

2013

Irving K. Barber School of Arts and Sciences
8th Annual Undergraduate Research Conference
FIPKE Foyer – 1st Floor
Thursday, April 4, 2013

POSTER PRESENTATION ABSTRACTS

Board	First Name	Last Name	Presentation Title	Page Number
1	Carrera	Banman	The effect of elevation on arbuscular mycorrhizal fungal colonization within members of the family Rosaceae in the Okanagan Valley	3
1	Garrett	Culos	Temperature Dependent Development of Stem-mining Weevil (<i>Mecinus</i>)	3
1	Nicole	Dale	Post-treatment substrate composition at a restored reach of Okanagan River, British Columbia	4
1	Elya	DeVolder	Immunohistochemical Procedure Refinement for the Osmoregulatory Organs of <i>Drosophila melanogaster</i> and <i>Aedes aegypti</i>	4
2	Kelsey Robert	Frankiw Weckel	Global Resources for Child and Adolescent Mental Health: A Survey of 184 Countries	5
2	Natasha	Garner	Dopant enhancement of Atmospheric Pressure Chemical Ionization in Mass Spectrometry	6
2	Alexa	Geddes	Changing Health Determinants in a University Campus Community: Action Research and Youth-Adult Partnerships	6
2	Jordan	Harrington	Hydrogeochemistry of the Kelowna aquifer system	7
3	Campbell	Ingle	Conservation on the Colorado River	8
3	Ashna	Jassi	How Does Ethnicity Influence the Perception of Pain in Others? A Focus on Aboriginal Canadians	8
3	Michael	Jay	The Affects of Decayed Wood in Soil Microsites on Ectomycorrhizal Fungal Communities in a High Elevation Forest	9
3	Candace	Klassen	Determination of real-time PCR detection limits for arbuscular mycorrhizal fungi inoculum <i>Rhizophagus irregularis</i> in plant roots and soil	9
4	Eliza	Maze	Acoustic signatures emitted by individual African Lions can be used as a non-invasive method to study their behavioural ecology	10
4	Karmen	McDivitt	Pain as a Social Phenomenon: Does Attachment Style Influence Pain Perception In Others	10
4	Lin	Miao	Using the Mini-Disk Infiltrometer to Measure Infiltration Rate of Burned Soils in the Laboratory	11
4	Christel	Mitchell	Social influences on adolescent cannabis use and how this relationship is mediated by cannabis cognitions	12

Board	First Name	Last Name	Presentation Title	Page Number
5	Katie	Norman	The Quantification of Ammonia Oxidizing Archaea In Apple Tree Orchards	12
5	Jeffrey	O'Keefe	The Synthesis of Pyrazole Compounds for New Anti-Inflammatory, Neuroprotective, and Anti-Cancer Drugs	13
5	Lisa	Olhauser	The influence of perceived dating partner drug use on adolescent drug use: A model mediated by cognition	14
5	Megan	Perra	The Potential for Vocal Fingerprinting in <i>Panthera Leo</i>	14
6	Charlotte	Pring	Synthesis of Catechin-3-O-glycoside	15
6	Carmen	Reid	An examination of the item and scale properties of the Beck Anxiety Inventory using Item Response Theory	15
7	Christine	Rogers	Social influences on adolescent cannabis use and how this relationship is mediated by cannabis cognitions	16
7	Edouard	Ronveaux	Investigating the Abiotic Controls on Sockeye Salmon Redd Density in the Okanagan River.	16
8	Morgan	Roosenmaallen	Topology, Knot Theory, and Matrix Theory: A Mathematical Classification of RNA	17
8	Kristen	Small	Identification of individual coyotes (<i>Canis latrans</i>) and analysis of non-linear chaotic (NLC) dynamics using bioacoustic algorithms	17
9	Shelby	Snow	The effectiveness of passive capillary wick samplers in determining nitrogen and water loss from the root zone of perennial red raspberry	18
9	Joanne	Taylor	Food and Water Security in Creston Valley, BC: Will Farmers Have a Say in the Columbia River Treaty Renegotiation Process	18
10	Yilin	Wang	What are the effects of the Okanagan River restoration on sediment transport and channel morphology in town Oliver, BC, Canada?	19
10	Jesse	Whiteman	Neuroanatomical Correlates of Subjective Well-Being in People with Acquired Brain Injury	19

The effect of elevation on arbuscular mycorrhizal fungal colonization within members of the family Rosaceae in the Okanagan Valley

Student: Carrera Banman

Supervisor: Dr. Melanie Jones

Mycorrhizal fungi play a large role in shaping plant communities, and in the development and structure of soil. They form mutualistic associations with roots of over 80% of all terrestrial plants. There are several types of mycorrhizae, formed by specific plant taxa. In this study, the goal was to determine if elevation played a role in the colonization of roots within the family Rosaceae, as there has not been previous research on this family in the Okanagan Valley. Members of the family Rosaceae typically form associations with arbuscular mycorrhizal (AM) fungi; I was also interested in observing whether or not there was colonization by ectomycorrhizal (ECM) fungi. I hypothesized that as elevation increased, there would be a noticeable shift in colonization from AM to ECM fungi. Four Okanagan sites were chosen: Big White, Kelowna, B.C.; Noble Canyon, Lavington, B.C.; Mount Baldy, Oliver, B.C.; and Nickel Plate, Penticton, B.C. Fifteen plants (two sub-samples per plant) sampled from each transect. Roots from *Rosa woodsii*, *Rosa acicularis* and *Amelanchier alnifolia* were collected at different elevations along each transect. Two, 1 cm sections of root from each sub-sample were stained using the ink and vinegar method. Root length colonization by vesicles, arbuscules and hyphae was determined, following the magnified intersect method. No ectomycorrhizal root tips were observed. The percentage of roots containing vesicles increased with elevation ($r^2 = 0.28$; $P=0.043$) at the Noble Canyon site. By contrast, both hyphal ($r^2 = 0.32$; $P=0.018$) and vesicular ($r^2 = 0.30$; $P=0.024$) colonization decreased with elevation at the Nickel Plate site. No differences in mycorrhizal colonization were found with elevation at the other two sites. Consequently, I conclude that there is no general relationship between the extent of mycorrhizal colonization and elevation in these two dominant genera in the Roseaceae in the Okanagan Valley.

