THE 5TH ANNUAL POSTDOC RESEARCH DAY
A CELEBRATION OF DIVERSE RESEARCH

Big Data Hub
Thursday, 28th March 2019
Schedule of Events

8:45 am – 9:15 am  Registration & Breakfast
9:15 am – 9:40 am  Opening and Welcome
9:40 am – 10:50 am  Session 1: Spotlight Talks
10:50 am – 11:20 am  Coffee Break
11:20 am – 12:30 pm  Session 2: Spotlight Talks
12:30 pm – 2:00 pm  Lunch
1:00 pm – 2:00 pm  Session 3: Exploration session
2:10 pm – 3:20 pm  Session 4: Lightning Session
3:20 pm – 3:50 pm  Coffee Break
3:50 pm – 4:50 pm  Keynote Talk  Isabelle Côté (Biological Sciences)
4:50 pm – 5:00 pm  Closing Remarks
5:00 pm – 7:00 pm  Award Ceremony and Reception (Location TBA)
Presentations

Session 1: Spotlight Talks
Viridiana Perez
Anthony McDonagh
Johannes Lehmann
Roger Ashmus
Priyanka Mishra
Juan Ferrer

Session 2: Spotlight Talks
Heather More
Bulmaro Valdes
Pengyu Liu
Nichole Scheerer
Pamela Filiatrault-Veilleux
Victor Cheung

Session 3: Exploration Sessions
Annika Airas
Krysta Coyle
Nick Dexter
Laura Hilton
Erin Goheen Glanville
Julia Link
Viridiana Perez
Victoria Spartacus

Session 4a: Lightning Sessions
Julia Link
Nadine Mengis
Simon Horton
Laura Hilton
Lizzie Dingle
Jessica Stockdale

Session 4b: Spotlight Talks
Erin Goheen Glanville
Sean McCann
David Shiffman
Anil Ufuk Batmaz
Isabelle Côté

BIOLOGICAL SCIENCES

From fish mate choice to government advice: the twists and turns of an academic career

A PhD is the worst and the also best preparation for life. In this talk, I will use the trajectory of my own career in science to exemplify the twists and turns, and ups and downs of an academic life. There was nothing in my early work on the intricacies of group living in a freshwater fish that could have led me to suspect that I would eventually document large-scale patterns of coral decline and the effects of marine invasive species, or advise the government on what it takes for marine protected areas to work. Along the way, there was conflict and finding a soulmate, moving around and having a family, feeling like an imposter and stepping up to lead. I will try to weave the academic and the personal and how they act on and react to each other. A scientific career – whether in academia or not – is definitely an adventure like no other.
Viridiana Perez

CHEMISTRY

My Boron Adventures and Clean Energy

My favourite element in the periodic table is Boron. It is a challenging element to work with but incredibly useful and relevant on our everyday life. This talk is about my adventures using boron for multiple projects and how my fascination for this element has driven me to work on research that might give us access to clean energy through water electrolysis.
Abstracts

Session 1: Spotlight Talks

Anthony McDonagh

CHEMISTRY

An Investigation into the Anomerisation of Selenium Glycosides

Chelate induced anomerisation is promoted when Lewis acids such as SnCl4 and TiCl4 coordinate to the pyranose ring oxygen and an additional site (e.g. C-6 carbonyl group of pyranuronates) to induce endocyclic cleavage and isomerisation to the more stable anomer. O-, S-, and -N3 1,2-trans glycosides of pyranuronates have been illustrated to isomerise under these conditions resulting in 1,2-cis glycosides. These intermediates have been used to synthesize molecules of biological importance (e.g. galactosyl ceramide analogues). The use of selenium glycosides have been primarily exploited as glycosyl donors in O-glycoside formation, however recently there have been a number of procedures for the synthesis of β-glycosyl selenides and only one reported procedure for α-glycosyl selenides. Thus there is a need to investigate alternative procedures for α-selenide formation. Presented here will be the results of an investigation into the conditions to anomerise selenium glycosides and applying the methodology to synthesize molecules of biological importance.
Abstracts

