caenorhabditis elegans

**Shideh Mirhadi**

Alcohol intoxication affects learning ability (1). Learning ability depends on the correct expression and functionality of the nervous system genes. Since many nervous system genes are targets for alcohol (2,3,4), alcohol can perceivably affect learning by disrupting various gene functions. This project focuses on the effect of alcohol on a particular type of learning: habituation. Habituation is a type of learning measured as a gradual decrease in response to repeated stimuli that is not due to fatigue or adaptation (5). The model organism Caenorhabditis elegans was used to study genes that contribute to the effects of alcohol on habituation of the Tap Withdrawal Response (TWR). Using a candidate gene approach, this project primarily focuses on the Gαs/cAMP/PKA and the Gαo/DGK/DAG pathway of C. elegans. Strains of worms with mutations in the Gαs/cAMP/PKA pathway and the Gαo/DGK/DAG pathway of C.elegans were analyzed to see whether any of these genes are involved in the abnormal habituation observed under alcohol intoxication. In the Gαs/cAMP/PKA pathway, Gαs (gsa-1), Adenylyl cyclase (acy-1) and the negative regulator cAMP phosphodiesterase (pde-4), were found to be involved in the alcohol-induced deeper habituation, but the regulatory subunit of PKA (kin-2) may not to be. In the Gαo/DGK/DAG pathway, Gαo (goa-1) was found to be involved in both the alcohol-induced deeper habituation and deeper initial response, whereas, unc-13, in the same pathway, was not. This study identified novel mechanisms underlying learning impairment under alcohol intoxication.

## The readability of online resources for dementia

**Arlo Sporn**

In recent years there has been an increase in the use of online health information by internet users. While this information is easily accessible, it is not necessarily easily understood. It has been shown that in order for the majority of Americans to understand a given passage of text, the text should be written at a grade level between 6 and 8. However, very little of the available online health information is written to that standard. This issue is particularly important when considering patients who suffer from dementia; as the symptoms of dementia progress, patients experience losses in their reading abilities. The aim of this study was to evaluate the readability of online information about Alzheimer's disease and dementia. Keywords 'Alzheimer' and 'dementia' were searched using the five most popular online search engines, resulting in a final sample of 200 webpages containing information about Alzheimer's disease and dementia. Each was analyzed for the readability of its text using the Flesch Reading Ease, Flesch-Kinkaid, SMOG and Gunning FOG readability calculators. The mean grade level of text as calculated by the Flesch-Kincaid, SMOG and Gunning Fog tests were 11.8, 13.9, and 13.2, respectively, while the mean Flesch Reading Ease score was 38.5, corresponding to a 'difficult' reading level. The results of this study show that the online information on Alzheimer's disease and dementia is written at an inappropriate reading level for the general public, and that the suppliers of this information should aim to lower the reading level of their content.

## MatLearn: User-Friendly Large-Scale Machine Learning

**Jennifer She**

Machine learning is becoming one of the key tools that we use to make sense of the ever-growing quantity of data that is being collected across many fields of science, engineering and business. This includes using symptoms exhibited by a patient and patient records to predict whether the patient is likely to have an illness and using past prices for a stock to determine whether the stock should be bought, held or sold This project focused on putting together, re-working, and demonstrating fundamental machine learning algorithms in MATLAB (written by supervisor and other students) used to fit and predict data. The result is a software package of around 60 variations of regression and classification algorithms that will be for open source, and over 40 demonstrations of these models built using simulated datasets to highlight the differences and the advantages of each. Unlike many existing tools for machine learning, this package is built using modern numerical optimization techniques which scales up to large datasets, as is most often the case in modern problems. The demonstrations and the structured natures of this package also allows it to be used for educational purposes.