Temperature Dependent Development of Stem-mining Weevil (Mecinus)

Student: Garrett Culos

Supervisor: Dr. Rebecca Tyson

Dalmatian Toadflax, *Linaria dalmatica* (L.) Miller (Plantaginaceae), is an invasive plant in Canada. It is particularly troublesome in southern British Columbia (BC) and Alberta, where it causes economic and ecological damage to rangelands. The European stem-mining weevil, *Mecinus janthiniformis*, was introduced to North America in 1991 as a biological control agent for Toadflax. In BC, *Mecinus* was highly successful in controlling the Toadflax population; however, in Alberta a lack of success is thought to be caused by brief extreme temperature swings during the winter (Chinook). We investigate this hypothesis with a mathematical model. Using temperature-dependent developmental rates as a basis, we find the Generation function (G function). This function maps oviposition (birth) date in one generation to oviposition date in the next. We take this G function and perturbed it with an altered

temperature profile, resulting in a shift in stability. We investigate the response of the G function to perturbations of the temperature profile. We find that Chinook shifts the oviposition day earlier if it occurs in the middle of winter, and later if in late fall or early spring.

Post-treatment substrate composition at a restored reach of Okanagan River, British Columbia

Student: Nicole Dale

Supervisor: Dr. Leif Burge

The Okanagan River in British Columbia, Canada, has been up to 84 percent channelized to protect urban and agricultural property. While this has been beneficial to humans, it has been detrimental to the natural habitat of the wildlife that live in and near the waterway. The Okanagan River is a tributary to the Columbia River and is one of the few remaining runs for sockeye and chinook salmon populations who spawn there and rear in Osoyoos Lake. The numbers of salmon that have travelled up to spawn in the Okanagan have dwindled over the years because of the poor suitability of the river environment due to the human channel modifications. In 2008, the Okanagan River Restoration Initiative (ORRI) project involving governmental, non governmental, and aboriginal organizations was undertaken to restore a reach of the river to a more natural state and recreate a good ecological habitat. Dykes in this reach were set back and two oxbow meanders were reconnected to the main channel. A grain-size analysis of the substrate sediment was conducted before and immediately after the restoration, and this thesis will serve as the third study since the project was implemented. The same procedures will be followed as in the 2009-10 study and statistical grain-size distribution comparisons using a Wilcoxon signed rank test will be made concerning the change in substrate over two years. Sediment will also be evaluated as to its suitability for salmon spawning according to parameters identified by previous research.

Immunohistochemical Procedure Refinement for the Osmoregulatory Organs of *Drosophila melanogaster* and *Aedes aegypti*

Student: Elya DeVolder

Supervisor: Dr. Mark Rheault

Organic cations are toxins that the osmoregulatory organs have to secrete in order to regulate homeostasis in the body. Malpighian tubules found in most insects are a major contributor to this regulation. Organic cations are passed through membranes facilitated by organic cation transporters. Through the use of immunohistochemistry it is possible to see where these transport proteins are located on the membrane. Two protocols for immunohistochemistry were adapted for the first time use in a new lab. The protocol was tried for both *Drosophila melanogaster* and *Aedes aegypti*. The protocols were adapted for time efficiency and better techniques. It was found that Bouin's Alcoholic Fixative is a better fixative than NBF (Paraformaldehyde), it temporarily stains the tissues yellow for better visualization when handling and creates crisper images when looked at under the microscope.

Clearing agent was found to be a good substitute for xylene, it was less toxic and degraded wax faster. Tissue preparation of full body, and gut dissections were tried. It was found that the guts had to be pinned prior to fixation in order to maintain orientation. Full body dissections gave the best results for sectioned slides, and gut dissections were the best for doing a whole mount.

Global Resources for Child and Adolescent Mental Health: A Survey of 184 Countries

Student: Kelsey Frankiw & Robert Weckel

Supervisor: Dr. Jodi Morris

Research estimates that worldwide, up to 20% of children and adolescents suffer from a diagnosable mental disorder. Ninety percent of these children live in low and middle income countries. Unfortunately, little information is available about the availability of child mental health resources (e.g., availability of facilities, services, etc.). Such information is essential in order to develop accessible, cost-effective, and scalable mental health treatments for children and adolescents. Data were derived from 184 countries that completed the 2011 World Health Organization Mental Health Atlas survey. These data provide the most recent approximation on the global availability of mental health resources. Children under the age of 18 living in high income countries are 16 times more likely to receive treatment than children living in low income countries. Median treated prevalence rates per 100,000 child population were 165 for low income countries, 1671 in lower middle income countries, 1789 in upper middle income countries, and 2604 in high income countries. Percentage of total health expenditure correlates with treated prevalence at the $p < 0.05$ level across all income categories. Globally, children make up less than 17% of the patient population in all mental health facilities. Child mental health resources are scarce across all income categories but are the most insufficient in low and lower middle income countries where the majority of children reside. Without treatment, child mental disorders are likely to persist into adulthood. It is essential that resources be invested in child mental health worldwide to alter maladaptive developmental trajectories. More attention needs to be drawn to global child mental health in order to increase service availability and the amount of resources allocated towards child mental health.

