Irving K. Barber School of Arts and Sciences

The University of British Columbia Okanagan

Undergraduate Research Conference

April 7, 2011

ABSTRACTS

ORAL PRESENTATIONS

UBC Okanagan Undergraduate Research Conference
Oral Presentations
April 7, 2011 – Location – ASC 165A/B
Group 1 - 1:00 – 4:00 pm

Presenter	Title	Location/Time
Alyosha Pushak	Automated Assignment Generation and Marking using the AutoEd System	ASC 165A/B, 1:20 – 1:40 pm
Daniel Morton	Radio Wave Propagation through Magnetized Plasma in the Interstellar Medium	ASC 165A/B, 1:40 – 2:00 pm
Jessie Slamka	3D Game Development free software	ASC 165A/B, 2:00 – 2:20 pm
Mike Chen	Envelopes of Star Forming Cores Are pre-staller cores confined by their environment's pressure?	ASC 165A/B, 2:20 – 2:40 pm
John Ryan	Europium in the Footwall of East Cleaver: Targeting Copper Mineralization in Volcanogenic Massive Sulphide Deposits	ASC 165A/B, 2:40 – 3:00 pm
Kelly McRae	Making Multiculturalism: Immigrant Attraction and Retention in Kelowna, British Columbia	ASC 165A/B, 3:00 – 3:20 pm
Kyle Nolan	Law & Order: Allusions to the *New York Times*	ASC 165A/B, 3:20 – 3:40 pm

Automated Assignment Generation and Marking using the AutoEd System

Student: Alyosha Pushak
Supervisor: Dr. Ramon Lawrence

AutoEd is an open source web-based system that allows professors to give students assignments made of randomly generated questions. The system was developed to improve student learning and provide students with easy access to a potentially unlimited amount of practice questions in a broad range of subjects, as well as saving time for professors and TAs by auto-marking assignments. Professors create question templates from which random questions are generated. Questions are written in HTML with special <eqn> tags that specify calculations and random variable assignment. Numerical values and units can be randomized. Students and professors can search for question templates by category, and then try practice questions generated from those templates. AutoEd provides immediate feedback to students and can provide hints as to what they did wrong and how to solve the question. This presentation will describe and demonstrate the AutoEd system and show how it was very successfully used in first year Physics courses.

Radio Wave Propagation through Magnetized Plasma in the Interstellar Medium

Student: Daniel Morton
Supervisor: Dr. Erik Rosolowsky

The majority of the "empty space" between stars in our Galaxy is in fact filled with dust, gas, and weakly magnetized plasma. This plasma is filled with high energy electrons which interact with the magnetic fields, emitting synchrotron radiation. These radio waves propagate through this turbulent medium and are continually affected by Faraday rotation caused by the free electrons and magnetic fields until they reach a point of observation here on Earth. The purpose of this study was to model the radio wave propagation through the plasma and compare the simulated results to observed data from the Canadian Galactic Plane Survey. The simulation would help determine the causes of some otherwise unexplained trends in the observed power spectrum data. By modeling a region of space, different physical parameters could be altered such as the electron density, magnetic field strength, and the number of additional background point source galaxies. The effects of altering such parameters would confirm that the trends in the observed power spectrum were a result of the addition of background galaxies acting as point sources in the collected images.

3D GAME DEVELOPMENT USING FREE SOFTWARE

Student: Jessie Slamka
Supervisor: Dr. Ramon Lawrence

3D video game development requires the use of various tools for the different stages, from conception, design, modelling, animating, coding, and testing. The focus of this project was going through the process of game development and getting to know the free software tools available for creating concept art, modelling meshes, animating those meshes, and creating game rules. Challenges included figuring out how to adapt previous knowledge of similar programs to the new software, adapting known mesh animation strategies to suit the different requirements when animating for a 3D game, and simulating the physics on the player-controlled character, particularly in terms of projecting motion onto trees. This presentation will discuss the tools and process used and show the game produced.

Envelopes of Star Forming Cores
Are pre-staller cores confined by their environment's pressure?