## CHOICES (Cardiovascular Health/Outcomes: Improvements Created by Exercise & education for SCI)

**Marko Gavric**

This study aims to determine whether body weight-supported treadmill training (BWSTT) has beneficial effects, over and above arm-cycle ergometry training (ACET) on indicators of cardiovascular disease (CVD) risk in individuals with severe spinal cord injury (SCI). Research in this area is important because the primary cause of illness and death among people with SCI is CVD. Currently, preventative measures are focused around increasing physical activity, especially through the use of ACET. However, ACET's capacity to improve cardiovascular health is questionable. Research has demonstrated that BWSTT, an alternative form of exercise, may be capable of improving cardiovascular health in individuals with SCI. The primary outcome measure for this study is aortic pulse wave velocity (aPWV) which has been shown to have prognostic value for CVD above and beyond that of other risk factors. It is hypothesized that through large muscle mass involvement and postural challenge, the physical stimuli of BWSTT will reduce aPWV and lower CVD risk in individuals with SCI. The primary outcome measure (aPWV) and secondary cardiovascular and autonomic parameters will be assessed using a combination of electrocardiography, ultrasound, blood pressure, and tonometry techniques. Fitness will be determined using a peak oxygen consumption test on an arm-cycle ergometer and body composition will be determined using a dual energy x-ray absorptiometry (DEXA) scan. Quality of life levels will be assessed using questionnaires. Training will involve 3, 60-minute exercise sessions per week, for 24 weeks and measurements will take place at baseline, 3 months, 6 months, and 6 months following exercise[HD1].

## Lifestyle and cognition: The relationship between sleep, exercise, and exam performance

**Kyle Gooderham**

Many studies have identified the benefits of behavioural lifestyle modifications for not only physical health, but also for cognitive wellbeing. For example, past research has shown improvements to attention, learning, problem solving, and memory in children and elderly populations who followed exercise regimens over the course of many months. These, and other experiments, have provided significant evidence for the benefits of lifestyle changes across dimensions of diet, exercise, and sleep. However, many of these experiments have been conducted in lab settings and have sought to identify only long term benefits to cognitive functioning. Little research has looked at the impact of these lifestyle factors on a real world cognitive task, nor the short term effects of these changes. In the present study, we hypothesized that recent lifestyle changes will correlate with performance on a school exam. We collected final exam grades for a number of undergraduate Psychology courses. We also administered a questionnaire to students immediately following each of the exams asking about their lifestyle habits, including time spent studying, sleep, exercise, and diet over the past 24 hours. Our results show that amount of sleep over the past 24 hours is most predictive of exam performance, with increased sleep duration being related to a higher grade. Surprisingly, time spent studying was not predictive of exam performance, and contrary to current literature, physical activity did not appear to impact performance either. Overall, our findings suggest that sleep habits play a big role in determining performance on real world examinations.

## Cancer Associated Fibroblasts (CAFs)-mediated Cisplatin Resistance in Bladder Cancer Cell Treatment

**Jessica Yu**

Bladder cancer is one of the leading malignant cancers and up to 50% of cases show no response to first-line chemotherapeutic treatments. Resistance to Cisplatin is a major obstacle in bladder cancer treatment. Cisplatin resistance mechanisms include increased DNA repair and tolerance to DNA lesions, and extracellular factors in the tumour microenvironment. Tumour progression relies upon a cross-talk between the cancer cells and their microenvironment consisting of fibroblasts, endothelial cells, immune cells, extracellular matrix (ECX) components, growth factors, cytokines and chemokines. Cancer-associated fibroblasts (CAF) are a special cell type in the tumour stroma usually derived from normal fibroblasts under the influence of the tumour microenvironment. This paper investigates the role of cancer-associated fibroblasts in developing resistance to Cisplatin-based chemotherapy for bladder cancer. We predict there will be a significant difference between NFs and CAFs on drug Cisplatin resistance. Here we show that co-culture treatments of parental bladder cancer lines with activated CAFs result in an increase in Cisplatin resistance in the bladder cancer cell line. We will investigate on the role of growth factors and cytokines in CAFs-mediated cisplatin resistance. Knowledge about the role of CAFs on drug resistance can lead to more efficient bladder cancer therapy and prognosis.