Session 1: Spotlight Talks

Johannes Lehmann

CHEMISTRY

Development of novel iminocyclitols for CNS related diseases

Sugar molecules present an important part of daily diet. Apart from their taste and energy storage capacities, sugars are one of the few molecules capable of crossing the blood brain barrier and protecting neuronal organs. Therefore, exploration of non-metabolisable synthetic sugar analogs and their effects on natural protein glycosylation provides a key step in development of drugs for the central nervous system.
The lysosome is a membrane-bound organelle found in higher eukaryotic cells. Their main function is to breakdown biomaterial (i.e. proteins and glycolipids). Within the lysosome, there are over 50 enzymes that facilitate this process and in some cases, when a single enzyme does not function properly it can result in cellular dysfunction and cell death. This defect is one of many disorders known as lysosomal storage diseases (LSDs). The main cause of LSDs is an inherited gene that expresses mutant forms of the enzyme that is less stable. The loss in stability results in poor trafficking of the enzyme to the lysosome, which results in accumulation of the associated biomaterial. The main treatment for LSDs is enzyme replacement therapy (ERT), where enzymes expressed in another vector (i.e. bacteria) are intravenously administered to patients bimonthly over the course of their life. ERT, however, cannot treat all forms of LSDs and therefore significant efforts to find other therapies (i.e. gene therapy) and drugs (i.e. pharmalogical chaperones) have been employed. Measures to evaluate the efficacy of these therapies, however, have received little to no attention over the past 20 years. Accordingly, developing tools to improve on this will be of significant value to drive preclinical research in this area.

In this talk, I will discuss the development of biochemical probes capable of monitoring a single lysosomal enzyme’s activity in live cells. I will then illustrate the value of these probes to measure the efficacy of a pharmalogical chaperone in LSD patient cells using fluorescence microscopy.
Abstracts

Session 1: Spotlight Talks

Priyanka Mishra

MOLECULAR BIOLOGY AND BIOCHEMISTRY

Meta-analysis suggests evidence of novel stress-related pathway components in Orsay virus - Caenorhabditis elegans viral model

The genetic model organism, Caenorhabditis elegans, shares many genes with humans and is the best-annotated of the eukaryotic genome. Therefore, the identification of new genes and pathways is unlikely. The establishment of a viral model system by Orsay virus in N2 Bristol strain opens unique prospects to identify novel pathway components of viral immunity. Using a bioinformatics meta-analysis approach, we showed that the top 17 genes differentially-expressed during viral infection, are functionally uncharacterized genes. Furthermore, functional annotation using similarity search and comparative modeling, was able to predict folds correctly, but could not assign easily function to the majority. However, we could identify gene expression studies that showed a similar pattern of gene expression related to toxicity, stress and immune response. Those results were strengthened using protein-protein interaction network analysis. This study shows that novel molecular pathway components, of viral innate immune response, can be identified and provides models that can be further used as a framework for experimental studies. Whether these features are reminiscent of an ancient mechanism evolutionarily conserved, or part of a novel pathway, remain to be established. These results reaffirm the tremendous value of this approach to broaden our understanding of Orsay viral immunity in C. elegans.
Juan Ferrer

ENGINEERING SCIENCE

3D printed macroporous materials

Porous materials with controlled porosities are used in a wide range of applications from reaction supports to cell culture and tissue engineering. PolyHIPEs are porous polymers that are synthesized by polymerizing the continuous phase of high internal phase emulsions (HIPEs), in a technique called emulsion templating. After polymerization, the templating dispersed phase is removed, revealing a porous structure. The composition and processing parameters of the emulsion allow control of the pore structure and mechanical properties of the porous material produced. Biocompatible porous materials can be created by polymerizing an appropriate combination of monomers in the continuous phase of the emulsion. In our work, we developed a method to produce multilayer porous materials based on PolyHIPEs. We prepared high internal phase emulsions (HIPEs) containing acrylate monomers such as MMA and EGDMA, the photoinitiator Darocur 1173 and several surfactants within the continuous phase and different amounts of an aqueous solution as dispersed porogen phase. Combining a syringe dispenser connected to a 3D printer, and subsequently, photo-polymerized upon exposure to UV light we created multilayer materials. The resulting macroporous materials have a highly interconnected pore structure with a controlled gradient in pore size and porosity, and can be printed following complex patterns. The possibility to combine a controlled morphology with biocompatible tridimensional structures makes these materials interesting for application as 3D scaffolds for tissue engineering.
Heather More