Student: Mike Chen
Supervisor: Dr. Erik Rosolowsky

The current literature on star formation cover a wide range of models that describes how the denser regions of a molecular cloud forms into a core and collapses into a star. These models range from a slow, gravitationally driven process to a rapid, turbulently caused evolution. A well received paper by Charles J. Lada and et. al. conjectures that the cores they surveyed are being hold together by the external pressure provided by the surrounding molecular cloud, which we called envelopes. This conjecture supports a more dynamic star forming process, but was not directly tested prior to my study of the NGC1333 region with Dr. Rosolowsky in 2009, using the ammonia spectrum. Our preliminary results agree with such a conjecture when we discovered the pressure of the envelopes to be high and comparable to the pressure of the cores. To obtain a more precise measurement of the mass density in the envelope region, and thus its pressure, I conducted another study of the same region on a set of spectrum emitted by a different chemical specie, formaldehyde. Formaldehyde is an excellent tracer for its number density, and I was able to extract its number density, along with various properties, using a quantum mechanical model. It turns out there is a good correlation between the presence of ammonia and formaldehyde in the envelope, which is excellent for pressure analysis. The correlation, however, breaks down at the cores. There seems to be a lack of formaldehyde in the core, which was unexpected. This, however, may be an indication that something much more interesting, chemically speaking, is happening at these cores.

Europium in the Footwall of East Cleaver:
Targeting Copper Mineralization in Volcanogenic Massive Sulphide Deposits.

Student: John Ryan
Supervisor: Dr Craig Nichol

Mineral resources and reserves must be calculated during the development phases of mine projects to accurately project mine life, milling processes and stripping ratios. The relatively simple geometry of Volcanogenic Massive Sulphide (VMS) Deposits can become distorted in highly deformed terrains and the targeting of potential ore becomes difficult. Sabina Gold & Silver's East Cleaver Zone is one such deposit where tight folding has made the targeting of the copper, and other potentially precious metal zones, difficult. This study has examined how various elements behave around conduits which carried metaliferous fluids that precipitate copper under moderate temperature (300C) and low pH conditions. Existing drill core and surface mineralization intercepts were sampled using standard commercial ICP-MS methods and examined to determine how the rock chemistry changed around these copper discoveries. Europium was investigated as it has been shown to demonstrate similar behavior to copper in VMS systems. Results suggest the presence of a europium halo that can indicate proximity to a copper target and distinguish between economically viable targets and sub-economic targets that may waste resources during exploration.

Making Multiculturalism: Immigrant Attraction and Retention in Kelowna, British Columbia

Student: Kelly McRae
Supervisor: Dr. Carlos Teixeira

The word 'multiculturalism' resonates with Canadians as a key signifier of what their country stands for. This is a powerful sentiment and something that has been clung to perhaps in response to the difficulty faced in defining what Canada stands for. Yet, while multiculturalism is embedded into the national psyche, it can be absent from the community identity. This paper seeks to understand the disparity between high new-immigrant settlement in Canada's largest cities versus midsized cities such as Kelowna, BC. This venture is embarked upon by addressing the following research questions: 1) Why are new immigrants not attracted to Kelowna? 2) What tools could be implemented to *attract* and *retain* immigrants to a midsized city such as Kelowna? 3) What role do government planning policies play in creating a welcoming community in Kelowna, BC? This paper finds that new-immigrants in Kelowna face similar barriers in comparison to their contemporaries in larger cities but are without many of the resources that assist in their integration into the community. Access to housing, adequate employment and the presence of compatriot communities are chief among the challenges that new immigrants face when settling in Kelowna. It is recommended that all levels of government employ strategic immigrant attraction policies that will encourage immigrants to settle in midsized cities, such as Kelowna, creating a more welcoming community for all.

Law & Order: Allusions to the *New York Times*

Student: Kyle Nolan
Supervisor: Dr. Christopher J. Schneider

This exploratory project investigates some of the media allusions to the popular American crime drama program Law & Order. Despites its recent cancellation in May 2010, Law & Order continues to remain one of the most popular and successful crime dramas to ever air on network television. The program popularized a "ripped from the headlines" format, one that purports to be both fictional and real simultaneously. This has caused some real problems. For instance in 2004, Brooklyn based lawyer Ravi Batra, sued the Law & Order franchise for $15 million dollars for "libel in fiction." Libel in fiction involves fictional depictions shown to actually cause damage to a real person's character. This case study examines the process and implications of fictional dramatizations that claim to be drawn from reality. Using Qualitiave Document Analysis (QDA) allusions to media documents were initially located in more than 150 Law & Order episodes. For this particular case study, four of these episodes linked with 28 news articles from the *New York Times* were selected for further examination. Analysis indicates that a significant amount of the television portrayals as presented on Law & Order can be directly linked with these newspaper articles. This case study provides some empirical evidence to support the idea that crime news media and crime entertainment media are in many ways connected, a process that may contribute to how people understand depictions of crime in media. Suggestions for future research will be noted.