## Geophysical Imaging Using A High Dimensional Lookup Table

**Jen Ling**

The geophysical imaging technique delineates the subsurface structure by solving a geophysical inversion problem that finds the best model given data sampled from a field survey. This technique has been extensively used in the studies of the Earth's physical properties for the search of resources like petroleum and minerals. Unfortunately, current methods for geophysical inversion require extensive computation time and memory due to the complexity of solving partial differential equations numerically many times. Addressing this problem, we propose a framework for geophysical imaging using a high dimensional lookup table (LUT). Instead of solving a large linear equations repeatedly to find a model, this framework computes possible models beforehand so that a large set of models corresponding to the data are stored in a database. The database will be sorted and organised into a high dimensional LUT, which would be queried using the data obtained in a geophysical survey. The LUT will match up the real data with pre-computed data in the LUT and return the query with the corresponding models without solving equations. To reduce the amount of storage required, importance sampling will be used to only store necessary data. In addition, this framework can potentially learn and predict which datasets are most likely to be queried to update the LUT by itself. Despite the main disadvantages of requiring a lot of computation time and data storage upfront, the efficiency and reusability of this framework will, on average, be more efficient long term for large imaging tasks.

## Toxicity Analysis of Essential Oil Extracts in Cabbage Loopers

**Alexander Cheng**

Cabbage Loopers (Trichoplusia ni) are the larval form of moths belonging to the family Noctuidae which are a field crop pest found commonly throughout North America. Cabbage Loopers are primarily problematic during their later larval stages but due to their short life cycles they may undergo multiple generations within a year depending on seasonal conditions. This study aims to offer a sustainable and safe alternative to current insecticidal agents as aging practices become ineffective due to increasing pesticide resistance. In the present study, contact toxicity of essential oil extracts was assessed against third instar of Cabbage Loopers. Toxicity of each oil extracts are measured and compared using calculated LD50 values (Dosage which produced $\geqslant$50% mortality rate 24 hours following exposure). Oil extracts are first diluted by weight/volume to a base concentration of one percent (0.001 mg/ cm2). Then using a topical dispenser, Cabbage Loopers are individually exposed to 1 µL of the solution and vital responces are assessed after 24 and 48 hours. Solutions which has produced at least 50% mortality at 1.0% are then subjected to subsequent dilutions until <50% mortality is observed. Results are compared to current pesticides and serves as merit for selecting potential botanical insecticide agents for development.

## The effect of acute stress on emotional learning with monetary gains

**Michelle Zhang**

Pavlovian conditioning is a form of associative learning essential for habit formation, including the formation of maladaptive behaviors such as overconsumption of food or drug taking which may result in serious healthcare issues. This raises the question of the influence from environmental factors such as stress. Past research has focused on learning of association between neutral stimulus with negative outcomes (aversive conditioning), but little is known about those with positive outcomes (appetitive conditioing). In the present study, we examined the effect of acute stress on appetitive conditioning using a between subject design. Participants in the stress condition immersed their hands in ice water while being videotaped, and particpants in the control condition were subjected to warm water without being recorded. Those in the stress condition showed reduced appetitive conditioning, indicated by increased reaction time and differences in the stimulus ratings. Thus, our study supports the hypothsis that acute stress affects appetitive conditioning. This finding helps to understand the influence of stress on associative learning related to dysfunctional behaviors such as addiction.