**BIOMEDICAL PHYSIOLOGY AND KINESIOLOGY**

**Effects of body size on neuromuscular delays and movement control in animals**

All animals must effectively sense and respond to their environment in order to survive - the ability to recover from a stumble, escape a predator, or catch prey can mean the difference between life and death. To be successful requires quickly detecting changes in the environment and performing appropriate compensatory movements. The speed of an animal’s nerves and muscles constrains its ability to do this - all else being equal, nerves that conduct information more rapidly and muscles that contract more quickly allow an animal to react faster to a stimulus. Our work investigates how size-dependent changes in nerve and muscle properties affect the reaction times of mammals ranging from 5 gram shrews to 5,000 kilogram elephants, and how this influences which methods they can use to effectively control their movement. We find that large and small animals are likely challenged by different aspects of their neuromuscular systems. Large animals in particular may need to offset some of these challenges by moving more slowly or using more complex control methods, which may have broad implications for animal ecology and behaviour. More generally, our findings contribute to a better understanding of the fundamental principles underlying the organization of the nervous system, and give insight into the relative contributions of nerve and muscle characteristics to movement control. This in turn will help identify the functional implications of diseases affecting the neuromuscular system and aid in developing effective treatments for humans and other animals.
Bulmaro Valdes

**MECHATRONICS**

*Using a Robotic Device to Train Arm Position Sense*

As humans, we are capable of knowing the position of our arms without the need of vision. This ability is called proprioception and can be affected after a brain injury. As we use this sense to help us coordinate arm movements, a deficiency in proprioception can affect our functional independence and quality of life. To retrain this sense after brain injury, we propose the use of a robotic system that allows people to move their arm to reach to virtual targets on a computer screen. The system allows us to hide the position of the participants’ hands to give them the opportunity to practice arm movements without vision. Preliminary results with healthy participants show promise for this technique to be further applied in people with motor disabilities after brain injury, such as people with stroke. The use of robotic devices as part of the rehabilitation programs of people with disabilities could provide clinicians with the opportunity to deliver therapy that combines different movement techniques (e.g., with and without vision), objectives (e.g., move to a virtual and/or real object) and levels of assistance (e.g., the robot helps the participant move their arms).
Pengyu Liu

MATHEMATICS

A polynomial metric on phylogenetic trees

In this talk, we will introduce metrics defined using a polynomial that characterizes all rooted binary tree shapes, that is, two unlabeled rooted binary trees are isomorphic if and only if their corresponding polynomials are identical. We will show that these metrics can distinguish random tree shapes generated by different models as well as phylogenetic trees of influenza.
Nichole Scheerer

Testing the Effectiveness of an Educational Intervention to Reduce ASD Stigma

Individuals with Autism Spectrum Disorder (ASD) have restricted interests and poor social communicative behaviours, which make it difficult for these individuals to develop friendships and interact successfully with their peers. While social impairments are a hallmark of ASD, these impairments may not be the only cause of their social challenges. In 2017, Sasson and colleagues reported that when both neurotypical children and adults viewed brief video clips of individuals with and without ASD behaving in real-world social situations, first impressions of the individuals with ASD were far less favourable. This research suggests that the social perceptions, judgments, and decisions of neurotypical peers may also contribute to the social difficulties experienced by individuals with ASD. Recent research has demonstrated that brief training geared towards increasing neurotypical individuals’ understanding of ASD can influence their overall acceptance of peers with ASD (Gillespie-Lynch et al., 2015). With this in mind, we developed an intervention for neurotypical audiences to educate them about ASD. By combining this intervention with the research paradigm developed by Sasson and colleagues (2017), we were able to assess whether this brief educational intervention has the capacity to improve these first impressions of individuals with ASD. While our educational intervention was shown to improve some of the rater’s judgements of the individuals with ASD, we found that the negative perceptions of the individuals with ASD were most strongly predicted by the rater’s own social competence. Future work will explore other factors that contribute to these negative perceptions of individuals with ASD.
Reading comprehension plays a key role in children's academic success. As Canada is a multicultural society where multiple languages are used; more studies are needed to better understand the relations between plurilingualism and reading comprehension of children in this context. Within this research, we explore the impact of multilingualism on word reading, reading fluency and reading comprehension skills of monolingual and multilingual children from Kindergarten to Grade 2. The sample included 99 monolingual English-speaker children and 112 multilingual children who speak English and one or more languages, from culturally diverse backgrounds, recruited from public schools throughout the lower mainland of British Columbia (BC). Children's word reading and reading fluency skills were assessed through Kindergarten to Grade 2, in addition of a reading comprehension measure in 2th Grade. Preliminary results demonstrated there was no difference between the two groups regarding word reading and reading fluency skills at the 3 time points, and the multilingual group performed as good as the monolingual group on reading comprehension in Grade 2. In contrast to numerous studies reporting that multilingual children tend to obtain lower scores on reading comprehension tasks than monolingual English speaking children, the present study findings suggest that on average, these children are capable of developing English reading skills at a rate and to a level that is comparable to their monolingual peers in a pluricultural context as in BC. These discrepant findings are discussed and explained in relation to the plurilingual competencies and practices of each group of participants in the study.
Session 2: Spotlight Talks