UBC Okanagan Undergraduate Research Conference
Oral Presentations
April 7, 2011 – Location – ASC 273
Group 2 - 1:00 – 4:30 pm

Presenter	Title	Location/Time
DeAnna Zanet	Characterization of the physiology and biological control activity of *Pseudomonas fluorescens* 1-112, a potential biocontrol agent against postharvest fungal pathogens of pome fruit	ASC 273, 1:20 – 1:40 pm
David Ensing	The potential for North American invasion by two European hawkweeds, *Pilosella caespitosa* and *Pilosella glomerata*	ASC 273, 1:40 – 2:00 pm
Jennifer Forsythe	Arbuscular Mycorrhizal Fungi Mutualism Strategies: *Glomus custos* as a "cheater" species	ASC 273, 2:00 – 2:20 pm
Monica Cella	Cloning and expression analysis of a lavender monoterpene synthase gene	ASC 273, 2:20 – 2:40 pm
Travis Thompson	Expression of Essential Oil Related Genes In *Lavandula*	ASC 273, 2:40 – 3:00 pm
Jessica Baker	Lavender Protects Against Infectious Colitis	ASC 273, 3:00 – 3:20 pm
Kirsty Brown	Gut Bacteria and Intestinal Immunity in a Type 1 Diabetes Mouse Model	ASC 273, 3:20 – 3:40 pm
Tyson Boettcher	Phagocyte respiratory burst: Effects of various pretreatment conditions and drug intervention	ASC 273, 3:40 – 4:00 pm
Sim Zijian	Roads or Rivers: Investigating barriers to gene flow in a species with limited dispersal ability	ASC 273, 4:00 – 4:20 pm

Characterization of the physiology and biological control activity of *Pseudomonas fluorescens* 1-112, a potential biocontrol agent against postharvest fungal pathogens of pome fruit

---

Student: DeAnna Zanet
Supervisor: Dr. Louise Nelson

Three important postharvest pathogens of pome fruit are *Penicillium expansum, Botrytis cinerea* and *Mucor pirformis*, which cause blue rot, grey rot and mucor rot, respectively. In recent years, the chemical fungicides used to control these diseases have been associated with the development of resistant populations of fungi. This has led to an increased interest in biological control agents, including the soil bacterium *Pseudomonas fluorescens*. This study examined the physiological characteristics and biological control activity of *P. fluorescens* strain 1-112 isolated from Saskatchewan soil. Using minimal medium amended with sole carbon sources of sucrose, fructose and glucose (major carbon sources in apple) at 5ºC, 1-112 grew in sucrose in the presence of *B. cinerea*, and grew alone in both fructose and glucose. 1-112 decreased the pH of the glucose minimal medium from 6.67 to below 4.5. 1-112 was able to grow in pH ranging from 4.0 to 5.5, and changed the pH of half-strength tryptic soy broth to more alkaline values up to pH 8.4. *In vitro*, cell-free filtrate from 1-112 inhibited growth of all three fungal pathogens, being most effective against *B. cinerea* with 96.4% inhibition. *In vivo,* the mixture of *P. fluorescens* strains 1-112 and 4-6 was most effective at inhibiting growth of *P. expansum* with 98.7% inhibition, and *Serratia plymuthica* 6-25, and the mixtures of strains 1-112 and 6-25 and 1-112 and 4-6 were most effective against *B. cinerea*, with 97.6%, 93.5% and 97.9% inhibition, respectively, after 90 days at 1ºC. The efficacy of the mixture of *P. fluorescens* strains may be attributed to the complementarity in the metabolism of the strains (for example, 1-112 cannot utilize sucrose and maltitol, while 6-25 can utilize both), as well as signaling between the strains at a molecular level. These results have provided further avenues of study into what substrate conditions provide optimal growth for biocontrol agents, and what qualities of mixtures are most effective against postharvest fungal pathogens.

The potential for North American invasion by two European hawkweeds, *Pilosella caespitosa* and *Pilosella glomerata*

Student: David Ensing
Supervisor: Dr. Jason Pither

Several alien, invasive European hawkweed spp. (*Pilosella* spp., formerly *Hieracium* subgenus *Pilosella*) have been introduced into North America and are unlikely to have reached equilibrium population levels or distributions. Hawkweeds negatively affect biodiversity and rangeland productivity, and are therefore the focus of weed control efforts. A key question is: Where are invasive hawkweeds likely to colonize and persist? I addressed this question by developing ecological niche models (ENM) for two relatively recently introduced species, *Pilosella caespitosa* and *Pilosella glomerata.* I developed the models using the freely available maximum entropy machine-learning algorithm, Maxent (Phillips et al. 2006). Maxent combines point occurrence data with abiotic information, typically climate data, to predict potential geographic ranges. I used BIOCLIM climate datasets (from "Worldclim") and point occurrence data from both the native (European) and introduced ranges, which were available in online databases. I also contributed occurrence data from field observations in Europe. To examine any change in climatic requirements from the native to the introduced range, I compared models that used native range data only, introduced range data only, and native and introduced range under current climate conditions. These models were then recalibrated using predicted future climate conditions. The outcomes of my research will help inform targeted, effective and efficient control methods aimed at limiting the future spread of *P. caespitosa* and *P. glomerata* in North America.