Dopant enhancement of Atmospheric Pressure Chemical Ionization in Mass Spectrometry

Student: Natasha Garner

Supervisor: Dr. Rob O'Brien

Being able to effectively and accurately analyze samples in the laboratory is an invaluable and increasingly demanded skill. With more demand for product analysis and transparency, better instrumentation techniques have many benefits, particularly in the biological and environmental sectors. Mass spectrometry is a critically important technique, which provides both quantitative, and irrefutable qualitative analysis. It relies on the presence of ions; since most analytes are present as neutral molecules being able to effectively and successfully ionize them is critical for proper analysis.

Although several different ionization sources at atmospheric pressure exist, the most common are Atmospheric Pressure Chemical Ionization (APCI) and Atmospheric Pressure Photoionization (APPI). Chemical additives (Dopants) are frequently added to enhance ionization in APPI; until recently, they had rarely been added to APCI. This research will examine the use of dopants in Atmospheric Pressure Chemical Ionization and other similar sources.

Atmospheric Pressure Chemical Ionization is a widely used mass spectrometry ionization source. It uses a coronal discharge (in lieu of photons) to induce ionization in the analyte. Ionization of the analyte occurs via a series of gas phase chemical reactions, which begin with the ionization of ambient nitrogen gas. This leads to the generation of H_3O^+ , OH^- and other ionic species via a series of cascade reactions. As seen in APPI, selecting a dopant with an appropriate ionization energy and proton affinity increases the ionization efficiency. With the addition of dopants in APPI, a broader range of analytes can be examined. Since the ionization of the analyte results from reactions with the ionized dopant and not the photons directly, we have hypothesized that similar reactions should occur, regardless of the initial method of dopant ionization. This research will use several approaches to examine this hypothesis.

Changing Health Determinants in a University Campus Community: Action Research and Youth-Adult Partnerships

Student: Alexa Geddes

Supervisor: Dr. Claire Budgen & Dr. Susan Holtzman

Healthy community development in educational settings has been the focus of considerable research, policy and practice activity over several decades. While the theory is appealing, the application has been challenging given the complexity of factors influencing people's lives. Changing health determinants (e.g., physical, social, environmental, organizational) is one approach to improving human health and decreasing high-risk behaviours and problematic lifestyle patterns. This presentation reports on a participatory community action research study aimed at exploring and changing determinants of health at the University of British Columbia's Okanagan campus.

The study is part of a long-term research program, which combines setting-based health promotion strategies and youth/adult partnership theory to assess campus community health, identify priority issues, mobilize existing resources and create health-promoting change. The participatory process has been effective at engaging a diverse array of community members to take action to improve their community. Individuals from diverse backgrounds have been engaged including specific population sub-groups such as: Aboriginal, Athletes, International, LGBTQ [Lesbian, Gay, Bi-sexual, transgendered and Queer], and Graduate Students. Methods such as Photovoice, Community Dialogue surveying, focus groups/talking circles, community forums, and action groups has given credibility to the process and generates a sense of equality to stimulate problem-solving ideas. In this study, areas of health-promoting campus change include: food, physical activity, transportation, drinking water and environment.

This study contributes new knowledge to the field of healthy community development; in particular it offers a practical approach to knowledge translation, changing health determinates and capacity building in health promotion practice and research.

Hydrogeochemistry of the Kelowna aquifer system

Student: Jordan Harrington

Supervisor: Dr. Craig Nichol

Water availability and quality are issues of concern in the Okanagan due to its arid climate. Groundwater is being used to meet ever increasing demand as nearly all surface water resources have been allocated in the Kelowna area. However, increasing groundwater abstraction requires a detailed characterization of the area's groundwater hydrology in order to sustainably pump groundwater. The physical hydrogeology of the Kelowna aquifer system has been characterized and work on that front is ongoing; the chemical hydrogeology remains virtually unknown. Hydrogeochemistry determines the suitability of water for different uses and can lead to valuable insights into processes affecting groundwater quality, specifically interactions between different aquifers and surface waters. A database of water quality analyses for a variety of wells in the Kelowna area was developed. Geochemical speciation modeling was performed using the program PHREEQC to assess sample quality and determine additional hydrogeochemical parameters. This was followed by further analysis in hydrogeochemical software (AquaChem) and ArcGIS. With some exceptions, Kelowna area groundwater is of the calcium-bicarbonate type and within the limits set by the Canadian Drinking Water Guidelines. Bedrock aquifer groundwater is easily distinguishable from that in unconsolidated sediments by its lower total dissolved solids. Relatively high chloride concentrations in some wells suggests that urban recharge is an important contributor to the shallow unconfined aquifer. A number of samples with relatively high potassium and sodium concentrations are likely attributable to localized processes in the Rutland area. A gradient of decreasing major cation and anion concentrations along a transect towards Mission Creek is interpreted to be the result of groundwater - surface water interaction. The lack of concentration gradients from upland recharge areas towards Okanagan Lake suggests that vertical flow between aquifers is minimal.

Conservation on the Colorado River

Student: Campbell Ingle

Supervisor: Dr. John Wagner

This poster is meant to present the various inefficiencies in our current consumption of electricity. Of particular importance is the Colorado River, the life force of the Southwestern United States. Supplying some 4 million acres of agriculture, and feeding 12 major metropolitan areas, the Colorado River is one of the most heavily used rivers in the world. This poster focuses on the importance of conservation and efficiency and its applications, not only for arid regions of the southwest, but for the whole world. It is important that developed nations provide a robust model of conservation and energy efficiency for all nations of the world to follow after, this poster begins to explain such possibilities.

