Science Atlantic | Science Atlantique

Student Awards Yearbook 2015-2016

Introduction

I'm pleased to share the 2015-16 Awards Yearbook with you, showcasing outstanding students from across the region who have presented or competed at one of the nine annual academic conferences sponsored by Science Atlantic this past year.

This Yearbook recognizes Atlantic post-secondary students who excel in scientific research and science presentation skills. The names, pictures, and presentation abstracts of these outstanding students can be found in the following pages.

Please also take a moment to learn of the many sponsors who make these awards and conferences possible. As well, a hearty thanks is extended to the students, faculty, and staff of the host institutions who worked hard to make these conferences successful!

Academic student conferences provide an opportunity for students to learn not only from experts in their field, but also from their peers. Students are given the chance to present their research outside their home institution (often for the first time), gain invaluable feedback from judges and others in attendance, and make important connections for future education and careers.

Congratulations to all!

Lois Whitehead
Executive Director

2015-16 Conferences

Atlantic Universities Geoscience (AUGC)
October 22-24, 2015
Saint Mary's University

Mathematics, Statistics and Computer Science
October 23-24, 2015
Acadia university

Atlantic Universities Physics & Astronomy (AUPAC)
February 5-6, 2016
Memorial University of Newfoundland

Aquaculture & Fisheries and Biology
March 11-13, 2016
Saint Mary's University

Environment
March 18-19, 2016
Université de Moncton

Psychology
May 12-13, 2016
Université de Moncton

Chemistry (ChemCon)
June 2-4, 2016
Mount Saint Vincent University

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Science Atlantic Science Communication Award

Sponsored By Canadian Science Publishing

Kyle Awalt (SMU)

Ashley Fletcher (SMU)

Dominic Guitard (UdeM)

Deanna Kerry (UPEI)

William Kidney (Acadia)

Sara Klapstein (MUN)

Katie McCulloch (Acadia)

Jennifer Poirier (StFX)

Laura Prichard (STU)

Christopher Small (UNB-F)

Hayley Tomkins (DAL)

Science Atlantic Undergraduate Research Award

T-Jay Anderson (MSVU)

Sonya Ardley (Acadia)

Alyssa Belong (MtA)

Emily Bond (DAL)

Karen Buckle (STU)

Taylor Brown (Acadia)

Yong Hong Chen (Acadia)

Natasha Collins (MUN)

Kody Crowell (Acadia)

Lisa Fang (MUN)

Bradley Greene (SMU)

Jacob Hambrook (UNB-F)

Sarah Hirtle (UNB-F)

Jennifer Hunter (UNB-F)

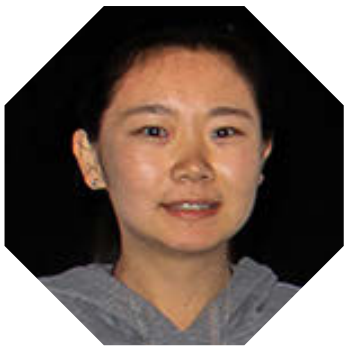
Science Atlantic Undergraduate Research Award

Thomas Huynh (DAL)

Sota Ichiba (Acadia)

Faith Lee (MUN)

Yinduo Ma (StFX)



Federico Mora (MtA)

Alexandre Pepin (UdeM)

Tanya Prystay (DAL)

Matthew Robertson (DAL)

Rachel Shin (DAL)

Samantha Stachiw (StFX)

Hayley Tomkins (DAL)

James Williams (StFX)

Jason Wuertz (UPEI)

Science Atlantic Graduate Research Award

Allison Dickhout (UNB-F)

Aaron Frenette (UNB-F)

Chris Lavoie (DAL)

Kieran Murphy (StFX)

Christopher Small (UNB-F)

Alex Veinot (SMU)

Emily Walker (SMU)

ACEmat Computational Modeling of Materials Award

Alexandre Pepin (UdeM)

Siobhan Morris (StFX)

Ifenna Mbaezue (SMU)

Conference Specific Awards

Biology

Emily Corkum (DAL)

Botany Award
Sponsored by the Canadian Botanical Association

Chemistry (ChemCon)

Sponsored by the Chemical Institute of Canada (CIC)

Best Undergraduate Presentation in Biological/Medicinal Chemistry

Julia McCain (Acadia)

Blake Power (MUN)

Best Undergraduate Presentation in Materials Chemistry

Adrienne Allison (DAL)

Kori Andrea (CBU)

Best Undergraduate Presentation in Analytical Chemistry

Ryan Greenham (Acadia)

Presley MacMillan (SMU)

Best Undergraduate Presentation in Inorganic Chemistry

Mason Lawrence (MUN)

Angela Todd (SMU)

Chemistry (ChemCon) Continued

Chandika Ramful (SMU)

Rachael Weagle (Acadia)

Best Undergraduate Presentation in Organic Chemistry

Melanie Davidson (SMU)

Murray Brooker Award in Chemistry

Best Undergraduate Presentation in Theoretical or Computational Chemistry

Archita Adluri (MUN)

Mitchell Pinto (Acadia)

Sponsored by the Canadian Association of Theoretical Chemists (CATC)

Environment

Amanda Ring (DAL)

K.C. Irving Environmental Science Centre Award

Geoscience (AUGC)

Glen Hodge (SMU)

Imperial Oil Best Poster Award

Daniel MacLeod (StFX)

Canadian Society of Petroleum Geologists (CSPG) Award

Geoscience (AUGC) Continued

Corwin Trottier (SMU)

The Frank S. Shea Memorial Award in Economic Geology

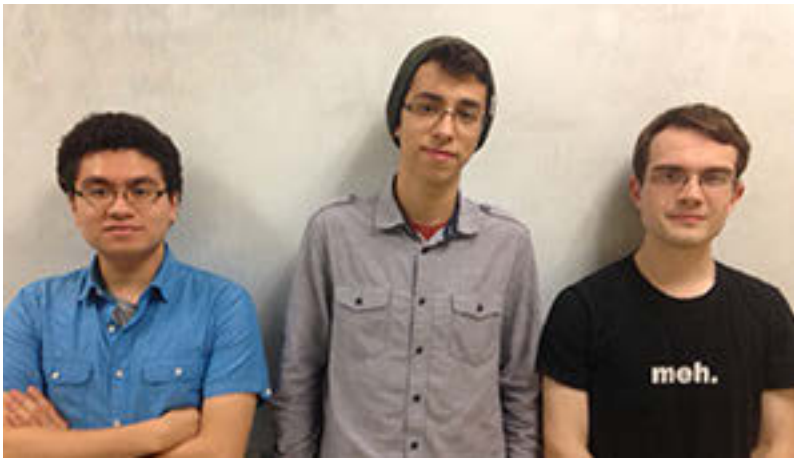
Kazuhito Mizutani (MUN)

Environmental Geoscience Award
Sponsored by the Atlantic Geoscience Society

Mathematics, Statistics & Computer Science

Science Atlantic Computer Science Programming Competition

1st Place
The Big Theta 3 (MtA)
William Fiset, Micah Stairs & Finn Lidbetter



2nd Place
UNB Red (UNB- F)
Raphael Beaulieu, Vlad Marica & James Harris

3rd Place
Dalhousie G0ld (DAL)
David Zorychta, Mathew Farrell &
Salman Mohammed

Mathematics, Statistics & Computer Science Continued

Mathematics Problem Solving Competition

1st Place

Noah MacAulay (MUN)

Michael Sullivan (MUN)

2nd Place

Brandon Doherty (UNB-F)

Jack O'Connor (UNB-F)

3rd Place

Shael Brown (DAL)

Jingwei Li (DAL)

Physics and Astronomy (AUPAC)

Stefan Juckes (DAL)