Arbuscular Mycorrhizal Fungi Mutualism Strategies: *Glomus custos* as a "cheater" species

Student: Jennifer Forsythe
Supervisor: Dr. Miranda Hart

Arbuscular mycorrhizal fungi (AMF) are obligate symbionts of almost all terrestrial plants. While the AMF symbiosis is relatively well documented, the behavior of AMF as strong mutualists has been called into question in recent years. In some cases, it has been documented that certain species of AMF may actually behave more parasitically than mutualistically. This project tests our hypothesis that the AMF species, *Glomus custos*, functions as a "cheater" AMF species in two host plants, Plantago and Leek. *G. custos* was inoculated with an AMF species of varying mutualistic degree, a diverse fungal treatment and a diverse plant treatment on both host plants. The amount of *G. custos* in all treatments was detected using quantitative PCR and confirmed with PCR and percent root colonization.

Cloning and expression analysis of a lavender monoterpene synthase gene.

Student: Monica Cella
Supervisors: Dr. Soheil S. Mahmoud and Zerihun Demissie

Monoterpenes are a group of aromatic natural products that are the main constituents of the essential oils (EO) of plants such as lavender, tea tree, peppermint, and ylang ylang. Though about 1000 monoterpenes have been described to date, typically a smaller subgroup occur in a given plant species. The EO of lavenders, for example, contains 50 - 60 constituents, with 3 – 5 dominating the EO in a species-specific manner. Monoterpenes are synthesized through the conversion of the precursor geranyl-diphosphate (GPP) into the respective terpene products, often by a single enzymatic reaction catalyzed by proteins known as monoterpene synthases (mTPS). Thus far four mTPSs have been described from lavender, including β-phellandrene synthase, which was recently cloned and characterized in Mahmoud's lab using various molecular techniques. My presentation will describe the techniques used to isolate, clone, and study mTPS genes. I will also discuss the developmental and inter-species expression of known lavender mTPS genes, determined using standard and quantitative real-time PCR. This research elucidates how plants produce essential oils, and provides insight into evolutionary relationships between different lavender species. It also helps us understand the genetic relevance and regulation of certain enzymes involved in essential oil metabolism in higher plants. Understanding the nature and regulation of monoterpene synthases could help improve EO composition and yield in economically important plants.

Expression of Essential Oil Related Genes In *Lavandula*

Student: Travis Thompson
Supervisor: Dr. Soheil Mahmoud

Essential oils are volatile substances that produce the aroma one would smell from a particular plant. These oils are comprised of a group of organic compounds known as monoterpenes. There are about 1000 monoterpenes known, with each plant species producing a subset of these compounds. Monoterpenes are produced through the plastidial pathway of isoprenoid biosynthesis in plants. Sequential condensation of the end products of the pathway, IPP (isopentenyl diphosphate) and its isomer DMAPP (dimethylallyl diphosphate), initially yields GPP, the linear precursor for monoterpene production. GPP is then converted to various monoterpenes by terpene synthase enzymes, encoded by terpene synthase genes (TPS). It has been previously shown that improving precursor supply can enhance monoterpene production in plants.
We hypothesized that the observed difference in essential oil composition among different lavender species results from the differential expression of the related genes. To test the hypothesis, we examined the expression of the MEP/DXP pathway genes (lavender produce monoterpenes through the MEP pathway) and several TPSs by Polymerase Chain Reaction (PCR) in both leaf and flower tissues of three lavender species including *L. angustifolia, L. latifolia and L. intermedia*. The results of each species of Lavender and its corresponding tissues were compared to each other to see the genetic relationship among these species. All the genes involved in MEP pathway were present to some extent in both tissues of all species. In addition, TPSs were present according to the oil profile of these plants. This research is the initiation of segregation analysis of genetic materials within lavender species.