How Does Ethnicity Influence the Perception of Pain in Others? A Focus on Aboriginal Canadians

Student: Ashna Jassi

Supervisor: Dr. Susan Holtzman

Aboriginal Canadians suffer disproportionately from chronic pain compared to Canadians of other ethnicities. However there is a dearth of research on factors contributing to this disparity. Pain assessment is an essential component in determining appropriate treatment and care for chronic pain patients. A variety of demographic factors, including ethnicity, have been found to influence the perception of pain in others. For example, past research indicates that ethnic minorities tend to be perceived as in less pain than majority populations. The current study aimed to assess how the ethnic label of "Aboriginal Canadian" affects the perception of pain in others. A sample of 189 undergraduate students were asked to read a medical case history depicting a female pain patient suffering from shoulder pain. Participants were randomly assigned to read a case history that told them that the patient was either (a) of either Aboriginal descent or (b) of European descent. Participants then viewed a video from the UNBC Shoulder Pain Expression Archive which portrayed an authentic shoulder pain patient (of ambiguous ethnicity). Participants provided an estimate of the average amount of pain experienced by the pain patient. No significant differences were found in estimates of the average pain experienced within the Aboriginal Canadian label group compared to the European Canadian label group. These results suggest that solely an ethnic label of "Aboriginal Canadian" may not influence the perception of pain in others. Implications for pain assessment of Aboriginal Canadian chronic pain patients will be discussed.

The Affects of Decayed Wood in Soil Microsites on Ectomycorrhizal Fungal Communities in a High Elevation Forest

Student: Michael Jay

Supervisor: Dr. Melanie Jones

Mycorrhizal fungi form symbiotic associations with plants. Ectomycorrhizal fungi, in particular, are found in symbiosis with coniferous trees and other plant families of the Northern Hemisphere by associating outside the host plant's cells. Previous work has shown that decayed wood, or coarse woody debris (CWD), has a substantial effect on ectomycorrhizal fungi (EMF) both for enzymatic activity and fungal community structure. However a recent study done in the Sicamous Creek Silvicultural Systems Trial, a high elevation coniferous forest located in Sicamous, British Columbia, Canada, showed negligible effects of decayed wood on EMF communities on both spruce saplings and seedlings. Since the negligible effects may have been due to the immature saplings, the research done here aimed to understand this phenomenon better by taking individual ectomycorrhizal root tips surrounding mature trees of the same forest. The enzymatic activities and fungal community structures were tested for on root from decayed wood (CWD) and control (mineral or organic) soils. A series of microplate enzyme assays were used to test for the presence and relative quantity of the following extracellular enzymes: cellobiohydrolase, β -glucosidase, chitinase, acid phosphatase, leucine aminopeptidase, and laccase. Fungal community structure was tested for using morphotyping techniques, followed by DNA extraction, PCR amplification and clean up, Sanger sequencing, and NCBI BLAST to determine the identities of the fungal species in each morphotyped group. Preliminary data indicates that the two types of control soil (mineral and organic) support relatively different species of EMF, however CWD appears to have had no substantial affect on community structure. These results indicate that similar EMF communities occur in CWD and control soils at the Sicamous Creek Silvicultural Systems Trial and suggest that, unlike other forest types, decayed wood in high elevation spruce-fir forests may not form a unique niche for EMF.

Determination of real-time PCR detection limits for arbuscular mycorrhizal fungi inoculum *Rhizophagus irregularis* in plant roots and soil

Student: Candace Klassen

Supervisor: Dr. Miranda Hart

The use of arbuscular mycorrhizal fungi (AMF) in agriculture has been employed as a means to enhance crop yield, and sustainability, with the desire being to take advantage of the symbiotic relationship between the mycorrhizal fungi and the plant. However, it has not been fully investigated if introduction of non-native AMF has any long-term effects or consequences on the natural soil ecosystem and its biodiversity. In order to accurately assess this issue, it is imperative to have an accurate method by which to measure and detect these fungal isolates in natural communities. The aim of this study is to establish detection limits for a commercial isolate *Rhizophagus irregularis* in two experiments using isolate specific molecular probes. In the first study, I diluted AMF inoculum in a sterile substrate to assess detection limits for pure inoculum. I then grew *R. irregularis* with *Achillea millefolium* in a

greenhouse at varying concentrations of the inoculum in a greenhouse bioassay. I will discuss results from both experiments, including molecular and microscopic findings. The results of these studies will provide valuable tools to help evaluate both the success and potential risks associated with AM fungal inoculation in natural systems.

Acoustic signatures emitted by individual African Lions can be used as a non-invasive method to study their behavioural ecology

Student: Eliza Maze

Supervisor: Dr. William Bates

Long range roars play a fundamental role in African Lion (*Panthera leo*) behavioural ecology. In the present study, PRAAT, SOUND ANALYSIS PRO and RAVEN algorithms were used to study individual acoustic signals recorded from wild Lions living in Zambia, Kenya and South Africa. The results suggest that lions emit acoustic energy that conveys specific information about the identity of the caller, including gender. Based on frequency-time fast Fourier transform (FFT) spectral analysis, Wiener Entropy analysis and correlation analysis, the following acoustic differences were observed between males and females. First, full-throated roars of males were significantly longer than those of the females. Secondly, full-throated male roars were more chaotic (noisy) than females. Third, male roars had a lower goodness of pitch than females. A computational analysis that measures the degree of similarity of vocalizations demonstrated that the highest similarity scores are obtained when two full-throated roars produced by the same individual were compared, as expected. Lions also showed significantly higher similarity scores when compared to other individuals of the same sex in comparison to the opposite sex. These results indicate that the analysis of acoustic signatures is a powerful non-invasive method to study the behavioural ecology of African Lions, in particular the timing of pride takeovers and movements of individuals associated with different prides.

Pain as a Social Phenomenon: Does Attachment Style Influence Pain Perception In Others

Student: Karmen McDivitt

Supervisor: Dr. Susan Holtzman

According to attachment theory, the nature of the affective bond between infants and their primary caregivers can influence thoughts, expectations, and behaviours in later social relationships throughout the lifespan. In the pain literature, there is strong evidence that social relationships can influence the experience of pain, and a number of studies have found significant associations between attachment styles and pain intensity. The primary goal of this online study was to explore the relationship between attachment styles and pain perception, from the perspective of the observer. A sample of 129 young adults read a medical case history vignette of a patient with chronic pain and viewed a video clip of that patient performing a pain-inducing activity. Participants then estimated the patient's pain intensity, and indicated their thoughts regarding the cause and treatment of the pain. Participants also completed a measure of adult attachment styles (Relationship Questionnaire; Bartholomew et al., 1992).