Victor Cheung

INTERACTIVE ARTS & TECHNOLOGY

Can My Computer Look Like This? Sci-Fi Inspired Real-World Computer Interfaces

From Star Trek’s LCARS to Ironman’s JARVIS, computer interfaces are depicted in Science Fiction (Sci-Fi) movies as visual representations of advanced systems, supporting a wide range of scenarios, including maneuvering spaceships, formulating strategies, visualizing data, and creating new ideas. Besides being ostentatiously impressive, it is crucial for these interfaces to be believable, at the same time immediately comprehensible for the audience, thereby creating a fictional world that still “makes sense” and therefore contributing to a plausible story. To achieve this, Sci-Fi creators combine novel and sometimes not yet invented technologies (e.g., gestural recognition, volumetric projections) with visual effects, and collaborate with interaction designers to develop “speculative interfaces”, that is, fictional interfaces that not only are functional (they get the job done), but also reflect the nature of the story (if the interface really exists this is how it will look like and operate).

Interestingly, some of our recent “breakthrough” interfaces, such as gestural controllers and virtual realities, are reminiscent of these speculative interfaces. Meanwhile, elements in our real-world interfaces, such as buttons, levers, touchscreens, are prevalent in Sci-Fi interfaces. How much does each interface influence another? What can we learn from their differences? In my research I sample and review interfaces (and their corresponding interactions) of both worlds, and answer the question of what we can learn from Sci-Fi interfaces. By aligning them with visual design theories and interaction frameworks, I aim to develop design guidelines for real-world interfaces that will improve their outlook, ease of use, and efficacy.
Annika Airas

URBAN STUDIES

Reinventing urban waterfronts in the Vancouver region: The case of public space creation and redevelopment in Squamish

Urban waterfronts are changing, and formerly industrial waterfronts in diverse locations are being rapidly redeveloped into recreational and residential sites. While cargo handling activities have extended from their traditional core urban port locations into the wider metropolitan region, likewise recent waterfront redevelopment processes have extended to changes beyond core urban locations into smaller cities and suburban areas. Both processes have occurred without much scholarly attention. This research follows the implications of waterfront redevelopment processes in smaller communities beyond the urban core, paying specific attention to the waterfront in Squamish, British Columbia. The research undertakes a discourse analysis of government and consultancy publications, as well as media content, archival materials, local histories, related waterfront reports, maps, and other visual materials. These are taken as evidence of what is envisioned for the public space of suburban waterfronts, and they shed light on what is missing or ignored in these visions. This research shows how suburban waterfront developments tend to ignore local cultural histories and communities while threatening the values of diversity that might be embraced in all public spaces, regardless of location.
Mantle cell lymphoma (MCL) is a rare form of non-Hodgkin lymphoma (NHL), which is often diagnosed at advanced stages and is largely considered incurable but with some patients having an indolent disease. The heterogeneity in clinical response is partially attributed to observable morphology and immunophenotype; however, little is known about the relationship between genetic features and variation in phenotype or response to treatment. Prior sequencing of 129 MCLs revealed HNRNPH1 (heterogeneous nuclear ribonucleoprotein H1) as a frequently mutated gene. HNRNPH1 is specifically implicated in auto-regulation, wherein an abundance of hnRNP H1 protein results in alternative splicing of the pre-mRNA. We demonstrate that recurrent silent mutations in HNRNPH1 are associated with a decrease in alternative splicing.