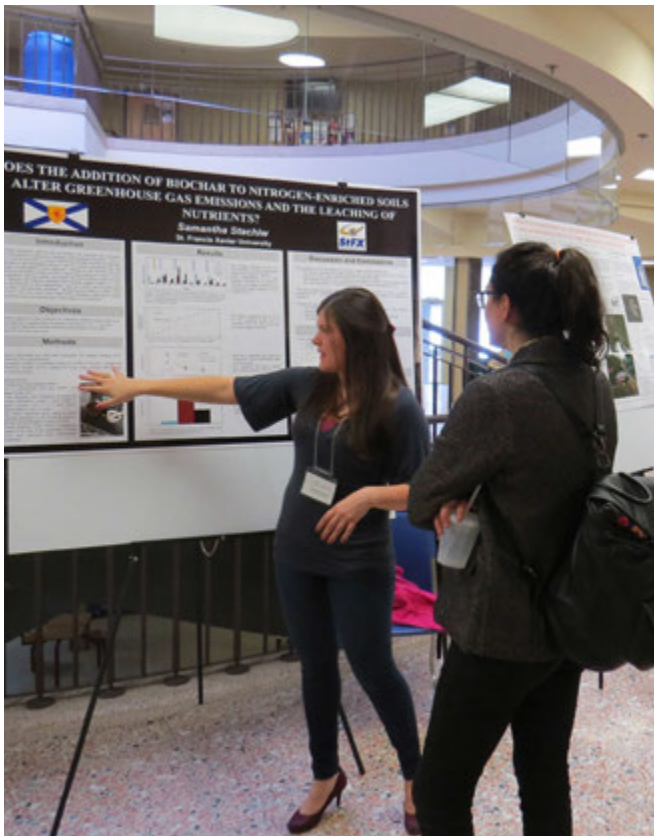
Andrew Way (MUN)

Tindall/Steinitz Award in Research

Psychology

Yasmin Beydoun (DAL)

Karen Nicholson Award in Neuropsychology



2015-16 Partners and Sponsors

Acadia University

ACEnet

Aquaculture Association of Canada (AAC)

Association des ingénieurs et des géoscientifiques du Nouveau-Brunswick (AIGNB)

Association of Professional Geoscientists of Nova Scotia (APGNS)

Association of Psychologists of Nova Scotia (APNS)

Atlantic Elver Fishery

Atlantic Geoscience Society (AGS)

Atlantic Society of Fish and Wildlife Biologists (ASFWB)

Bruker Canada

Canadian Association of Theoretical Chemists (CATC)

Canadian Centre for Fisheries Innovation (CCFI)

Canadian Psychological Association

Canadian Science Publishing

Canadian Society for Brain, Behaviour and Cognitive Science (CSBBCS)

Canadian Society of Exploration Geophysicists (CSEG)

Canadian Society of Petroleum Geologists (CSPG)

Chemical Institute of Canada (CIC)

Chemical Institute of Canada, Chemical Education Trust Fund

Chemical Institute of Canada, Maritime Division

Chemical Institute of Canada, Newfoundland and Labrador

City of St. John's

Clean Annapolis River Project

Clearwater Seafoods Ltd.

Collège des psychologues du Nouveau- Brunswick (CPNB)

Concordia University

Consortium national de formation en santé (CNFS)

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2015-16 Partners and Sponsors

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Mount Saint Vincent University, Office of the President
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Université de Moncton, Conseil étudiant de l'école de psychologie
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Université de Moncton, Faculté des arts et des sciences sociales
Université de Moncton, Faculté des études superieures et de la reserche
Université de Moncton, Faculté des sciences
Université de Moncton, Faculté des sciences de la santé et des services communautaires
Université de Moncton, l'alUMni
Université de Moncton, Vice-rectorat à l'enseignement et la recherche
University of Alberta
University of Ottawa

Science Atlantic Member Institutions

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Dalhousie University

Dalhousie Agricultural Campus

Grenfell Campus (Memorial University)

Memorial University

Mount Allison University

Mount Saint Vincent University

Natural Sciences & Engineering Research Council of Canada

Saint Mary's University

St. Francis Xavier University

St. Thomas University

Université de Moncton

University of New Brunswick, Fredericton

University of New Brunswick, Saint John

University of Prince Edward Island

Abstracts

DFT-Calculated Molecular Polarizability as a Single Parameter Descriptor for the Partitioning and Phase Behaviour of Chlorinated and Brominated Compounds

Archita Adluri (Memorial University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the CATC Award for the Best Undergraduate Poster Presentation in, Theoretical or Computational Chemistry

Organochlorine and organobromine compounds like polychlorinated diphenyls (PCBs) and polybrominated diphenyl ethers (PBDEs) are persistent environmental pollutants with significant toxicity. The partitioning and volatility of these compounds are important factors in predicting their toxicity and environmental fate. A general but simple Quantitative Structure Predictive Relationship (QSPR) was developed for the vapor pressure (Pvap) and water/octanol partition coefficient (Kow) of organochlorine and organobromine species. Simple linear regression was used to determine the relationships between these properties and the calculated molecular polarizability of a test set of 105 molecules. The polarizability was calculated using density functional theory (B3LYP/aug-cc-pVTZ). The coefficients of determination were R2=0..96 and 0.93 for log Kow and log Pvap, respectively. Even the relative properties of structural isomers within this set were predicted with generally good accuracy. This relationship is used to predict pVap and KOW for similar organochlorine and organobromine species where there are no experimental values available. This QSPR provides a straightforward means to estimate the partitioning of these compounds using only a single descriptor, which can be calculated routinely using standard quantum chemistry programs.

Electrochemical Impedance Spectroscopy of Pseudocapacitive Manganese Oxide Electrodes after Increasingly Long Potentiostatic Holds

Adrienne Allison (Dalhousie University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the CIC Award for the Best Undergraduate Poster Presentation in Materials Chemistry

A major challenge when using an organocatalyst is separating it from reaction products. We are developing heterogenized organocatalysts that can be easily separated from reaction mixtures, which do not rely on covalent immobilization. Although covalent bonding avoids significant catalyst leaching, they are conformationally rigid and lack mobility, which impacts their interactions with reactants. Therefore, we are exploring electrostatic interactions as an immobilization method, which provides conformational freedom while localizing the catalytic species near the solid support. Amberlite® IRN78, an anion exchange resin made of the styrene-divinylbenzene copolymer, was loaded with L-prolinate or L-prolinesulfonate organocatalysts (15.5 and 15.9 wt%, respectively) as counterions. The newly generated catalysts were tested in the model asymmetric aldol condensations and evaluated for conversion, yield, and diastereoand enantioselectivity. Significant leaching of L-prolinate from the ion exchange resin resulted in a loss of activity upon catalyst recycling; however, L-prolinesulfonate is showing improved reaction selectivity and recyclability.

What's all the Hype about Binaural Beats? An Examination of the Differential Effects of Binaural Beats, Arousal, and Placebo on Attentional Vigilance

T-Jay Anderson (Mount Saint Vincent University)

Presented at the Science Atlantic Psychology Conference, May 12-13, 2016

Winner of the Science Atlantic Undergraduate Research Award

Binaural beats (BB) are an auditory illusion in which a single pulsating beat is heard even though two slightly different sound waves are presented to each ear. Although widely advertised as revolutionary self-help technology, supporting evidence is scant. One purported benefit of BB is improved concentration/ ability to sustain attention. In two experiments, the validity of this claim was tested. In Exp. 1, participants listened to BB, arousal-inducing tones (AT), and white noise (WN) while engaged in an Identical Pairs-Continuous Performance (IP-CP) vigilance task. Half received the suggestion that BB are "scientifically proven" to increase attention and focus in order to induce an expectation of enhanced mental ability and task performance. Overall, BB did not increase accuracy or reduce RT on the IP-CP. Both the BB and the AT resulted in more false alarms than did WN. A positive expectation of BB resulted in significantly lower hit rates than did no exposure. These findings suggest BB do not enhance vigilance, and positive expectations seem to have a negative effect on vigilance. Exp. 2 was conducted to test whether refinements to the methodology would affect the results. Changes included utilizing a between-subjects design, pre-testing the auditory stimuli with physiological measures to ensure the arousal produced by BB and AT were equal and higher than WN, and increasing the length of the vigilance task. The combined findings are discussed with respect to the degree to which BB, increased arousal, and positive expectations (i.e., placebo) affect vigilance performance.

Interactions between Superparamagnetic Iron Oxide Nanoparticles and Cellulose for Biomedical Applications

Kori Andrea (Cape Breton University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the CIC Award for the Best Undergraduate Oral Presentation in Materials Chemistry

Magnetic nanoparticles have become prominent in many biomedical applications. One example is their use in wound management to control or detect sepsis. Currently, wound monitoring involves bandage changes and visual inspection by a healthcare professional. However, wound-healing processes have several biomarkers that include temperature changes, which can be targeted to develop biosensors. These can be incorporated into wound dressings and reveal temperature changes during healing, allowing detection of early signs of infection without bandage removal. Our research involved development of smart wound dressings incorporating ferromagnetic nanoparticles (NPs) that remotely respond to thermal variations. This involved incorporating the ferromagnetic NPs onto cellulose fibers that are used as absorbents in wound-dressing materials. Before the NPs could be incorporated into dressings in clinical practice, their interactions with cellulose must be understood. Thus, we conducted many investigations of the immobilization mechanism between ferromagnetic NPs and cellulose. Here we report the immobilization of ferromagnetic NPs on cellulose wound dressings and describe the NP/cellulose interaction.