Participants' scores on all four attachment styles were related to the ways in which they perceived the patient's pain. For example, participants higher on secure attachment were more likely to rate the pain as genuine, fearfully attached individuals were more likely to attribute the pain to psychological distress and believe that the patient would benefit from counselling, and participants higher on dismissive attachment did not believe the individual would benefit from counselling. Implications for the formal and informal care of patients with chronic pain will be discussed.

Using the Mini-Disk Infiltrometer to Measure Infiltration Rate of Burned Soils in the Laboratory

Student: Lin Miao

Supervisor: Dr. David Scott

Wildfire sites may be especially vulnerable when soils have experienced severe heating and become water repellent. Research has shown that water repellent (or hard-to-wet) soils can significantly reduce infiltration rates and thereby increase the risk of overland flow and soil erosion. One means of measuring infiltration rates on burned soils is the Mini-disk Infiltrometer (MDI). In this study I test the performance of the MDI, on a range of soils, using three hydraulic head (H) settings. The objective was to test whether we could reproduce a well-known theory of how water repellent and wettable soils affect infiltration rate (Letey, et. al 1962). Ten soil samples were used in this study. Six soils were taken directly from the September 2012 Peachland fire. The other three soils were from older fire sites and another one was control sand for laboratory work. The tests were all conducted in the laboratory on dry, sieved (2 mm) soils. Soil wettability was measured using Water Drop Penetration and Critical Surface Tension tests. Soil texture was determined by the hydrometer method. The infiltration rate curves were constructed to compare with the theoretical curves. In addition, cumulative infiltration volume curves were created to smooth the infiltration rate data. First, for the same soil, using different hydraulic head settings showed that the differences caused by hydraulic head are small. Also, as expected, the infiltration rates on a lower H were higher. Second, eight soil samples showed a similar infiltration pattern and these soils follow the expected curve. They were not considered to be water repellent or only slightly water repellent. Two soils from earlier fires, samples 7 & 8, were so water repellent that it was not possible to measure infiltration, or to construct infiltration curves. Therefore, we could not reconstruct the infiltration rate curve produced by Letey.

Social influences on adolescent cannabis use and how this relationship is mediated by cannabis cognitions

Student: Christel Mitchell

Supervisor: Dr. Marvin Krank

Drug use among adolescents has become a widespread problem, with cannabis being the most commonly used illicit drug. Cannabis use among adolescent is associated with a variety of adverse consequences, therefore it is important to find ways to prevent, delay and reduce experimentation or regular cannabis use. This study examined how adolescent cannabis use is related to social cognition. Specifically, we looked at how mother, father and peer cannabis use affects adolescent cannabis use by changing cannabis use cognitions. In this longitudinal study, 768 adolescents (male=349, female=419) who had never used cannabis, were measured at two points in time, twelve months apart. Adolescents were asked about their own cannabis use behaviours along with their mothers, fathers and peer cannabis use behaviours. Explicit and implicit cannabis cognitive associations were also measured using The Outcome Expectancy Liking scale and Ambiguous Word Homographs. Structural equation modeling tested whether these cognitions mediated the direct relationship between adolescent cannabis use. The effect of social influence was fully mediated by cannabis cognitions ($\chi^2(9, N=768)=18.175$; CFI=0.978; TLI=0.933; RMSEA=0.036). Examining each source of influence independently, the relationships between adolescent cannabis use and mother ($\chi^2(2, N=768)=1.003$; CFI=1.000; TLI=1.063; RMSEA=0.000), father ($\chi^2(2, N=768)=0.850$; CFI=1.000; TLI=1.075; RMSEA=0.000) and peer ($\chi^2(4, N=768)=0.785$; CFI=1.000; TLI=1.051; RMSEA=0.000) cannabis use were each fully mediated by cannabis cognitions. These results show the importance of targeting cannabis cognitions in order to prevent, delay and reduce experimentation or regular cannabis use among adolescents who have social support systems that use cannabis.

The Quantification of Ammonia Oxidizing Archaea In Apple Tree Orchards

Student: Katie Norman

Supervisor: Dr. Louise Nelson

Ammonia oxidation is a key part in the nitrogen cycle, determining the balance between reduced and oxidized forms of nitrogen. The oxidation of ammonia to nitrate is a critical step in the nitrogen cycle and has agricultural and environmental consequences including the release of greenhouse gases, such as NO and NO₂, into the atmosphere. Ammonia-oxidizing Archaea (AOA) contribute in nitrate leaching from soils, which cause surface and groundwater contamination in addition to the reduction of available fixed nitrogen for ecosystems. Understanding AOA abundance and activity and understanding how soil properties influence this group may lead to improvements toward sustainable agriculture. This study assessed the effect of pH, soil depth (2, 15, and 30 centimeters), presence or absence of bark mulch, and nitrogen application (20 g N/tree or 40 g N/tree) on the abundance and activity of AOA in an apple orchard. One to two gram soil samples were taken from apple tree plots at the Pacific Agri-Food Research Centre, Summerland. DNA and RNA were extracted using Mo-Bio extraction kits. The RNA was

further digested with DNase to remove any DNA and converted into cDNA. Quality control was performed using a nanodrop spectrophotometer to determine the 260/230 and 260/280 ratios. The integrity of the RNA was determined on a 1% agarose gel. Nucleic acid aliquots were stored at -80°C. Plasmids harbouring genes for archaeal 16S rRNA and amoA were used to generate standard curves using known quantities of the genes. Quantitative PCR was used to determine the gene copy number in the soil samples. Statistical analysis was used to determine if there were significant differences among treatments. The results will be discussed.