# Driving Alveolar Macrophage Development Using PPAR-Gamma Agonist Rosiglidazone

**Blair Hardman**

Alveolar macrophages (AM) are self-renewing innate immune cells occupying the alveolar space of the lungs. They maintain homeostasis in the lung by clearing cell debris, surfactant, and microbes through phagocytosis. In addition, AMs are thought to promote tolerance in the tissue by being anti-inflammatory. Similar to alternatively activated macrophages, AMs have high level of expression in genes regulating lipid metabolism. These genes have been shown to be controlled by the master regulator PPAR-ɣ. Animals and patients deficient in PPAR-ɣ do not have mature AMs and thus develop pulmonary alveolar proteinosis and spontaneous inflammation due to the accumulation of lung surfactant. These data demonstrate the critical role for PPAR-ɣ in the development of alveolar macrophages and in maintaining lung homeostasis. Studying AMs is complicated since obtaining large numbers of cells via bronchoalveolar lavage or highly pure populations fetal monocyte cultures are difficult. Previously our lab has shown that bone marrow cells (BMCs) grown in granulocyte macrophage colony stimulating factor (Csf2) produces a population of cells closely resembling alveolar macrophages (MHCIIlo/midCD11c+ CD200R+ CD206+ Siglec-F+ and HA binding). Although the Csf2 derived BMCs partially enriches for the alveolar-like macrophages, the expression of the key alveolar macrophage marker, Siglec F, is low. In addition, there is heterogeneity in the culture with dendritic cells present. Here, we used the PPAR-ɣ agonist Rosiglitazone (RGZ) to further differentiate and enrich for alveolar-like macrophages from the Csf2 BMCs. In addition, the effect of glucose metabolism by the BMCs was investigated. Optimizing this approach offers the ability to generate more and purer population of AMs as a tool to study these cells in vitro. In addition, this method raises the possibility of deriving AMs from peripheral blood monocyte progenitors. This could be a valuable alternative in generating the necessary cells for autologous AM transplants for various lung diseases.

# Speech Perception for Second Language Speakers

**Claire Allen**

Upon learning a second language, speakers often have difficulty with perceiving it's new, unfamiliar sounds. In every language, different sound pairs have varying levels of functional importance, such that some sound pairs are used more than others for distinguishing words in the language. Differences in functional importance have shown to be correlated with perception, such that sound pairs with higher functional importance are more perceptually salient than pairs that carry less importance. For example, the sound pair "d" and "z", as in "puddle" and "puzzle", serves to distinguish more words than the pair "d" and "th", as in "den" and "then". This study looks at the interplay between functional importance and second language acquisition by investigating how Mandarin ESL speakers perceive sound pairs with varying levels of functional importance that do not occur in their native language. Participants listened to sentences embedded in white noise, with the last word of each being one word of a minimal pair: a highly predictable right word, or wrong word. They were asked to determine if the last word in each sentence was right or wrong, and to provide the right word as a correction to any wrong word trials they heard. Reaction times, accuracy, and typed responses to wrong word trials were analyzed. Pilot data from 9 Mandarin speakers show that English sound pairs with high functional importance are perceived more accurately (mean = 22.4% correct) than medium or low pairs (~14% correct each), with no differences in reaction times across pair types.

## Current Assets: Sweet Liquid Economic Nectar

**Hudhaifah Zahid**

Inequality is approaching pre First World War levels, evidences Thomas Picketty in his epic, Capital in the 21st Century. He suggested it to be a by-product of capitalism itself, where the rate of return exceeds the rate of growth (r>g). This claim took the world by storm, as has his solution: global wealth tax. Wealth tax solves inequality, but is impractical. For a better solution, we must look at a different take on inequality. Joseph Stiglitz puts forth that beyond being a nature of capitalism, inequality is a policy choice. He argues that a comprehensive progressive fix is the better solution. For fiscal policy, he seeks progressive taxation. Both progressive income and consumption taxes are practical and familiar, but neither solves inequality on the whole. This paper contributes by adding a new, more effective candidate to the field of solutions to inequality: current assets tax. The argument is that it has all the benefits of wealth tax, without much of its drawbacks. The tax is modelled for the US and Canada. For example, the USA has around 172 trillion dollars in financial assets that present more than 4 trillion dollars (current US fiscal spending) when taxed at a rate of 2.5%. Its effects on certain segments, like pension savings or liquidity markets are assessed and possible criticisms are courted. As nectar is to flower, current assets are to economy. Careful harvest may solve inequality.

## Resource consumption and population growth

**Giorgio Viancha Sgarbi**

The goal of this project is to predict the population of a region in the next years based on the resources available and to apply a model for population dynamics. To this purpose, we use an established model for metropolitan population growth and resource consumption. We compare this model and its predictions to data obtained from the city of Vancouver. We use the number of registered vehicles within the greater Vancouver area as our "resource" and make predictions about the population growth in Vancouver. Limitations of the model are discussed in the context of this prediction

# PROSPECTIVE PRESENTERS

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