Investigation of Effluent Water Quality and Treatment Options for a Carrot Processing Facility

Sonya Ardley (Acadia University)

Presented at the Science Atlantic Environment Conference, March 18-19, 2016

Winner of the Science Atlantic Undergraduate Research Award, first place

The purpose of this study was to investigate the effluent quality of a food processing plant in rural Nova Scotia, which primarily processes frozen carrot and blueberry products between August and November. Wastewater from production was directly discharged into an adjacent saltwater basin and had historically met the operating guidelines established by Nova Scotia Environment. However, during the 2014 processing season, Environment Canada conducted an acute lethality fish test to assess the quality of the final effluent discharged directly from the pipe outlet. The test failed, which lead to an environmental direction to treat the effluent in order to pass an additional test one year later. A data review and comprehensive sampling program was established to profile the plant processing water quality, in order to determine the cause for the failed fish test and explore possible solutions. Results indicated that it was primarily the high biochemical oxygen demand (BOD) which was responsible for depleting dissolved oxygen, and suffocating the fish during the acute lethality test. Certain processes in the plant were identified as being high contributors to organic loads in the effluent. Additionally, the results of the sampling program indicated that the current wastewater treatment at the Hillaton plant was insufficient, which initiated bench-scale wastewater treatment experimentation using activated sludge and coagulation/flocculation methods. The most effective treatment option for the Hillaton plant proved to be activated resulted in the greatest BOD reduction.

N-Demethylation of Alkaloids Using Nanoscale Zero-Valent Iron

Kyle Awalt (Saint Mary's University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the Science Atlantic Science Communication Award

The N-demethylation of naturally occurring opiate compounds is a necessary step in the synthesis of pseudo-opioid pharmaceuticals. Such drugs have gained recent media attention in the fight against opiate addiction; hence, the ability to synthesize them efficiently is important. This work aims to improve the N-demethylation of alkaloid precursors through the use of nanoscale zero-valent iron in a modified Polonovski reaction. Initial studies performed on dextromethorphan, 1, using a nanoscale zero-valent iron catalyst compare favorably with literature results using commercially available iron(0) dust,1 yielding similar amounts of the demethylated product, 2, in one third the reaction time or with 10% of the catalyst loading.

Identification of Rickettsia species in Nova Scotia and New Brunswick ticks

Alyssa Catherine BeLong (Mount Allison University)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Undergraduate Research Award, third place, poster

Rickettsia spp. bacteria, also known as spotted fever group bacteria, are obligately intracellular bacteria that can cause potentially lethal illnesses in humans and other mammals. Due to the intracellular replication of this group, Rickettsiae are typically transmitted between vertebrates via arthropod vectors such as ticks. The best known illness of this type, Rocky Mountain spotted fever (RMSF), is the most lethal tick borne illness in North America and is caused by one species member of this group, Rickettsia rickettsii. In this study, the risk of spotted fever rickettsiosis in the Maritimes was assessed by examining the prevalence of different rickettsial species in Nova Scotia and New Brunswick ticks. This was done by PCR amplification and sequencing of the rickettsial gltA, 17kDa, 16S, OmpA and OmpB genes under supervision of Dr. Vett Lloyd. The rickettsial genus gltA gene was amplified in 50% (5/10), 60% (6/10)

Studying Morpho-semantic and Morpho-syntactic Anomalies in Modern Standard Arabic through ERPs

Yasmin Beydoun (Dalhousie University)

Presented at the Science Atlantic Psychology Conference, May 12-13, 2016

Winner of the Karen Nicholson Award in Neuropsychology

Modern Standard Arabic (MSA) is the literary standard used by Arabic speakers. Its words are composed of two overlapping morphemes: a semantic morpheme that is a 3-consonant root containing the meaning of the word, and a syntactic morpheme that is the sets of letters inserted into the roots to form new words. The objective of the study was to understand how overlapping morphology is processed using semantic and syntactic neurocognitive distinctions. We tested native Arabic speakers using EEG as they read sentences that contained either a correct final target word, a morpho-semantic anomaly or one of two morpho-syntactic violations (semantically related and unrelated). Two (ERPs) were examined: The N400 associated with semantic violations and the P600 associated with syntactic anomalies. We hypothesized that when reading a morpho-syntactic anomaly an N400 will be elicited and that both types of morphosyntactic anomalies will elicit a P600 in addition to small N400 responses (larger in the unrelated condition). The majority of the results were as predicted: the morpo-semantic anomaly elicited a prominent N400 effect in the centroparietal regions while the semantically related morpho-syntactic anomaly elicited a significant P600 peak in the posterior regions in addition to a smaller, but significant, N400 effect. The unrelated morpho-syntactic condition elicited a smaller, but significant P600 as well as an N400 response. Results point to a distinction in processing for each morpheme in MSA, with a plausible interaction between them when considering the general semantics. Results have implications for better understanding sentence processing in under-studied languages.

Testing the Effects of Sediment Acidification and Predator Cues on the Burrowing Behaviour of Juvenile Mya Arenaria

Melanie Bishop (University of New Brunswick, Saint John)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Undergraduate Research Award, honourable mention, poster

The increasing concentration of atmospheric carbon dioxide (CO_2) from human activities has led to greater absorption of CO_2 into ocean surface waters, altering seawater chemistry and lowering pH. This so-called Ocean acidification can also lower sediment pH and can result in physiological and behavioural impacts on marine organisms. This study aimed to investigate the impacts of sediment acidification (addition of CO_2) and green crab (Carcinus maenus) predator cues on the burrowing behaviour of juvenile (≤ 5 mm) soft-shell clams, Mya arenaria. Additionally, this study aimed to assess whether changes to GABAA (gamma-aminobutyric acid) neurotransmitter functioning could be a possible mechanism driving clam burrowing responses to more acidic sediment conditions. In the first experiment, clams were exposed simultaneously to conditions that varied in terms of acidity and predator cues. In a second experiment, clams were treated with an antagonist of the GABAA neurotransmitter receptor (gabazine) to investigate whether burrowing responses to acidic sediment conditions would change when clams were treated with gabazine. In the first experiment, there was no significant interaction between sediment acidity and presence of predator cues, although acidic sediments significantly reduced the proportion of clams burrowing. In the second experiment, there was a significant interaction between the effects of gabazine and sediment acidification. When treated with gabazine, clam burrowing in acidified sediment was restored to proportions similar to those observed in non-acidified sediment, suggesting that elevated CO_2 concentrations can interfere with GABAA neurotransmitter receptor functioning in soft-shell clams (likely in their pedal ganglia), resulting in atypical behaviour.

Pre-Nesting Behaviour of Western Atlantic Leatherback Sea Turtles, *Dermochelys Coriacea*

Emily Bond and Michael James (Dalhousie University)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Undergraduate Research Award, first place, oral

Satellite telemetry can provide rare insight into the life histories of highly migratory marine species. In the Northwest Atlantic, the leatherback sea turtle, Demochelys coriacea, has a broad geographic range extending from nesting beaches at low latitudes to foraging grounds off the coast of Eastern Canada. Leatherbacks are capital breeders that fast during the nesting season and exhibit relatively low levels of multiple paternity within clutches. Though various hypotheses regarding the timing and location of leatherback mating activity have been proposed, these are largely not supported by empirical data. In this study, six mature female leatherbacks were equipped with satellite-linked transmitters off Nova Scotia prior to their southern migration. Tracked turtles completed their southward migration before nesting in Colombia (n=2), Trinidad (n=2), Guyana (n=1) and French Guiana (n=1). Using kernel density estimates, residency areas were inferred from 50% volume contours over a standardized time interval of 120 days prior to first nesting. All individuals first exhibited offshore residency within a relatively small range of latitude before transiting to their respective nesting beaches. Analysis of the movements of mature male leatherbacks (n=11) revealed similar offshore seasonal residency patterns. While previous telemetry work indicates that some males reside adjacent nesting beaches for a portion of the nesting season to seek mates, analysis of offshore residency at low latitudes during the period of follicular development before first nesting highlights additional important mating areas for this population.