Using RNA-seq, we demonstrate that increased HNRNPH1 expression is associated with higher rates of alternative splicing across various subtypes of NHL. Using an in vitro model of MCL, we demonstrate wild-type splicing of HNRNPH1 results in an abundance of canonical transcripts compared to alternative spliced transcripts. Furthermore, due to the presence of a premature termination codon, the alternatively spliced transcript is targeted to nonsense-mediated decay. When this process is inhibited, we observe an increase in alternatively spliced transcripts with no concomitant increase in hnRNP H protein.

Taken together, our data are consistent with HNRNPH1 representing a novel oncogene whose expression is deregulated through silent mutations that perturb splicing. As an RNA-binding protein involved in RNA maturation, we hypothesize that HNRNPH1 mutations have pleiotropic downstream effects on the transcriptome of MCL. Further work will investigate these downstream targets and effects. This research is identifying alternative splicing as putative driver of lymphomagenesis and will have important consequences for the treatment of MCL.
Over the past decade, machine learning with deep neural networks has had a transformative effect on many fields, from natural language processing to image classification. Coupled with specialized hardware for accelerating training and the ubiquity of large, rich data sets on which to train and test, these algorithms have reached unprecedented levels of accuracy on some of the most historically challenging tasks in computation. In this exploration we highlight recent theoretical results on the approximation capabilities of deep neural networks in a variety of tasks, complementing the theory with numerical experiments performed on SFU's own Compute Canada facility Cedar. Our results aim to address a few key questions in machine learning applications in the sciences, namely "How much data is required for training?" and "How do these algorithms compare with standard techniques from applied mathematics?"
Diffuse large B cell lymphoma (DLBCL) is the most common type of non-Hodgkin lymphoma. Standard therapy comprising the rituximab monoclonal antibody and four cytotoxic agents (R-CHOP) cures 60% of patients, but alternative treatment options are limited for the remainder. Fcy receptor IIb (CD32B), encoded by FCGR2B, is an inhibitory IgG receptor that facilitates internalization of rituximab by malignant B cells, thereby preventing their recognition and destruction by immune effector cells. We have previously identified somatic focal amplifications of FCGR2B in a subset of DLBCLs that are associated with significantly elevated mRNA and protein expression of FCGR2B. Accordingly, both FCGR2B amplification and expression above the median are associated with inferior patient outcomes. However, it is not yet clear what causes elevated FCGR2B expression in the majority of cases without an amplification. Identification of somatic and/or germline variants that drive elevated FCGR2B expression or increase susceptibility to somatic amplification has been hampered because FCGR2B resides in a segmentally duplicated region with a nearly identical paralog, FCGR2C. To identify and accurately assign variants to the correct paralog, we employed a combination of Oxford Nanopore long-read and 10X Chromium long-range sequencing along with Bionano optical mapping and identified a pattern of germline copy number variations and gene conversion events that further homogenize paralogous sequences and may contribute to the formation of somatic amplifications of FCGR2B. These data bring us closer to identifying the genetic features that underlie an important mechanism of treatment failure in DLBCL.
Erin Goheen Glanville

COMMUNICATION
Listening and Refugee Dialogue

Refugee and refugee claimant policy is a polarized and polarizing topic on social media and around the dinner table. Worn Words is a digital media project that re-narrates the everyday words used in refugee policy debates in Canada, such as ‘border,’ ‘security,’ ‘welcome,’ or ‘humanitarian,’ with the aim of creating a culture of listening in local community contexts. In my interviews with artists, academics, activists, and service providers, I did not ask people to address the keyword ‘listening’ but most interviewees pointed to its importance of their own accord. This proposal is for an interactive media display based on the emergence of ‘listening’ as a keyword in my research project. I will offer people the opportunity to hear a variety of perspectives on its importance as well as a chance to articulate and contribute their own perspective. A website with different video clips will be on the computer screen. People will be invited to click on as many as they would like to hear different people address the keyword ‘listening.’ Once they have finished, they can anonymously answer the questions ‘what is the importance of listening for refugee studies?’ and the answers will be turned into a word cloud that I will post on my Twitter feed at the end of the day.
The hydrodynamic regime is a very new and exciting field in solid state systems which has only recently become experimentally accessible due to very clean samples of crystals. It is the regime where only the collisions between the electrons and the Coulomb interaction (which describes the electrostatic interaction between charged particles) govern the physical behavior. An important transport property in this regime is the viscosity of the electron fluid which describes the tendency of a fluid to turbulent flow and the electrical conductivity. These transport properties are theoretically determined for Luttinger metals. Luttinger metals are systems with two parabolic energy bands that touch in one point.
Session 3: Exploration Session