Lavender Protects Against Infectious Colitis

Student: Jessica Baker
Supervisor: Deanna Gibson

Colitis is a type of inflammatory bowel disease (IBD) and refers to inflammation of the colon. It is a chronic, relapsing, immunologically mediated disorder in the gastrointestinal tract that results in bloody diarrhea and ulceration. Canada has the highest prevalence and incidence of IBD in the world. Currently there is neither a cure nor prevention with limited therapeutic options. Lavender essential oil extract has an extensive therapeutic history and has been shown to possess antimicrobial and anti-inflammatory properties. The goal of this study was to examine a unique cultivar of lavender, *Lavandula x intermedia* cv Okanagan Lavender, for anti-inflammatory effects in a mouse model of colitis induced with an intestinal pathogen, *Citrobacter rodentium*. We found that lavender essential oil was protective against infectious colitis. Orally gavaged lavender resulted in a significant reduction in cecal tissue damage corresponding with significantly reduced cytokine expression and immune cell infiltration during colitis compared to colonic mice alone. We found the lavender had direct cytotoxicity to *Citrobacter rodentium* revealing that antimicrobial properties were important for the loss of inflammatory responses. Our results reveal that Okanagan Lavender is a potential therapeutic against acute colitis through antimicrobial and/or anti-inflammatory effects.

Gut Bacteria and Intestinal Immunity in a Type 1 Diabetes Mouse Model.

Student: Kirsty Brown
Supervisor: Dr. Deanna Gibson

Type 1 diabetes (T1D) is an autoimmune disease in which increased inflammation attacks the pancreatic insulin secreting beta cells resulting in the inability to metabolize glucose. Recent evidence suggests a compelling role for the intestinal microbiome (enteric bacteria and their genetic material) in the pathogenesis of diabetes. Diabetics are clinically known to have "leaky" guts and bacteria are known to modulate intestinal barrier function. Considering the gut and pancreas are connected via the lymphatic system, it is plausible that the intestinal microbiome affects T1D pathogenesis through intestinal immune responses. Female non-obese diabetic (NOD) mice spontaneously develop T1D while genetically similar non-obese resistant (NOR) mice do not. Similar to diabetics, we have previously shown that NOD mice have dysfunctional barriers. The goal of this study was to examine the potential role of gut microbiota in modulating intestinal inflammation and barrier dysfunction altering T1D disease onset. The microbiomes from NOD and NOR mouse strains were examined for differences in microbiota, intestinal inflammation and mechanisms of barrier function. NOD mice were found to have a greater overall load of bacteria compared to NOR. Correspondingly, mRNA expression of pro-inflammatory cytokines and those involved in T cell migration were increased in colonic tissues from NOD mice compared to NOR. Claudin-1, a tight junction protein involved in barrier function, was found to have altered expression in the gastrointestinal tract of NOD mice at the mRNA level, and altered localization at the protein level. When we switched the microflora between NOD and NOR mice creating NOD mice colonized with NOR flora and vice versa, we found that the barrier dysfunction in NOD mice was

reversed in the presence of NOR microflora. This suggests that NOD specific microbiota is associated with increased inflammatory responses that specifically mediate barrier dysfunction via claudin-1. This could have broad implications for understanding the pathogenesis of T1D.

Phagocyte respiratory burst: Effects of various pretreatment conditions and drug intervention

Student: Tyson Boettcher
Supervisor: Dr. Andis Klegeris

When immune cells are exposed to a pathogenic substance capable of provoking an immune response, one of the defense mechanisms employed is the production of a large amount of reactive oxygen species (ROS). This process is known as a respiratory burst due to the accompanying rapid increase in oxygen consumption. The ROS then act to destroy the pathogens by oxidation. Unfortunately, ROS do not selectively destroy infected and/or damaged cells and healthy cells are damaged in the process. Luminol-enhanced chemiluminescence can be used to assess the respiratory burst of immune cells. This assay measures the amount of ROS produced by the cells through their chemical reaction with luminol that results in light production. The enzyme, nicotinamide adenine dinucleotide phosphate-oxidase, produces ROS and drugs that are capable of inhibiting the enzyme or that have radical scavenging abilities would be useful in reducing damage due to excessive ROS production. Novel cobalt containing compounds were tested for their ability to inhibit phagocyte respiratory burst. Their corresponding non-cobalt ligands as well as cobalt salts were tested to help deduce which molecular moiety was responsible for the observed reduction of light production. Also, new methods of stimulating the respiratory burst were investigated by subjecting the cells to various pretreatment conditions; they included 24-hour exposure to various pro-inflammatory compounds, such as interferon-gamma, amyloid-beta, and lipopolysaccharide. The effect of acute temperature changes on the respiratory burst was also investigated. This project has possible applications to any disease with an inflammatory component, including Alzheimer's disease that exhibits chronic inflammation in the brain.