The Synthesis of Pyrazole Compounds for New Anti-Inflammatory, Neuroprotective, and Anti-Cancer Drugs

Student: Jeffrey O'Keefe

Supervisor: Dr. Ed Neeland

Pyrazoles are a class of chemical compounds with a molecular structure that can be modified to create a wide range of derivatives, which are potentially useful in treating a variety of medical conditions. In this way, a series of neuroprotective and anti-inflammatory pyrazole-based drugs have been produced and patented by researchers at UBC Okanagan in 2010. These drugs were found to be more potent and faster acting than anti-inflammatory drugs currently on the market. During the summer of 2012, two new derivatives of the parent compound of this series were synthesized and their biological activity tested. N1,N2-bis(4-cyano-1-phenyl-1H-5-yl)malonatediamide, 1, was found to be biologically inactive and N1,N2-bis(4-cyano-1-para-chlorophenyl-5-yl)oxalamide, 2, was found to have neuroprotective properties. The objective of this research project was to further examine these two new compounds by optimizing their respective synthetic yields, testing their respective reactivities, and synthesizing derivatives of each to improve the safety and therapeutic applicability of this new series of pyrazole compounds. This process began by varying the reaction conditions for the syntheses of these compounds, which continued until experimental procedures for each compound reliably produced a yield greater than 90% that could be completed within four hours. Further reactions were then attempted utilizing 1 and 2 as starting material. More specifically, the reaction of 1 with a variety of bases was performed to explore the possibility of deprotonating and derivatizing the doubly activated carbon. Compound 2 was reacted with a series of amines in order to synthesize derivatives of this neuroprotective agent. The structure of each new compound was confirmed using chromatography and instrumental spectroscopies. Once pure, the biological activity of the new compounds was tested using in vitro bio-analysis, in which cell lines were treated with varying concentrations of the new compounds, and then subjected to pro-inflammatory agents.

The influence of perceived dating partner drug use on adolescent drug use: A model mediated by cognition

Student: Lisa Olhauser

Supervisor: Dr. Marvin Krank

Adolescence is a critical period of transition from childhood to adulthood and the developmental period of greatest risk for the initiation of substance use. The substance use behaviours of those in an adolescent's social network are associated with an even further increased risk of use. While social influences on substance use are well documented, few studies investigate this relationship from a cognitive perspective. In this longitudinal study, 837 adolescents (Male=376, Female=461) with dating partners in grades seven (N=304), eight (N=277), and nine (N=256), were measured once a year for three years on the perceived drug use of their dating partners, two cognitive measures of drug associations, and their own substance use behaviours. The Outcome Expectancy Liking scale and Ambiguous Word Homographs measured explicit and implicit cognitive associations with alcohol and marijuana. Results reveal a direct relationship of perceived dating partner use on adolescent substance use one year later for both alcohol and marijuana. Significant gender differences were observed, with females being more influenced by perceived substance use of their dating partners than males. Results of structural equation modeling reveal the relationship between perceived dating partner use and adolescent use one year later is fully mediated by drug cognitions for both alcohol ($\chi^2 (2, N=837)=2.881$; CFI=.998 and TLI=.982; RMSEA=.023) and marijuana ($\chi^2 (2, N=837)=.007$; CFI=1.000 and TLI=1.151; RMSEA=.000). These findings provide support for the efficacy of targeting cognitive associations during early adolescence to prevent, delay, and reduce future alcohol and marijuana use.

The Potential for Vocal Fingerprinting in Panthera Leo

Student: Megan Perra

Supervisor: Dr. William Bates

Previous studies have shown the importance of F0 (fundamental frequency or 'pitch') in distinguishing between different individuals of the same species, calling it a 'vocal signature'. The results of previous playback experiments would suggest that the African Lion (*Panthera Leo*) is capable of recognizing foreign versus familiar individuals based on their roars. Analysis of lion roars in the programs PRAAT and SAP (Sound Analysis Pro) reveal that F0 is not a reliable indicator of individuality. A qualitative investigation of a call's structure proved to be more revealing than the quantitative datasets collected in either program. While the roars of specific individuals in a given duet did not often have significantly different F0 values, each signal could be attributed to a certain lion by observing the different patterns of energy density distribution within the formants, or the amount of entropy present. The entropic nature of a call was additionally used to define different call types, but outside of duets was not indicative of individuality. Unique structure was far less obvious in the recordings of single lions, and it is possible that social context may determine the strength of a vocal signature's presence in a call.

Synthesis of Catechin-3-O-glycoside

Student: Charlotte Pring

Supervisor: Dr. Cédric Saucier

Polyphenols are known to have various health benefits due to their antioxidant activity and can be found in various natural sources including wine, green tea and coffee. The flavan-3-ol family is a group of polyphenolic secondary plant metabolites, which include catechin, epicatechin, epigallocatechin and epicatechin gallate. These monomers and their O-glycosides have been detected in red wine samples. The glycosides of these monomers are more stable than their corresponding free phenols, and may be more easily absorbed by the body. This makes them potential compounds to be used as an antioxidant supplements by the food industry.

The Q-TOF-LC-MS analysis of wine samples has revealed the existence of the flavanol glycosides in red wines, but has not allowed us to differentiate between the possible regioisomers of the monomeric glycosides. The aim of this project is to synthesise the regioisomers of flavanol glycosides to be used as standards in order to identify and quantify flavanol glycosides in wine samples.

This chemical synthesis of one such flavanol glycoside, catechin-3-O-glycoside, will be described. Protecting group strategies for both the catechin and glucose unit will be discussed with emphasis on the importance of selective protection. The conditions used for the glycosylation reaction and final deprotection steps will be also be detailed.