Landscape Genetics of Lake Chub (Couesius Plumbeus) In a Branching River Drainage in Northern Labrador

Hilary Brewis (Dalhousie University)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Undergraduate Research Award, honourable mention, poster

Knowledge of population genetic structure in spatially complex river systems is necessary for future attempts of conservation of freshwater fish species in Canada's vulnerable northern watersheds. I examined patterns of contemporary and historical connectivity to determine the population structure of Lake Chub (Couesius plumbeus) for seven lakes in the Kogaluk River system in northern Labrador. Fin clip samples of Lake Chub (N=726) collected from the drainage were examined for polymorphism at 19 microsatellite loci. Relatively high levels of population structure were observed, along with low contemporary migration rates between lakes, thus indicating populations to be relatively isolated.
Factors responsible for this observed structure were then explored. No pattern of isolation-by-distance was observed despite migration being physically possible, suggesting a lack of migration-drift.

Fall Migration Decisions of Northern Saw-Whet Owls at an Ecological Barrier

Taylor Brown (Acadia University)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Undergraduate Research Award, third place, oral

Migration is a perilous undertaking for any organism, and is often only undertaken within a restricted range of intrinsic and extrinsic motivating factors. The added risk of crossing an ecological barrier such as a large body of water means that migratory decisions based on these factors are much more crucial for survival than they would be otherwise. Aside from limited data garnered from banding-recapture studies, little was previously known about migratory habits of northern saw-whet owls (Aegolius acadicus), especially with respect to how they navigated large expanses of water such as the Gulf of Maine. Between 12 October 2015 and 10 November 2015, 26 saw-whet owls were captured at two NS sites using mist nets, banded, and fitted with VHF radio-transmitters. Using data downloaded from receiver towers along the coastlines of Canada's Maritime Provinces and the northeastern United States, we tracked individual saw-whet owls as some reverse migrated, some remained on winter territories, and some forward migrated directly over the Gulf of Maine. The latter results provide insights into a previously unknown feat of migration by a small (80-100g) nocturnal raptor.

Spontaneous Activation of Causal Inferences Consistent with the Self-Serving Bias: A Probe Recognition Investigation

Karen Buckle (St. Thomas University)

Presented at the Science Atlantic Psychology Conference, May 12-13, 2016

Winner of the Science Atlantic Undergraduate Research Award

Spontaneous inferences are instantaneous, automatic, and unintended assumptions about behaviours or outcomes. Existing research demonstrates different types of spontaneous inferences, including trait, situation, and social role. For example, if given the description "John gets an A on a test", one may automatically infer that John is smart or that the test was easy, without being aware of their inferences about the reason for John's success. The present experiment aims to further our knowledge of spontaneous inferences in the area of self-perception by exploring to what extent the self-serving bias (i.e., the tendency to take credit for our successes and place blame for our failures) influences spontaneous causal inferences about one's own behaviours. The experiment uses a probe recognition methodology, which measures participants' accuracy and reaction times when rejecting probe words that are not present in a target sentence. Since spontaneous inferences should interfere with the task of probe rejection, reaction time and accuracy were expected to be slower and worse for causal probes consistent with typical self-serving attributions. Participants were slower at rejecting external causal probes for negative outcomes, consistent with the predicted direction, but they were also slower at rejecting external causal probes for positive outcomes, which was inconsistent with the predicted direction. The findings may help in understanding the degree to which the self-serving bias influences individuals' interpretations of positive and negative life events.

Android App for Crop Yields Estimation Using Machine Learning Methods

Yong Hong Chen (Acadia University)

Presented at the Science Atlantic Mathematics, Statistics and Computer Science Conference, October 23-24, 2015

Winner of the Science Atlantic Undergraduate Research Award, first place

A major problem in the agricultural and forestry fields is how to speed up the process of measuring harvest. Farmers are unable to know the crop yields until they harvest, pack up and measure their crops in use of manual mechanical equipment. Therefore, we wish to develop a smartphone application with access to a cloud-based machine learning service that can estimate the amount of crops on the bush or tree in order to facilitate the harvest-counting process. Relevant background on Android platform and machine learning predictive models is reviewed. The development process of a mobile harvest-counting system is presented as well. Currently, an Android application and a machine learning model for counting. blueberries in the fields have been built. The predictive model is tested on a set of images based on the output estimates of blueberries along with a black and white density image that visualizes the distinction between objects and their surroundings. It is shown that the model is capable of distinguishing blueberries precisely from their surroundings in images of blueberry bushes and that images with a proper blueberry size (near the ones used to train the model) would usually get a good approximation of actual count.

Investigation of Growth Rates in Thyasirid Bivalves

Natasha Collins (Memorial University)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Undergraduate Research Award, second place, poster

Some marine bivalves form symbioses with chemoautotrophic, sulphur-oxidizing bacteria, and supplement their particulate feeding diet with symbiont-derived nutrients. The broadly distributed family Thyasiridae contains both symbiotic and asymbiotic species, and the former often reach larger sizes than the latter, presumably due to the extra nutrients obtained from their symbionts. In Bonne Bay, Newfoundland, multiple thyasirid species coexist: symbiotic Thyasira cf. gouldi, closely related but genetically distinct asymbiotic T. cf. gouldi, and another asymbiotic species, Parathyasira sp. Symbiotic T. cf. gouldi can reach larger sizes than asymbiotic T. cf. gouldi, and Parathyasira may be even larger. Here, I use different methods to test whether larger thyasirids have a greater growth rate than smaller thyasirids, or whether they are older. I hypothesize that symbiotic T. cf. gouldi have the most efficient nutrient assimilation capacity and therefore the highest growth rate, followed by Parathyasira sp. (which may live longer) and asymbiotic T. cf. gouldi. Measurements of shell growth bands, carbon and oxygen stable isotope analysis of shell carbonates, elemental analysis on cross-sections of shells, and growth measurements after marking shells with a fluorescent dye all indicate that Parathyasira sp. Has the fastest growth rate of the three groups of bivalves. Stable isotope analysis shows that asymbiotic and symbiotic T. cf. gouldi have similar growth rates, while growth bands and elemental analysis suggest that symbiotic individuals grow slightly faster than asymbiotic ones. Parathyasira appears to have very efficient particulate feeding, and symbiont presence may only provide a small growth enhancement to Bonne Bay thyasirids.

Floral Sex Allocation in Three Species of Lobelia

Emily Corkum (Dalhousie University)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Botany Award

Sex allocation theory predicts that hermaphrodite organisms will display an optimal pattern of investment in each sex function in order for each individual to maximize its reproductive success. Plants of the genus Lobelia (Campanulaceae) provide an ideal system in which to study floral sex allocation as their flowers are protandrous (sequentially male and then female) with no overlap. Because flowers open acropetally reproductive opportunity for a given sex changes with flowering position within an inflorescence. Under negative frequency-dependent selection, early (basal) flowers are expected to have higher relative female allocation, while late (apical) flowers are expected to have higher male allocation. This effect is expected to be strongest in highly outcrossing species, and weak or nonexistent in self-fertilizing species. Three related Lobelia species with different mating systems were used to test this theory: L. cardinalis, (primarily outcrossing), L. inflata, (completely self-fertilizing), and L. dortmanna, whose mating system falls somewhere in between. In order to quantify absolute and relative sex allocation, all pollen grains (male allocation) and ovules (female allocation) were collected from 60 flowers of each species. Pollen grains and ovules were counted using image analysis of photos taken through a stereomicroscope. In agreement with sex allocation theory, self-fertilizing L. inflata showed no relationship between position along the flowering stem and relative femaleness, while the more outcrossing L. dortmanna showed a negative relationship. No relationship was found in highly outcrossing L. cardinalis; potential explanations for this result are discussed.

Validating Tidal Models in the Bay of Fundy Using Surface Drifters

Kody Crowell (Acadia University)

Presented at the Science Atlantic Mathematics, Statistics and Computer Science Conference, October 23-24, 2015

Winner of the Science Atlantic Undergraduate Research Award, second place, mathematics

The Finite Volume Community Ocean Model (FVCOM) is used to generate accurate numerical simulations of the tides in the Bay of Fundy in order to better predict the speed of the water in Digby Neck passages. Knowing the model speed, we can calculate and predict the potential power generated by any in-stream tidal turbines. To validate this model, the data was generated at a higher time-resolution within a smaller time window and subsequently compared to experimental data using PySeidon, a python-based tidal validation suite used for analysing FVCOM output. The experimental data was collected from a series of surface drifter runs throughout the passages during ebb and flow tide. Although the model speed showed a remarkable agreement in trajectory behaviour to the observed speeds, it was consistently shifted by some bias, the origin of which is still under speculation. Plotting the cubed ratio of model and drifter speeds within the passages suggested that the discrepancy could be caused by the model's failure to capture water motion at a lower speed. More work is needed to tune the FVCOM model in order to produce more accurate simulations. Future developments include the possible use of a numerical drifter, which could provide insight into the speed bias, generate an understanding of particle motion through passages, and predict the interaction marine life might have with tidal turbines.