Roads or Rivers: Investigating barriers to gene flow in a species with limited dispersal ability

Student: Sim Zijian
Supervisor: Dr Michael Russello, Philippe Henry

Habitat destruction and fragmentation due to human development threaten the survival of species. Elucidating the level of gene flow and landscape connectivity between populations affected by habitat fragmentation can help predict a species response to such anthropogenic disturbances. The American pika (*Ochotona princeps*), a small lagomorph, is discontinuously distributed along elevation gradients in the Coast Mountains of BC. This makes it an ideal system to study the effects of anthropogenic disturbances and natural landscape features in shaping the distribution of genetic variation on a spatial scale. Using 10 microsatellite loci, we quantified the distribution of genetic diversity both within and between putative populations of *O. princeps* inhabiting the Coast Mountains of BC in order to test specific hypotheses regarding the effect of landscape features, including a major road, several rivers and varying elevation on the underlying population genetic structure. The explicit assessment of population connectivity in American pika populations will inform conservation strategies that could be directed to restoring or enhancing connectivity between habitat patches in order to maintain evolutionary potential in populations potentially at risk.

UBC Okanagan Undergraduate Research Conference
Oral Presentations
April 7, 2011 – Location – ASC 271
Group 3 - 1:00 – 4:30 pm

Presenter	Title	Location/Time
Alysha Baker	High-Stakes Deception: The Face as a Source to Emotional Deceit	ASC 271, 1:20 – 1:40 pm
Andrew Hughes	Shifting Laterality and Cognitive Performance	ASC 271, 1:40 – 2:00 pm
Audra Roemer	Gender and Risk for College Binge Drinking	ASC 271, 2:00 – 2:20 pm
Raquel Graham	Living with chronic pain: How patient coping affects day-to-day spousal well-being	ASC 271, 2:20 – 2:40 pm
Kyle Dick	Understanding the Relationship between Humour Styles, Anger, Social Relationships, and Well-Being	ASC 271, 2:40 – 3:00 pm
Natasha Korva	Dangerous Decisions: Interaction of juror attitudes and defendant appearance on legal decisions	ASC 271, 3:00 – 3:20 pm
Nathan Ryckman	Modern Mnemonics: Emotion, Hemispheric Interaction, & the DRM Paradigm	ASC 271, 3:20 – 3:40 pm
Priscilla Healey	Psychometric Properties and Item- and Test-Level Bias in the Beck Hopelessness Scale Across Community, Clinical, and Forensic Samples	ASC 271, 3:40 – 4:00 pm
Seton Timoney	A Novel Intervention for the Enhancement of Well-Being	ASC 271, 4:00 – 4:20 pm

High-Stakes Deception: The Face as a Source to Emotional Deceit

Student: Alysha Baker
Supervisors: Dr. Stephen Porter (Ph.D.) & Leanne ten Brinke (Ph.D. Candidate)

It has long been hypothesized that the face can reveal one's true emotions through the leakage of genuine emotions and inadequate falsification of deceptive expressions. Despite the previous empirical attention examining cues to deceit, past research has been criticized for its artificial nature due to the use of unmotivated liars and student samples. The present study examined emotional facial cues to deception in a sample of individuals making a televised plea for the safe return of a missing family member ($N = 52$), approximately half of whom were responsible for the murder of that missing individual and thus deceptive in his/her role as the concerned relative. Each 1/30-s frame of video was analyzed for the presence and duration of selected facial muscle activation. Analyses identified four independent facial muscles as significant predictors of veracity. These included the *corrugator* (eye brow furrow), *frontalis* (raising of eyebrows), *zygomatic major* (upwards pull of lip corners)*,* and *depressor anguli oris* (downward pull of lip corners). Upper face sadness is typically produced by the activation of the *corrugator* and *frontalis* muscle. Completing the prototypical expression of distress is the activation of *depressor anguli oris* in the lower face. This study suggests that educated attention to the face can reveal deeply held secrets, making the face an important informational channel for detecting high-stakes lies.

Shifting Laterality and Cognitive Performance

Student: Andrew James Hughes
Supervisor: Dr. Barbara Rutherford

Cerebral laterality, which is the level of dominance of a single brain hemisphere, has been linked to a number of cognitive advantages. Various patterns of laterality have been associated with increased performance on specific cognitive tasks. For example, left hemisphere dominance is associated with increased performance on language tasks, while right hemisphere dominance is associated with increased performance on visual-spatial tasks. While hemispheric dominance is generally thought to be stable within individuals, previous research has suggested that it may be subject to influence. This study investigated the possibility of intentionally shifting individual's hemispheric dominance for a short period of time. Two studies tested three groups of participants, left-hemisphere dominant, right-hemisphere dominant, and no dominance, to investigate whether an intervention designed to temporarily shift laterality toward one or other hemisphere will differentially affect cognitive performance compared to a neutral intervention.