An examination of the item and scale properties of the Beck Anxiety Inventory using Item Response Theory

Student: Carmen Reid

Supervisor: Dr. Brian O'Connor

The Beck Anxiety Inventory (BAI) was designed to address the need for a clinical measure of anxiety that is both appropriate for psychiatric samples, as well as the need for a measure that reliably distinguishes between anxiety and depression. Since the initial psychometric evaluation of this measure, additional research has elucidated issues in terms of the underlying factor structure of the inventory. The purpose of this study was to investigate item and scale properties of the BAI using more sophisticated statistical procedures. Our aim was to examine whether the BAI is a unidimensional construct. Using a sample of 528 university students, this exploratory study used factor analysis with polychoric correlations, parallel analysis, and item response theory (IRT). IRT provides tools that model item characteristics in relation to levels of a latent trait and yields information about the sections of the latent trait where a measure provides the maximum information. A principal components analysis (PCA) was conducted on the 21 items with a nonorthogonal (varimax) rotation. The number of factors extracted was determined by parallel analysis and by Velicers Map test with the eigenvalues and fit coefficients indicating that there was one dominant factor underlying the measure. IRT methods were then used to examine the

performance of the BAI at the item and test levels. These findings demonstrate shortcomings evident in previous psychometric evaluations of the BAI.

Social influences on adolescent cannabis use and how this relationship is mediated by cannabis cognitions

Student: Christine Rogers

Supervisor: Dr. Marvin Krank

The purpose of our study was to examine the role of alcohol-related cognitions in mediating the relationship between perceived peer alcohol use and initiation of adolescent alcohol use. 381 students from school district 23 (Female = 216, Male= 165) in grades 7 (n=184), 8(n=127), and 9 (n=70) were examined on two levels of alcohol-related cognitions; Alcohol Outcome Expectancy Liking scale (AOEL) and Word Homographs (or ambiguous word associations; AW) as well as perceived closest friends' alcohol use and their own current alcohol use. These participants were assessed again one year later. Non-users at time one (T1) were studied to observe the initiation of alcohol use at time two (T2; one year later). Using structural equation modeling procedures, we examined the relationship between peer alcohol use at T1 and alcohol-related cognitions at T1 in explaining adolescent use at T2. It was found that explicit and indirect cognitive associations, as measured by the AOEL and AW respectively, fully mediate the well-established relationship between peer alcohol use and adolescent use one year later ($\chi^2 (13, N=381)= 25.929$; CFI=.964; TLI= .923; RMSEA=.051). This strong mediating role of alcohol cognitions on perceived peer use and onset of adolescent alcohol use adds to our understanding of the transition from non-use to use. Targeting these cognitions within an age group that is highly susceptible to social influence on alcohol use may offer a unique and effective approach for prevention programs thus reducing alcohol use and its related consequences.

Investigating the Abiotic Controls on Sockeye Salmon Redd Density in the Okanagan River.

Student: Edouard Ronveaux

Supervisor: Dr. Leif Burge

The Okanagan River Restoration Initiative (ORRI) site is evaluated. Sockeye salmon spawning density as well as ten other abiotic parameters are compared from phase 1 to phase 2 of the ORRI site. Spawning density did not differ between phase 1 and 2, although there was an overall increase in the 4 years examined by this study. An overall increase in spawning activity is observed in both restored and unrestored reaches of the channel. Spawning patch area differed between restored and unrestored reaches. A Geographic Information System (ArcGIS 10) was used to map spawning patches within the two reaches from year to year. Spawning patches were mapped each year and overlaid onto each other to indicate the areas of the patch used each year. The hypothesis is that spawning areas used each year have attributes that are attractive for spawning activities.

Topology, Knot Theory, and Matrix Theory: A Mathematical Classification of RNA

Student: Morgan Roosenmaallen

Supervisor: Dr. Javad Tavakoli

Ribonucleic acid (RNA) performs many roles in biological systems, from data storage in viruses to forming the catalyzing components of protein-making ribosomes. Much of the function of RNA comes from its secondary structure (first order folding), taking the form of loops, bulges, and other shapes, with more complex structures forming with longer RNA strands. Knowledge of the range of possible secondary structures for RNA of arbitrary length is therefore critical in the understanding of RNA functionality and, as a consequence, in the development of associated pharmacological products. In 2002 it was discovered that the partition function and matrix theory used in quantum mechanics to classify topological structures associated with particles is amenable to solving the range of possible RNA secondary structures in terms of 'knots'. Specifically, the Feynman diagrams produced by the above mathematics are identical to the chord diagrams used in knot theory, the latter of which can be used to describe topological features of folded RNA strands, in particular, their genus. In this poster I explain the core principles and findings of this intersection between theoretical physics, abstract mathematics, and biochemistry, describing the relevant mathematics, the potential applications, and the research that I am looking to conduct with it.

Identification of individual coyotes (*Canis latrans*) and analysis of non-linear chaotic (NLC) dynamics using bioacoustic algorithms

Student: Kristen Small

Supervisor: Dr. William Bates

We investigated vocal signatures produced by coyotes living in the Creston Valley and in the Okanagan Valley. Individual vocal signatures have been described in many mammalian species. The present study investigated differences in fundamental frequency (F_0) values between individual coyotes. The data set was comprised of six Creston Valley files which were further broken down into 15 subsections, and five Okanagan files which were further broken down into 15 subsections. We used Fast Fourier Transform (FFT) computer algorithms RAVEN, PRAAT, and SOUND ANALYSIS PRO to measure fundamental frequency (F_0) values. Each individual showed a unique F_0 value, however analysis of variance did not show significant differences in these F_0 values. Statistics may not be telling the whole story as subtle differences in signals are known to be important in animal behaviour. The presence of non-linear chaotic (NLC) dynamics including subharmonics and deterministic chaos has been shown to encode emotive information in mammals, including humans. By examining FFT spectrograms, different patterns of NLC dynamics were observed in coyote bark and howl sequences. Finally, a preliminary field experiment was conducted in order to begin to study the effects of distance and vegetation on coyote call amplitudes and F_0 values. Atmospheric and landscape effects on NLC signatures must await future research. An inverse relationship between acoustic amplitude and distance was observed, however, F_0 values remained constant despite differences in landscapes. This indicates that F_0 is a reliable acoustic

signature for studying wild coyotes. Finally, I will discuss how the analysis of coyote NLC signatures will shed light on the evolutionary developmental biology of mammalian vocalizations and the evolution of human speech.