Viridiana Perez

CHEMISTRY

The World of Nanomaterials and Clean Energy

Take a walk to my exhibit where I will show you how small is small and how small is nano. Bonus, some interesting science demonstrations on how my research attempts to solve problems for clean energy storage.
According to the National Spinal Cord Injury Statistical Center over 60% of spinal cord injuries caused by accidents, falls and also sport activities [1] which can be avoided by designing effective safety systems and establishing preventative interventions [2]. The design of a new technology depends on quantified physical contact with the human body. Thus understanding the mechanical properties of the soft tissues and how the body reacts to a specific contact is essential. However contact mechanics for in vivo human tissues have not been thoroughly explored and comprehensively mapped [3,4]. In order to precisely measure the soft tissue contact characteristics, a new high-precision in vivo tissue testing (HITT) system was developed. This HITT system facilitates high-precision in vivo mechanical testing at the bedside in the clinic or operating room and can be run with different muscle activation and joint positions. Thus dynamic mechanical tests can be conducted to determine in vivo tissue contact stiffness and damping characteristics that can be used to characterize and model the effects of age, muscle activation and joint position on in vivo tissue contact mechanics for different soft tissues in various positions. In a long-term objective, mechanical characteristics collected will be used for advancing computational models and simulations of contact that will provide the baseline data to develop injury prevention technologies.
Session 4: Lightning Session

Julia Link

Hydrodynamic transport in Luttinger metals

The hydrodynamic regime is a very new and exciting field in solid state systems which has only recently become experimentally accessible due to very clean samples of crystals. It is the regime where only the collisions between the electrons and the Coulomb interaction (which describes the electrostatic interaction between charged particles) govern the physical behavior. An important transport property in this regime is the viscosity of the electron fluid which describes the tendency of a fluid to turbulent flow and the electrical conductivity. These transport properties are theoretically determined for Luttinger metals. Luttinger metals are systems with two parabolic energy bands that touch in one point.
Estimates of the 1.5 °C carbon budget vary widely among recent studies, emphasizing the need to better understand and quantify key sources of uncertainty. Here we quantify the impact of carbon cycle uncertainty and non-CO2 forcing on the 1.5 °C carbon budget in the context of a prescribed 1.5 °C temperature stabilization scenario. Our best estimate of the total (fossil fuel + land-use change) carbon budget for 1.5 °C is 700 PgC, which corresponds to about 11 years of current emissions.

However, non-CO2 greenhouse gases and aerosol emissions represent an almost equivalent forcing to the climate system and therefore correspond to a large future scenario uncertainty. In our scenario, the increasing non-CO2 emissions and decreasing aerosols cause the long-term carbon budget to decrease following temperature stabilization. Negative emission technologies would be required to compensate not only for the increasing non-CO2 climate forcing, but also for the declining natural carbon sinks.
Simon Horton

Resource and Environmental Management

Simulating all the snow in western Canada and then trying to predict avalanches

Snow avalanches claim 13 lives per year in Canada and cause millions of dollars in physical and economic damage. Predicting avalanches is difficult in uncertain, variable, and chaotic mountain environments. Although avalanche forecasters understand the physics of mountain weather, snow thermodynamics, and fracture mechanics, forecasting is an art that ultimately comes down to dealing with large degrees of uncertainty and applying risk management techniques. With the booming amount of data and computer horsepower, we’re able to physically model many aspects of the mountain environment by coupling weather forecast models, snow physics models, and terrain models. We currently simulate the evolving snowpack across the vast mountains of western Canada in real-time. The simulations produce a compelling (but imperfect) picture of where avalanches may occur. The question I’m left with is how can we use these simulations to improve avalanche forecasts? I’m employing statistical techniques and visual analytics to distill the meaningful information from these large complex simulations and build simple decision aids that avalanche forecasters can use for day-to-day operations.
Laura Hilton