Spectroscopic Analysis of a 19th century Tibetan Thangka

Melanie Davidson (Saint Mary's University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the Murray Brooker Award for Best Undergraduate Oral Presentation in Chemical Education

Cultural heritage science brings together scientific methods of analysis and study with a desire to preserve items of importance to our cultural heritage. In this work, the spectroscopic analysis of a Tibetan thangka (The Buddha of Long Life) is presented. The thangka was believed to date to the mid-1800's. In the 1960's the painting underwent a problematic restoration which resulted in an overall darkening of the painting and in addition, a backing layer was applied using an adhesive. Dispersive Raman spectroscopy, surface-enhanced Raman spectroscopy (SERS), confocal Raman spectroscopy and confocal SERS was used to characterize various pigments and the restored adhesive. Spectroscopic analysis was conducted to determine the identity of the pigments and the restored features as well as in an attempt to validate the suspected age of the thangka. Several pigments were identified including: orpiment, vermilion, and Prussian blue. The conclusions made using spectroscopic measurements were consistent with an 18th-19th century Tibetan color palette.

Spatial Variability of Aquatic Ecosystems in a Groundwater Dominated Watershed

Allison Dickhout (University of New Brunswick)

Presented at the Science Atlantic Environment Conference, March 18-19, 2016

Winner of the Science Atlantic Graduate Research Award, second place, oral

Groundwater inputs in river systems supply cool stable flows to the channel creating patchiness in water temperatures across the watershed. Differences in temperature regimes may increase spatial variability of aquatic communities and fish health. This research examines the upper Kennebecasis River, NB, which has high levels of groundwater inputs, and flows through an area with potential to be developed by hydraulic fracturing. In order to detect changes to the aquatic ecosystem due to future development activities, the current surface water conditions within the watershed were characterized. Fish community data was collected along with a suite of environmental variables across a range of sites within the upper Kennebecasis watershed. For more detailed study, a small-bodied fish, the Slimy Sculpin (Cottus cognatus), was used to explore the relationship between temperature regimes and relative organ size and condition. If groundwater inputs affect these fish communities, it was predicted that temperature would explain a large portion of the variability of the community structure and composition. Differences in the relative size of sculpin liver and gonads as well as condition were also expected between sites with high and low levels of groundwater inputs as temperature plays a large role in regulating fish growth.

Horizontal Transmission of the Microsporidia, *Nosema Adaliae*, from the *Adalia Bipunctata* to the *Chrysoperla Carnea*

Ashley Fletcher (Saint Mary's University)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Science Communication Award, biology, poster

The green lacewing, Chrysoperla carnea Stephens, and the two-spotted lady beetle, Adalia bipunctata L.,are two natural enemies commonly used in biological control in North America. They are used in greenhouses and agriculture through augmentative release, and are mass-produced in commercial insectaries in Europe. Both have been found to host different species of microsporidia; however Nosema adaliae has been successfully identified and maintained within A. bipunctata, having a chronic effect on its host. Due to coexistence of the two insects, horizontal transmission of N.adaliae from A. bipunctata to C. carnea will provide knowledge of host specificity of the pathogen and lacewing susceptibility. The objective of this study is to determine if N.adaliae is successfully transmitted through oral consumption, if dose affects transmission, and if the pathogen has effects on C. carnea larval development. Three treatments of varying doses of infected and non-infected A. bipunctata eggs were fed to C. carnea,larvae, and development was observed over 30 days. Experimental trials were conducted under controlled environmental conditions. Sample smears were prepared upon death or after the 30 days, and all test larvae were examined for microsporidian spores. The microsporidium was transmitted to two lacewing larvae, both had died early in development suggesting acute effects of the pathogen. Low transmission suggests pathogen resistance and poor susceptibility of C. carnea to N. adaliae.

The σ-Hole Interaction of 1,3-bis(2,6- diisopropylphenyl)imidazolidine [SiPr] With Iodine-Containing Small Molecules

Bradley Greene (Saint Mary's University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the Science Atlantic Undergraduate Research Award

Iodine-containing small molecules, such as R-CC-I and I-CC-I, can form halogen bonds, interactions that arise from the electrostatic forces between a halogen and Lewis base. This interaction arises from the presence of a σ-hole, an area of relatively positive electrostatic potential on the outer tip of the halogen. Halogens also have the ability to act as both halogen bond donors and acceptors in polyhalide environments. Our interest in N-heterocyclic carbene [NHC] chemistry led us to explore the reactivity of these strong Ccentered bases with several iodine-containing small molecules, in particular, diiodoacetylene [ICCI] and 1- iodo-2- (trimethylsilyl)acetylene [ICC(TMS)]. We have systematically studied the reactions between the NHC, 1,3- Bis(2,6- diisopropylphenyl)imidazolidine [SiPr], and both the iodoalkynes and we have identified and characterized a variety of interesting products. For instance, we isolated SiPr•ICC(TMS) from the reaction with the TMS substituted acetylene. Perhaps the most interesting species were isolated from the interaction of SiPr and ICCI in the presence of excess iodide. [SiPr-I]I•ICCI•I[I-SiPr] and [SiPr-I]I•I2CCI2 •I[I-SiPr] are unprecedented hybrid polyhalide species. Single crystal X-ray data have been collected for all of the products isolated. The structural geometries have been used to investigate the halogen bonding, and other intermolecular interactions, in these novel compounds.

Removal Efficiencies of Wastewater Treatment Technologies for Top Pharmaceuticals

Ryan Greenham (Acadia University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the CIC Award for the Best Undergraduate Oral Presentation in Analytical Chemistry

The presence of pharmaceuticals in wastewater, and their subsequent release in to the environment have attracted growing public concern. While studies were performed to detect pharmaceuticals in waste water effluents, little research has been conducted to assess the efficiency of pharmaceutical removal using different treatment technologies. To assess the removal efficiencies of pharmaceuticals from wastewater, samples were taken from wastewater treatment plants in Nova Scotia and New Brunswick, which were analysed for 12 of the top 20 pharmaceuticals sold in Canada, and 2 metabolites. Pharmaceutical concentrations were quantified, and average removal efficiencies of pharmaceuticals were calculated at the 95% confidence level. The average pharmaceutical removal efficiencies for 9 technologies: aerated lagoon, extended aeration, facultative lagoon, membrane bioreactor, modified conventional, oxidation ditch, primary treatment, rotating biological contactor and sequencing batch reactor technologies, were determined to be 95 ± 0.3%, 87 ± 1%, 94 ± 4%, 97%, 82 ± 4%, 94 ± 0.6%, 23 ± 6%, 87 ± 0.4%, and 75 ± 4% respectively. The negative removal efficiency of primary treatment was due to sampling uncertainty introduced by several hours of retention time. Further experiments were performed to assess dissolved oxygen, chemical oxygen demand, total suspended solids, colour, and turbidity of the samples as well. The results help establish fundamental knowledge for studying pharmaceuticals in wastewater treatment, where improvements need to be made for better preventing pharmaceuticals from releasing into the environment.

Is Backward Recall Really Based on Visuospatial Information?

Dominic Guitard (Université de Moncton)

Presented at the Science Atlantic Psychology Conference, May 12-13, 2016

Winner of the Science Atlantic Science Communication Award

Immediate memory is usually studied by asking participants to recall a short series of items in their presentation order immediately after their presentation. In this task, participants recalled the items from the first presented item to the last. In a variant of the task, called backward recall, participants are asked to recall the items in the reverse order by beginning with the last presented item. It has been suggested that visual-spatial representations are more involved in backward than forward recall (Li & Lewandowsky, 1995; St. Clair-Thompson & Allen, 2013). In two experiments, we tested this hypothesis by asking participants to perform manual tapping which is a secondary task known to interfere with visual-spatial representations. In the manual tapping condition, participants were required to press the 11 outside keys of the numeric keyboard. In Experiment 1, tapping was performed at encoding and in Experiment 2, tapping was performed at recall. In both experiments, recall direction was also an independent variable. At recall, a cue was displayed to indicate whether recall was forward or backward. Results of both experiments revealed that, as expected, recall performance was lowered in the tapping than in the control condition without interference. However, contrary to the visual-spatial hypothesis, the detrimental effect of manual tapping was of similar magnitude in both forward and backward recall.