Gender and Risk for College Binge Drinking

Student: Audra Roemer
Supervisor: Dr. Zachary Walsh

College students are at increased risk for problematic substance use, and identifying factors that increase risk of hazardous alcohol use among college students is a research priority. In the present study, we examined the cross-gender consistency of the association between impulsivity, self-esteem, parenting styles, and alcohol consumption among 139 (88 female, 55 male) undergraduate university students. We further examined the extent to which the relationship between parenting styles and drinking behaviors were mediated by self-esteem and impulsivity. The influence of self-esteem differed across genders, such that males with lower self-esteem reported more alcohol-related problems $F(1, 49) = 4.50, p = .04$. Impulsiveness was associated with higher levels of binge drinking and alcohol-related problems in both males and females, and with total drinking days among females only, $F(1, 86) = 9.48$, $p < .01$. The influence of parenting styles on drinking behavior differed across gender, such that the parenting style was associated with higher levels of alcohol consumption among males, $F(1, 49) = 4.13$, $p < .05$, but not among females, $F(1, 86) = .94$, $p = .33$. Specifically, having two parents who were authoritative were associated with more frequent drinking days among male students. Supplementary analyses indicated that impulsiveness and self-esteem did not mediate the relationship between parenting styles and on drinking behaviors. These findings highlight the importance of considering gender when examining risk for hazardous drinking among college students, and suggest that parenting styles and self-esteem may be particularly important for understanding problematic alcohol consumption among male students.

Living with chronic pain: How patient coping affects day-to-day spousal well-being

Student: Raquel Graham
Supervisor: Dr. Susan Holtzman

Living with a chronic pain condition is often accompanied by substantial physical and emotional suffering. Patients' negative mood and pain coping strategies are known to affect the pain experience. However, little is known about the ways in which patient mood and ways of coping may impact caregiver well-being. The goal of this study was to investigate whether patient levels of pain, mood, and catastrophizing contribute to caregiver burden on a daily basis. Thirty individuals with rheumatoid arthritis (RA) and their spouses engaged in an initial background interview, followed by twice daily telephone interviews for 1 week. Multi-level regression analyses were conducted using hierarchical linear modeling software. Results indicated that patient pain and patient negative affect did not significantly impact spousal burden. However, on mornings when patients engaged in higher than usual levels of pain catastrophizing, spouses reported significant increases in caregiver burden over the course of the day. This research illuminates the need to specifically evaluate how patients cope with their pain, in addition to their level of pain alone. Findings suggest that pain catastrophizing is not only associated with negative outcomes for the patient, but for the spouse as well. The level of burden experienced by the spouse can strongly influence the quality of care that is provided, emphasizing the benefit of assessing spousal well-being and patient-spouse interactions.

Understanding the Relationship between Humour Styles, Anger, Social Relationships, and Well-Being

Student: Kyle Dyck
Supervisor: Susan Holtzman, PhD

Research has shown that humour can be significantly associated with one's mental and physical well-being. Recent work has involved the exploration of four specific styles of humour that may be differentially related to well-being: (1) Affiliative Humour, or humour used to strengthen social relationships, (2) Self-Enhancing Humour, or possessing a humourous outlook on life, (3) Aggressive Humour, or humour expressed with others as a target, and (4) Self-Defeating Humour, or humour expressed with oneself as the target. Both self-enhancing humour and affiliative humour have been positive correlated with well-being, while aggressive humour and self-defeating humour have been negatively correlated with well-being. However, the mechanism by which these distinct styles of humour may affect well-being is still unclear. Furthermore, although aggression and social relationships appear to relate to humour use, results in this area have been mixed, and the differential effects of anger expression and suppression remain unexplored. Based on these findings, the overarching aim of this cross-sectional study was to analyze the relationships between humour styles, perceived social support, anger, depression, and life satisfaction. A total of 473 undergraduate university students each completed a series of online questionnaires assessing the study variables. As hypothesized, strong correlations were found between humour styles and social support. For example, the use of affiliative humour was significantly associated with higher levels of social support, even after controlling for related confounds. Interestingly, the extent to which participants express or suppress their anger related differentially to humour styles. For instance, participants who tended to suppress their anger also reported using higher levels of self-defeating humour. These results suggest the need for further investigation into both predictors of humour style, and factors that may moderate and mediate the relationship between humour styles and well-being.

Dangerous Decisions: Interaction of juror attitudes and defendant appearance on legal decisions.