The effectiveness of passive capillary wick samplers in determining nitrogen and water loss from the root zone of perennial red raspberry

Student: Shelby Snow

Supervisor: Dr. Craig Nichol

Dense agricultural regions can lead to contamination of groundwater with nitrate (NO₃⁻). This is a rising problem in modern society given that high nitrate concentrations in groundwater have been known to cause biological harm. Closely matching agricultural nitrogen applications to plant requirements over the course of a year will prevent over application and reduce the leaching of nitrate. A field trial comparing irrigation and fertilizer application treatments in red raspberry has been established at an Agriculture and Agrifood Canada (AAFC) station in Clearbrook, BC. The trial uses Passive Capillary Wick Samplers (PCAPs) to collect water that has moved out of the raspberry plant's functional root zone. It is especially important that the volume of water recovered in the PCAPs is representative of the water drainage since the amount of nitrate leached is determined by volume of water and concentration of nitrate in the samplers. The collection method must accurately sample both matrix flow and preferential flow over various water contents without altering the infiltration of water. It was unclear if the PCAPs were over or under sampling water volume percolating through the root zone during the rainy season. To test the ability of the PCAPs to accurately capture water volume, and make an estimate of soil water flux, a tracer was used to track movement of a 'rainfall event' through the soil profile. The results indicate that the PCAP tracer recovery is less than 100% and the PCAPs may be under sampling water drainage. This study demonstrates the use of breakthrough curves to assess sampler efficiency and soil flux. The results will be used to determine if the water volume measured was under sampled and if PCAPs were consistent between treatments.

Food and Water Security in Creston Valley, BC: Will Farmers Have a Say in the Columbia River Treaty Renegotiation Process

Student: Joanne Taylor

Supervisor: Dr. John Wagner

Creston Valley in Canada is the largest agricultural area in the Canadian Columbia directly affected by the Libby Dam on the Kootenai River, one of the CRT dams. The additional water storage created by Columbia River Treaty dams has also made it possible to bring as much as one million additional acres of land into production in the United States even though the treaty does not explicitly address agricultural issues or provide any guarantees of future water availability for the agricultural sector. However, the net effect in Canada has been negative since several thousand acres of prime agricultural land was flooded and many farming communities were displaced from their homes including. Furthermore the Ktunaxa First Nations were severely affected by the eradication of salmon fishing cultures, exterminating an

entire traditional subsistence culture. In this poster, I analyze preliminary research findings which articulate the impacts of the fifty year old Columbia River Treaty on agriculture in Canada with reference to the Creston Valley and traditional First Nations territory as it nears its sixty year anniversary in 2024. Future research will contribute to helping Canada and the USA decide whether to renegotiate, terminate, or continue the present bi-lateral treaty.

What are the effects of the Okanagan River restoration on sediment transport and channel morphology in town Oliver, BC, Canada?

Student: Yilin Wang

Supervisor: Dr. Leif Burge

The purpose of my project is to identify the effects of river restoration on sediment transport and channel changes at the ORRI site of the Okanagan River in Oliver, BC, Canada. Our aim is to understand the process of river restoration and therefore predict the future strategies for river restoration. The natural river channel shape, channel pattern and the substrate conditions were restored to improving sockeye salmon spawning habitat. The relationship between sediment transport pattern and channel morphology is studied in detail by analyzing the field data from 2008, 2009 and 2012 and the change of 13 cross-sections from these three years are monitored. The hydraulic variables and parameters are conducted to refer the change of channel migration and thus the sediment transport pattern. Channel shape is strongly related to the flow characteristics and sediment flux, and these two factors are altered during the river restoration and therefore rebuild the river channel. Setting back the dykes and reconstructing the floodplain activate the connectivity of floodplain and channel would potentially reduce the amount of fine sediment suspended load. Bedload sediment transport test is conducted. Other complex factors such as shear stress, effective shear stress and boundary shear stress are also considered to explain the sediment transport response. Transect profiles from 2008, 2009 and 2012 are plotted while areas of deposition and erosion from each cross section are determined. The computer modeling program called BAGS, which is called Bedload Assessment for Gravel-Bed Streams, is chosen to model the sediment discharge rate within the channel from the data in 2012. Analyzing the cross-sections by comparing the result from BAGS model and transect profiles.

Neuroanatomical Correlates of Subjective Well-Being in People with Acquired Brain Injury

Student: Jesse Whiteman

Supervisor: Dr. Mark Holder

Research in the cognitive and affective neurosciences indicates that the left frontal cerebral cortex plays a primary role in the processing of positive emotions, while the right cerebral cortex is more involved in the processing of negative emotions. However, the relationship between the location of a brain injury and scores on current measures of well-being (i.e., Subjective Happiness Scale, Satisfaction with Life Scale, and the PANAS) in people with acquired brain injury (ABI) is not known. Individuals with varying typologies of ABIs including stroke, anoxia, and traumatic injury, were assessed to determine levels and correlates of happiness, life satisfaction, and positive and negative affect. Their levels of well-being were

related to the typology and location of their injury. We hypothesized that insults localized to the left hemisphere (specifically the left frontal lobe) would display poorer well-being, especially the affective components (happiness and positive affect), whereas subjects with right hemisphere insults would display higher levels of well-being. Social support and spirituality were assessed to determine whether they influenced the relations between psychological well-being and the type and location of ABI. We hypothesized that higher levels of social support and spirituality would contributed to higher levels of well-being in people with ABI