The Effects of Diet Cycling on Male and Female Mice

Lisa Fang (Memorial University)

Presented at the Science Atlantic Psychology Conference, May 12-13, 2016

Winner of the Science Atlantic Undergraduate Research Award

Obesity is now considered a global epidemic by the World Health Organization as obesity rates continue to rise worldwide. A popular method to combat this epidemic is weight loss through dieting. However, many individuals undergo repetitive cycles of weight loss and subsequent regain. This phenomenon is known as weight cycling or yoyo dieting; however, not much is known about the body's response to yoyo dieting and if that differs between sexes. The aim of the present study is to investigate the physiological and anatomical responses to diet cycling between sexes by using an animal model, as well as evaluate how yoyo dieting affects weight loss. C57Bl/6 mice were given ad libitum access to alternating palatable, calorie dense diet and standard diet over the course of 28 weeks. Both sexes experienced transient hypophagia in response to switches from a palatable diet to a standard diet and transient hyperphagia in response to switches from a standard diet to a palatable diet; however, males showed an attenuated hypophagic response, which suggest that females may be at an increased physiological risk to weight cycling. Females were also found to retain more adiposity. Both cycled males and females were unable to return to the final body weight of controls, and multiple exposures to chow did not appear different to a single exposure to chow. These findings suggest that yoyo dieting is not an effective method of dieting.

Integrative Approach for Specific Identification and Reliable Quantification of a Fish Microsporidianimpacting Aquaculture

Aaron Frenette (University of New Brunswick, Fredericton)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Graduate Research Award, second place, Aquaculture & Fisheries

Microsporidians are fungal parasites that infect a diversity of invertebrate and vertebrate hosts. Fish aquaculture endeavours support epizootics due to the high biotic potential achieved through asexual microsporidian reproduction and the ease of parasite transmission in settings with such high host density. A major obstacle limiting effectiveness of mitigation strategies against microsporidian parasites is the inability to quantify infections reliably. Rational strategies to mitigate infections rely on integrating traditional and molecular methods for parasite identification with knowledge regarding temporal and spatial features of host-parasite interactions. In this study we present an integrative approach using spore morphometrics and nucleotide sequence of the Internal Transcribed Spacer (ITS) of ribosomal DNA to identify Loma morhua infecting Atlantic cod. Related congeneric microsporidians were distinguished using a PCR assay that showed 100% sensitivity in confirming L. morhua infections. Our identification of 11 polymorphic ITS variants was compatible with the enhanced analytical sensitivity of parasite detection achieved using conserved primers that amplify known congeneric species. Spatial assessment of infections identified the spleen as most reliable organ for detecting parasites (96.6% prevalence). Accordingly, we focused on the spleen to developed qPCR methodologies effective in quantifying L. morhua infections. The utility of our qPCR assay was substantiated through the identification of differential infections between different cod family lines. This research is amenable to transfer of technology for integrative approaches that will be required for identification and mitigation of pathogens as aquaculture diversifies to include alternative finfish species.

Insights into the Establishment and Regional Expansion of an Exotic Swim Bladder Nematode of American Eels

Jacob Hambrook (University of New Brunswick, Fredericton)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Undergraduate Research Award, second place, oral

Anguillicola crassus is a parasitic nematode that infects eels and causes swim bladder pathology. The parasite was first documented in the Japanese eel Anguilla japonica in East Asia. It was introduced to American eels (Anguilla rostrata) and was first identified in South Carolina in 1995. The first recorded instance of the exotic parasite in Canadian waters was in Nova Scotia in 2007. We monitored invasion and establishment of this parasite in New-Brunswick. We observed rapid establishment of A. crassus infection in two New-Brunswick river systems draining into the Bay of Fundy. A significant increase in parasite prevalence was observed from 2013 to 2015. We report for the first time, the establishment and proliferation of the parasite in a Prince Edward Island river (2014-2015). Anguillicola crassus was absent from New-Brunswick rivers draining into the Northumberland Strait in 2013-2014, but was identified in three of four rivers sampled in 2015. Parasite morphometrics and PCR amplification of the large ribosomal DNA subunit were performed to confirm species identity across the expanded host range. Parasite establishment in American eel populations and invasion of Atlantic Canadian river systems is rapidly ongoing and parasite transmission dynamics must still be elucidated. Our molecular tools for parasite identification are amenable to antemortem detection of infection towards elucidation of transmission dynamics. Given that the American eel is currently classified as threatened (COSEWIC), population level impacts are best studied without the need to kill the host.

Zebrafish as a Model Organism for Parasitic Infections of Translational Significance to Aquaculture

Sarah Hirtle (University of New Brunswick, Fredericton)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Undergraduate Research Award, third place, Aquaculture & Fisheries

Aquaculture is a potential solution to the supply-and-demand problem posed by declining fish stocks (e.g.salmon, cod, eel). The high mortality rates inflicted by fish pathogens compromise the profitability of commercial aquaculture ventures. To combat pathogens, the basic processes by which they operate, especially their modes of infection and transmission must be known. Research colonies of zebrafish show a high prevalence of infection with microsporidian parasites, but little is known about the dynamics of their transmission. The zebrafish is widely used in basic and biomedical research. These parasitic infections represent a confounding variable in research because parasites are known to be master immune manipulators. In this study, we assess the feasibility for vertical transmission of the obligate intracellular microsporidian Pseudoloma neurophilia. This will be modeled through collection of spores from infected zebrafish and injection of these spores into zebrafish embryos. Parasite development and tissue tropisms will be evaluated by light and epifluorescent microscopy. This research will provide an opportunity for mass in vivo culture of P. neurophilia spores. Importantly, artificially inducing parasite infections in embryos may offer a new perspective and screening tools towards generating specific pathogen-free (SPF) zebrafish in addition to a source of parasites for empirical studies. Any developmental or immunological findings gained from zebrafish could also be translated to the study of parasitism in endangered/threatened wild fishes and fishes chosen to diversify finfish aquaculture.

Fluid Inclusion and Stable Isotope Study of Gold Formation in the Lavoie-Maisie Gold District, Northwestern New Brunswick

Glenn Hodge (Saint Mary's University)

Atlantic Universities Geosciences Conference, October 22-24, 2015

Winner of the Imperial Oil Best Poster Award

Hosted in the late Ordovician sediments of the Grog Brook Group, the Menneval gold occurrence in the Lavoie-Maisie Gold district is a gold-bearing quartz vein striking northeast with a strike length of ~600 m (with gold grades ranging from trace to >10g/t). The first discovery at Maisie was in 2011 by M. Taylor, which led to more detailed exploration in the region to further understand the conditions of formation of the gold occurrences, as well as the full expanse of the gold occurrence. Minimum conditions of entrapment and fluid isochores for the system are being determined through fluid inclusion studies of two phase quartz-hosted fluid inclusions (L+V). The average minimum trapping temperatures resulting from these measurements is 177.58 +/- 31.10˚C for 55 single inclusions measured, with the average salinity being 2.77 +/- 0.03 wt% NaCl. Additional constraints on vein formation temperature are being constrained by the chemistry of quartz (Ti-in-quartz thermometry) and rutile (Zr-in-rutile thermometry) in the mineralized veins by means of LA-ICPMS (University of New Brunswick). The timing of rutile formation is unclear at present but initial data suggest that the hydrothermal system locally reached much higher temperatures than suggested by regional metamorphic assemblages. Trace element chemistry of the rutiles in the veins, wall-rocks and associated Ti-bearing oxides in the porphyry intrusion are being compared in order to determine whether the rutile in the veins are wall-rock derived, or crystallized from the same fluids that sourced the gold (possibly from the intrusion). Cathodoluminescence has been used to examine growth textures and brittle structures in the vein quartz in order to determine whether different generations of fluids can be linked to specific growth periods in the veins. SIMS oxygen isotope results (University of Manitoba) showed very little variation in isotope ratios suggesting that either the quartz vein underwent a number of opening-closing cycles which would restore the initial isotope values of the parental fluid reservoir (i.e., open system), or that there was mixing of fluids, with sources being close in isotope values. Themore likely of the two scenarios with the data thus far would be mixing of fluids, involving hydrothermal and metamorphic sources similar salinities and temperatures. Further data are being collected to better constrain the temperatures of the quartz veining, which will then allow fluid sources to be clarified.

Does Access to Notes During a Test Increase Long-Term Retention of Information?