MOLECULAR BIOLOGY AND BIOCHEMISTRY

Genetic drivers of FCGR2B amplification and overexpression in DLBCL

Diffuse large B cell lymphoma (DLBCL) is the most common type of non-Hodgkin lymphoma. Standard therapy comprising the rituximab monoclonal antibody and four cytotoxic agents (R-CHOP) cures 60% of patients, but alternative treatment options are limited for the remainder. Fcγ receptor IIB (CD32B), encoded by FCGR2B, is an inhibitory IgG receptor that facilitates internalization of rituximab by malignant B cells, thereby preventing their recognition and destruction by immune effector cells. We have previously identified somatic focal amplifications of FCGR2B in a subset of DLBCLs that are associated with significantly elevated mRNA and protein expression of FCGR2B. Accordingly, both FCGR2B amplification and expression above the median are associated with inferior patient outcomes. However, it is not yet clear what causes elevated FCGR2B expression in the majority of cases without an amplification. Identification of somatic and/or germline variants that drive elevated FCGR2B expression or increase susceptibility to somatic amplification has been hampered because FCGR2B resides in a segmentally duplicated region with a nearly identical paralog, FCGR2C. To identify and accurately assign variants to the correct paralog, we employed a combination of Oxford Nanopore long-read and 10X Chromium long-range sequencing along with Bionano optical mapping and identified a pattern of germline copy number variations and gene conversion events that further homogenize paralogous sequences and may contribute to the formation of somatic amplifications of FCGR2B. These data bring us closer to identifying the genetic features that underlie an important mechanism of treatment failure in DLBCL.
Lizzie Dingle

**GEOGRAPHY**

**Beyond inundation: linking sediment dynamics to channel change and flood risk**

Rivers draining the largest mountain ranges on Earth carry huge quantities of sediment, most of which is ultimately delivered to the sea hundreds to thousands of kilometers downstream. As sediment is transported downstream by rivers, it undergoes a series of transformations. Downstream of large mountain ranges, river bed sediments typically get smaller as rivers flow out onto much lower gradient floodplains. In virtually all rivers, an unusually abrupt transition in river bed grain size from gravel to sand occurs, a phenomenon known as the gravel-sand transition. All of the gravel-sized (and larger) sediments delivered out of mountain ranges become trapped upstream of this transition, while sand (and finer sediment) is transported and deposited further downstream. Migration of the transition can elevate flood risk as gravel deposition in formerly sandy reaches reduces channel capacity and can drive lateral erosion of the channel into its adjacent floodplain, often threatening communities and infrastructure. In Canada, where flood defences are relatively advanced, insured flooding damage costs were $590 million in 2017 and uninsured costs borne by governments were ~$750 million. Improving flood resilience is complicated by processes that modify the ability of rivers to convey water and sediment downstream. The formation, stability and environmental impacts of the gravel-sand transition is important, but not entirely understood. My primary objectives are to explore the dominant processes controlling the emergence of gravel-sand transitions downstream of major mountain ranges, and to examine how channel stability responds to changes in water and sediment supply across them.
Abstracts

Session 4: Lightning Session

Jessica Stockdale

MATHEMATICS

Approximation Methods for Stochastic Epidemic Modelling

Statistical analysis of infectious disease outbreaks is complicated by large amounts of missing data: we might know when a person reports to hospital, but when did their infection begin? When using individual-based models to represent the spread of disease in a population, this results in intractable likelihood expressions as there is uncertainty about when the disease may have been spread from person to person. Current methods for dealing with this, such as data augmentation, can be computationally cumbersome. My work seeks to build approximation methods, which make a number of independence assumptions to result in tractable likelihoods that are fast to compute and provide accurate approximations to the truth. We hope that these methods will be a useful tool for the applied scientist, for whom fast, often real-time, analysis is key. I will provide a brief motivation for and introduction of these methods, along with an example of an application to the West African Ebola virus epidemic.
Erin Goheen Glanville