Student: Natasha Korva
Supervisor: Stephen Porter

Research has demonstrated that judges and jurors make implicit assessments about defendant appearance that impact impressions of guilt. Dangerous Decisions Theory (DDT; Porter & ten Brinke, 2009) posits that intuitive evaluations of facial trustworthiness influence the evaluation of evidence presented in courtroom settings. The present study expands on recent research exploring the DDT, and examines the role of biases and attitudes in legal decision-making. Replicating the methodology used by Porter, ten Brinke and Gustaw(2010), participants (N=98) were presented with two vignettes describing severe or petty crimes, accompanied by a photograph of the supposed male or female defendant. Photos of defendants were previously rated as highly trustworthy or untrustworthy. Following the presentation of the evidence in each case, participants then rated the defendant's culpability. Participants also completed questionnaires assessing potential biases.

Results indicated that participants who held a racial bias were less likely to consider exonerating evidence, specifically for an untrustworthy defendant. Individuals endorsing justice fairness and recognizing that biases can have a detrimental effect on legal decision-making, in contrast, were more likely to exonerate a perceived untrustworthy defendant. These results suggest that untrustworthy faces activate particular biases, and a tunnel-vision approach to decision-making that may lead to wrongful convictions in a legal setting.

Modern Mnemonics: Emotion, Hemispheric Interaction, & the DRM Paradigm

Student: Nathan Ryckman
Supervisor: Dr. Barbara Rutherford

This study examines the theory that rapid bilateral saccadic eye movement effects subsequent memory performance by increasing the level of interaction between the hemispheres of the brain. Emotionally valenced and neutral DRM lists (lists of 15 highly related words with one highly correlated non-presented lure word) were accompanied by a visual hemifield disruptor that allowed for either a single or both hemispheres to engage the word at encoding. Accuracy on a serially presented recognition memory test was measured. The results show that saccadic eye movements have no effect on the remembering of the word lists, though emotion did. Based on these findings, hemispheric interaction is likely not the underlying mechanism of the memory benefits observed in previous research examining saccadic eye movements.

Psychometric Properties and Item- and Test-Level Bias in the Beck Hopelessness Scale Across Community, Clinical, and Forensic Samples

Student: Priscilla Healey
Supervisor: Dr. Brian O'Connor

The Beck Hopelessness Scale (BHS) is a 20-item dichotomous self-report apparatus designed to measure various levels of hopelessness (Beck et al., 1974), and has shown to be a better indicator of suicide ideation and self-harm than severe depression. Previous factor analyses, using Pearsons r correlation matrixes, have yielded inconsistent results identifying numerous multidimensionality factor structures that vary based on the sample size and population. In addition, normative data on the BHS was obtained through assorted clinical samples, and further investigation of this test's functioning in other populations is warranted. The psychometric properties of the BHS were examined in data from 1414 participants from four different samples (hospital clinical patients = 325, juvenile delinquents = 492, prison inmates = 335, undergraduate students = 262). Initial analyses provided evidence for the unidimensionality of the items across samples, with one dominant factor and much smaller subsequent factors. Item response theory (IRT) analyses revealed identified redundancies among some BHS items, suggesting the measure can be shortened. Differential item functioning (DIF) and differential test functioning analyses (Oshima, 2008) will be conducted to examine item and test bias across the four samples. Preliminary analyses indicate occasional, statistically but minor levels of bias at the item level. However, it is expected that the item biases will cancel each other out at the test level.

A Novel Intervention for the Enhancement of Well-Being

Student: Seton (Linden) Timoney
Supervisor: Dr. Mark Holder

Happiness has been positively linked to resilience, increased immunocompetence, and greater longevity. Though research has validated a number of behavioral and observational methods of increasing happiness, studies have overlooked the possibility of increasing happiness and reducing depression through a method known as priming. Prior research demonstrates that priming individuals with a specific concept (e.g., rudeness) can activate thoughts and behaviors (e.g., decreased latency to interrupt a conversation between two confederates) consistent with that concept. The present study attempted to increase positive well-being by priming individuals with the concepts of happiness, joy, and optimism. Undergraduates were randomly assigned to one of three groups. Participants unscrambled sentences containing either happy, sad, or emotionally neutral words. Participants then completed measures of positive and negative well-being, and a behavioral measure of prosocial behavior. We anticipated that individuals in the happy condition would score higher on measures of positive well-being and lower on measures of negative well-being than individuals in the sad and neutral groups. We also predicted that individuals in the happy condition would be more likely to display prosocial behavior. However, analyses revealed no significant multivariate or univariate effects ($ps > .05$). Despite that a large body of literature reliably reports priming of a wide variety of attitudes and behaviors using similar methods to those used in the present study, priming did not increase happiness or prosocial behavior, or decrease depression. The present findings lend support to the perspective that in order to experience an emotion, an individual must be consciously aware of its source.