Jennifer Hunter (University of New Brunswick)

Presented at the Science Atlantic Psychology Conference, May 12-13, 2016

Winner of the Science Atlantic Undergraduate Research Award

The current study investigated whether or not having access to study notes during an exam aided in long-term information retention. Many educators allow students to have access to notes during a test but there is little research on how this affects the retention of the studied content. Participants from the undergraduate population at the University of New Brunswick studied 5 informative passages from the Graduate Record Exam (GRE). Participants were then randomly assigned to one of three groups: a one page note-taking condition (no access during exam), a one page note-taking condition (with access during exam), and a control group that simply studied (re-read) the passages. Participants were assessed at the end of their study condition by completing a short multiple-choice test. Approximately one week later, participants returned to complete an identical test without study opportunity. Their scores were assessed to determine whether having access to notes during an exam improved retention compared to no access to notes, or regular study. It was hypothesized that the noteaccess condition would lead to the greatest retention of information due to the unique encoding process that would occur in that condition. No significant differences were found between study condition and long term retention. The main effect of time was significant, reflecting a drop in accuracy from test 1 (immediately after study) to test 2 (one week later). This effect suggested that note creation did not act as a protective factor against forgetting. In addition, the quality of notes created was analysed in terms of word count and instances of paraphrases. Results showed a weak positive correlation between word count and accuracy on the initial test, but this was not significant. The correlation was also examined between instances of paraphrasing and accuracy and was again found to be a weak positive correlation but this result was also not significant.

In Vitro Validation of FAM156 as a Potential Mediator of Paclitaxel Resistance in Breast Cancer

Thomas Huynh (Dalhousie University)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Undergraduate Research Award, first place, poster

Despite advances in treatment, breast cancer remains one of the leading cause of cancer-related mortality affecting Canadian women. Paclitaxel is a principle chemotherapeutic used to breast cancer, however some patients demonstrate no response to paclitaxel treatment. The goal of our project is to develop a genetic profile to predict a patient's response to paclitaxel prior to drug administration by identifying genes that mediate resistance to paclitaxel. FAM156 gene was identified in a previously performed RNAi in vivo screen. An in vitro assessment was performed to validate their proposed role. Individual knockdown of FAM156 was generated by performing a lenti-viral shRNA knockdown in a MDA-MB-231 triple negative breast cancer cell line. A cell proliferation assay using trypan blue dye exclusion was used to determine the growth rate of the knockdown when treated with 2.5nM paclitaxel. An apoptosis assay was performed using flow cytometry and annexin V 647 and 7AAD to determine level of apoptosis when treated with paclitaxel. A cell viability assay was performed to generate a dose response curve to determine the IC50 of the knockdown when treated with paclitaxel. Interestingly, FAM156 knockdown had a significant decrease in the level of live cells and IC50 when treated with paclitaxel. FAM156 knockdown also showed a significant increase in apoptosis compared to the control. FAM156 was identified as a novel paclitaxel resistance gene in breast cancer. To further investigate its role, an in vivo assessment needs to be performed to determine if the gene knockdown actually translates to more treatment sensitive tumors., CA Giacomantonio1,3, P Marcato1, Department of Microbiology and Immunology2.

An Alternative Method of Ordered ANOVA Under Unequal Variances

Sota Ichiba (Acadia University)

Presented at the Science Atlantic Mathematics, Statistics and Computer Science Conference, October 23-24, 2015

Winner of the Science Atlantic Undergraduate Research Award, Mathematics and Statistics, second place

Ordered one-way analysis of variance (ANOVA) has drawn a lot of research. Its test procedure differs from unordered one-way ANOVA as it needs to detect not only the difference in mean, but also whether the means follow monotonic restriction. Welch trend test, proposed by Roth (1983) is an ordered test based upon Welch unordered test by Welch (1953) which allows unequal variances across the treatments.However, it is pointed out that WT test has inflated type one error than its nominal p-value. We propose an alternative test for ordered one-way ANOVA which employs parametric bootstrap method similar to Krishnamoorthy et al. (2007) in order to have well controlled type-I error.

Physical Properties of Carbon Nanotube Tapes

Stefan Juckes (Dalhousie University)

Atlantic Universities Physics & Astronomy Conference, February 5-6, 2016

Winner of the Tindall/Steinz Research

Carbon nanotubes (CNTs) represent a promising technology for mitigating climate change, and improving energy and aerospace technologies. CNT bulk materials have physical properties that are several orders of magnitude less extraordinary than their nanoscale constituents. However, their properties can still be useful in some applications. Electrical resistance was measured on three CNT tape samples synthesized at the University of Cambridge during the summer, using a Physical Properties Measurement System. Parallel thermal conductance (PTC) measurements were then carried out on four more samples to compare their thermal conductivity to other tapes. Electrical resistance data show primarily semiconducting behaviour. Results for thermal conductance show promising behaviour, and thermal conductivity calculations give reasonable values, using approximate dimensions measured using scanning electron microscopy (SEM). However, more accurate thickness measurements are needed to determine thermal conductivity. Further thermal conductance measurements will also be completed on replicate CNT tape samples.

Free Energy Comparison of Cylindrically Confined Ring Polymer Models

Deanna Kerry (University of Prince Edward Island)

Atlantic Universities Physics & Astronomy Conference, February 5-6, 2016

Winner of the Science Atlantic Science Communication Award

The mechanics of how bacterial chromosomes segregate after replication are not well understood. One explanation is that it is related to the entropy of the ring-shaped chromosomes within the bacteria cell. Using hard sphere chains as simple chromosome models, it can be shown through Monte Carlo simulations that cylindrically confined two-polymer systems have higher entropy when the polymers are separated rather than overlapping. As systems always favour configurations with maximum entropy, the polymers will spontaneously segregate from one another whenever possible—a phenomenon that may be occurring with bacterial chromosomes. The goal of this work is to compare free energy calculations from this two-polymer model to one with a single polymer confined within a bottle-shaped cylinder.

A Method for Estimating Parameters for GP Model Fitting

Bill Kidney (Acadia University)

Presented at the Science Atlantic Mathematics, Statistics and Computer Science Conference, October 23-24, 2015

Winner of the Science Atlantic Science Communication Award

The Bay of Fundy is a body of water located between Nova Scotia and New Brunswick and is home to the highest and lowest tides in the world. The flow of such large volumes of water creates the potential to generate significant amounts of energy by harvesting this tidal power using in-stream turbines. In order to identify the optimal locations to deploy turbines, numerical models such as FVCOM are very good methods for predicting the potential power surface of a the Bay of Fundy, however they can be quite computationally expensive. Gaussian Process (GP) models provide us with a way of creating surrogate models for FVCOM, estimating the potential power surface with much less computational expense. In order to fit the best GP model, certain parameters must be either known or estimated. Included among these parameters are parameters which can be interpreted as representing the amount of correlation between points in the water along each dimension of the surface that is to be predicted. The aim of this research is to refine the process by which these parameters are estimated so as to produce more reliable surrogate GP models.

Dissolved Organic Matter Controls Mercury Photoreactions in Freshwater Lakes

Sara Klapstein (Memorial University of Newfoundland)

Presented at the Science Atlantic Environment Conference, March 18-19, 2016

Winner of the Science Atlantic Science Communication Award

Methylmercury (MeHg) contamination through bioaccumulation and biomagnification is an issue in many remote ecosystems far from direct pollution sources. Quantifying why and how some ecosystems are more sensitive to contamination following atmospheric mercury deposition is key to mercury fate modeling. While the mechanism of mercury methylation is known to be dominated by bacterial pathyways, the demethylation of MeHg is less understood. Photodemethylation is thought to be one of the main processes through which MeHg can be converted into a less biologically toxic form of mercury. Previous studies highlight the importance of photodemethylation to mercury budgets, yet few have examined the magnitude and variability of photodemethylation rates as a function of associated dissolved organic matter (DOM). A temporal comparison study between summer and fall was conducted using lake water collected from 6 lakes in Kejimkujik National Park, Nova Scotia, Canada. Sample lakes were chosen based on a known range of DOM concentration. Lake waters were filtered to 0.45 µm and placed in closed polytetrafluoroethylene (PTFE) bottles with >50% headspace, spiked with 3 ng/L MeHgOH, and exposed to 0, 1, 2, 3, 5, and 7 days of natural solar radiation in each experimental season. Lakes with higher DOM concentrations had significantly lower rates of photodemethylation than lakes with lower DOM concentration ($p<0.001$). Climate change in temperate and boreal regions of Atlantic Canada is projected to increase rainfall amounts and occurrences and thus lead to browning of freshwaters and further inhibition to the photodemethylation pathway of MeHg reduction.