**Digital Storytelling for Refugee Dialogue in Canada**

Those who migrate under the label 'refugee' have become a lightning rod for widespread curiosity and concern about people on the move around the world. The proliferation of stories being produced currently about forced migration, by and large, bear the signs of humanitarian framing. As such, they respond to the question, "what can citizens do?" and are evaluated according to the question, "what can this story do?" I turn to the important but buried questions, "how was this story produced?" and "how has mediation shaped the story?"--not to create cynicism about what we can't know--but to better understand how mediations might create a culture of listening. I work within the tradition of critical refugee studies, which "listens" to refugee cultural production to understand the systems that impact refugee lives. To explore the questions above, I am experimenting with putting critical refugee studies into practice, by producing a collection of digital videos (Worn Words) about the overused, everyday words in policy debates about refugee migration. I use storytelling and interview footage to bring together the cross-sector knowledge of experts on refugee discourse and am currently working with an animator to create the pilot video on the word 'border.' This presentation will describe the project and offer the list of ethical principles I have developed during the production of digital stories for refugee dialogue.
Session 4: Spotlight Talks

Sean McCann

BIOLOGICAL SCIENCES

The birds, the bees, and the Boeings: Managing insects and the risk of bird strikes at YVR

Airplanes and birds both soar through the sky, but sometimes serious issues arise when their paths intersect. When airplanes collide with birds, the result is usually fatal to the bird, sometimes dangerous to the aircraft and its occupants, and always costly to the airport and aircraft operator. At Vancouver International Airport, located on a major bird migration route, bird-airplane conflict is common, and is often a result of birds entering the airfield grounds in search of food. We have been investigating invertebrate prey fed on by birds at YVR, and whether reducing this prey can reduce the incidence of bird-airplane conflict at the airport. Our investigations of bird diet have revealed the major prey species favoured by birds visiting the airport, the majority of which are introduced species. Our preliminary study of pest management techniques on the airfield has shown that selective application of a pesticide may reduce these prey species numbers dramatically, though our future research will focus on pesticide-free alternative management strategies. Overall, our research had opened a window on the surprisingly complex ecological interactions of a seemingly uniform landscape.
Session 4: Spotlight Talks

David Shiffman

BIOLOGICAL SCIENCES

Global content analysis of shark conservation coverage in the popular press suggests biases contributing to public misunderstanding

There is significant public interest in chondrichthyan conservation, but many concerned citizens are misinformed about the threats facing sharks and the most effective solutions to protect sharks. This analysis considers how shark conservation threats and solutions are portrayed in an important information pathway, popular press coverage. Through an analysis of 1,808 popular press articles from 2008-2017 from across the English speaking world, we note that shark conservation threats and solutions are not covered in a factually accurate manner with appropriate context. A concerned citizen learning about shark conservation primarily through reading popular press coverage would wrongly believe that shark finning is the only major threat facing sharks and would wrongly believe that banning fishing for sharks and trade in their products are the only available solutions. Citizens’ understanding of conservation threats and solutions to those threats influences what solutions they’ll support, suggesting that these results are cause for concern if our goal is enacting science-based management policies for sharks.
Abstracts

Session 4: Spotlight Talks

Anıl Ufuk Batmaz

INTERACTIVE ARTS AND TECHNOLOGY

Towards precise and accurate interactions in VR and AR headsets: How errors affect the user performance in virtual environment

Immersive Virtual Reality and Augmented Reality headsets have become an important research asset for studies in various disciplines. Through the 3D tracking sensors embedded in these headsets and controllers, researchers can collect data to assess user performance in a virtual environment. However, the raw data acquired from these sensors is often not suitable for end-user applications due to measurement errors, mis-calibration, medium noise and human errors. To reduce the effects of such errors, the data is processed by signal processing methods, depending on the device design and used sensors. Even after such signal processing, the data contains noise and this noise can be observed when the system is fixed to a reference object. This noise, on the other hand, can also cause a change in user performance and users may have to adapt their movements to accurately interact with the virtual environment. In our research, we are investigating how different levels of noise affect the user performance for various dependent variables and how much of these errors can be tolerated during data collection for various tasks. In our first studies, we found that even 0.5° of fluctuation in the rotation signal can significantly increase the error rate of the users in a pointing task. We hope that the results of our study can guide the design of 3D controller and tracking systems towards better 3D user interfaces.