PAd-DalPhos: A Versatile New Ancillary Ligand for Challenging Nickel-Catalyzed Amine Arylations

Chris Lavoie (Dalhousie University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the Best Graduate Oral Presentation

While palladium-based catalysts have been explored extensively for use in sought-after C-N cross-couplings (i.e., Buchwald-Hartwig amination, BHA), the use of nickel, a much cheaper and abundant metal, has received comparatively little attention. This is particularly true in the case of cross-couplings involving small, nucleophilic nitrogen reagents such as primary alkylamines[1] and ammonia. [2] Given the significant advances in catalyst performance that have been achieved in BHA chemistry as a result of strategic ancillary ligand design, our current aim is to develop highly effective nickel catalysts for C-N and related cross-couplings by way of tailored ancillary ligand design and pre-catalyst formation. This investigation has led to the development of the newest addition to the DalPhos ligand family, PAd-DalPhos, an air-stable ligand that is derived from the phenyl-trioxa-phosphadamantane family of phosphines (CgPPh). The remarkable versatility of the air-stable (PAd-DalPhos)Ni(o-tolyl)Cl pre-catalyst will be the focus of this presentation, which includes unprecedented room-temperature reactivity along with the broadest scope of reaction partners known for any single nickel catalyst system. [3] [1] Ge, Green, Hartwig, J. Am. Chem. Soc. (2014). [2] (a) Borzenko, Rotta-Loria, MacQueen, Lavoie, Stradiotto and co-workers Angew. Chem. Int. Ed. (2015). (b) Green and Hartwig, Angew. Chem. Int. Ed. (2015). [3] Lavoie, MacQueen, Rotta-Loria, Sawatzky, Borzenko, Stradiotto and co-workers. Nature Comm. (2016).

Unique UiO-67 – Determining the Stability through Solid-State NMR Analysis

Mason Lawrence (Memorial University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the CIC Award for the Best Undergraduate Oral Presentation in Inorganic Chemistry

From gas storage and catalysis to light harvesting, and many applications in between, metal-organic frameworks (MOFs) are a hot topic of study. MOFs are comprised of two main components; a cation inorganic metal node or cluster and an anionic organic ligand also known as linkers. One group of interest are the Zr-clustercontaining MOFs including UiO's, PCN's, NU-1000, and MOF-841. The rationale for the utility of these MOFs stems from their stability with respect to solvents, pH, temperature, and pressure (to name a few). However, of all these MOFs, there exists one lonely outlier; UiO-67. UiO-67 is a Zr6O4 (OH)4 12+ node bridged to other nodes via biphenyldicraboxylate dianions. Unlike other Zr-MOFs, UiO-67 has been shown to have less-than expected stability (relative to UiO-66 and other highly stable Zr-containing MOFs). To that end, we have set out to investigate why this MOF is unique among this family of MOFs. The presentation will outline how solid-state NMR, in combination with surface area measurements can be utilized to explore and track the stability of this particular MOF over an extended period of time as a function of solvent(s) used for MOF activation1 . Further investigation into linker modification in UiO-67 has been performed to study how the stability will change with different linkers. By utilizing the planar and torsion-angle free, pyrene linker to form UiO-67-py, we hope to determine if the torsional strain on the biphenyl linker used in traditional UiO-67 is responsible for the observed instability. 1. M. C. Lawrence, C. Schneider and M. J. Katz, Chem. Comm., 2016, DOI: 10.1039/C5CC09919F.

Comparison of the logistic regression model and Cox regression model

Faith Lee (Memorial University)

Presented at the Science Atlantic Mathematics, Statistics and Computer Science Conference, October 23-24, 2015

Winner of the Science Atlantic Undergraduate Research Award, Mathematics and Statistics, third place

In some epidemiological studies, the response measurement of interest is the time to occurrence of an event; however, the model of choice is the logistic regression model. In logistic regression model, the response variable is binary unlike survival regression models such as Cox model, where the response variable is the time-to-event. This talk aims to show that the logistic regression model and the Cox model may yield different results based on an application of a real data. A study conducted by Caplehorn and Bell in 1991 explored the use of methadone in a cohort of 238 heroin addicts, who were enrolled in either one of the two clinics (Clinic 1 or 2) offering methadone maintenance treatment. The two clinics differ in their live-in policies for patients and we would like to investigate which clinic is better at retaining individuals. The logistic regression model was used to assess the association of type of clinic with treatment cessation. Only the type of clinic and level of drug dose were obtained as associated with treatment cessation. The Cox regression model was used to study the effect of the type of clinic on the retention time of the clinic while adjusting for other significant factors, level of drug dose and prison record. Results from the Cox model with time-varying effects revealed no significant difference between the two clinics in retention times in the first 300 days after admission, but Clinic 2 tends to have longer retention times after 300 days.

Multiple Imputation for Canadian Charitable Organization Data

Yinduo Ma (St. Francis Xavier University)

Presented at the Science Atlantic Mathematics, Statistics and Computer Science Conference, October 23-24, 2015

Winner of the Science Atlantic Undergraduate Research Award, Mathematics and Statistics, first place

Recently, charitable organizations have attracted a lot of attentions from governments and the public. As a critical sector affecting social welfare and harmony, charities have always been a hot topic in public life. The first available Canadian Charitable Organization data provide structural and financial information of charities from years 2003 to 2009. However, this data set has a huge amount of missing values, which is a challenge for any data mining technique. In this research, we attempt to impute 2008 charity data with multiple regression imputation, then implement Decision Tree algorithm to the imputed data. By comparing misclassification rates from the multiple regression imputation and the rough imputation (i.e.mean/mode imputation), we want to discover whether multiple regression imputation can reduce the misclassification rate.

Preliminary evaluation of the compositional sedimentary variation of the Jurassic Iroquois

Daniel Macleod (St. Francis Xavier University)

Atlantic Universities Geosciences Conference, October 22-24, 2015

Winner of the Canadian Society of Petroleum Geologists (CSPG) Award

The compositional sedimentary variation of the Jurassic Iroquois and Mohican formations of the Scotian Basin (Canada) was evaluated in 9 wells (566 cutting samples) using a Thermo Scientific Niton xl3t goldd+ XRF analyser and the SandClass geochemical compositional classification based in major elements [1].
Our data shows that these two formations present a large inter and intra unit compositional variation, even between closely related wells. It is clear that these units represent very dynamic depositional systems with apparent lateral facies variability. The integration of our data with those previously published will enable refinement of the currently accepted stratigraphic frameworks and/or the definition of new paleoenvironmental models, through finer-tuning of the sedimentological, biological and hydro-atmospheric conditions correlative of sedimentation for the referred time interval. We wish to acknowledge the industry and government partners of the Basin and Reservoir Lab and the consortium Source Rock and Geochemistry of the Central Atlantic Margins for their kind support.

Investigation into the Interaction between Protein Aggregates and Various Salts

Presley MacMillan (St. Mary's University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the CIC Award for the Best Undergraduate Poster Presentation in Analytical Chemistry

Alzheimer's disease (AD) is a neurodegenerative disorder caused by protein aggregation. There have been many theories proposed regarding the cause of AD and the mechanisms at play; one of which is the pore-hypothesis theory. This theory stats that protein aggregates are able to insert themselves in to cell membranes forming non-specific channels (pores) which leads to a loss in cell homeostasis and ultimately cell death. Previous research has been done to suggest that partially formed aggregates (oligomers and protofibrils) are the true cause of the pores that form in cells. This research focuses on studying the interaction between insulin (a model amyloid protein) solutions made in a variety of different salts and acids, and a LB-LS biomimetic membrane which is deposited onto a screen printed electrode modified with silver nanoparticles, to determine if different salts are crucial to the aggregation process. Surface-Enhanced Raman Spectroscopy (SERS) and Electrochemical SERS (E-SERS) is used to monitor molecular changes that occur due to this interaction. Studies on the aggregation of insulin in the variety of salts and acids were done using turbidity measurements to determine if the expected aggregation sigmoidal curve was obtained (figure 1), and attenuated total internal reflection Fourier transform infrared (ATR-FTIR). ATRFTIR was done on both the native and aggregated form of each insulin solution to monitor the shift in amide peaks.

Does the [5 + 1 + 2 + 1] Rhodium-catalysed Cycloaddition Reaction Actually Proceed via an Alternate Pathway? The Elucidation of a [5 + 1 + 1 + 2] Mechanistic Pathway via DFT Investigation.

Ifenna Mbaezue (Saint Mary's University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the ACEmat Award in Computational Modeling of Materials

A [5 + 1 + 2 + 1] cycloaddition reaction is a rhodium-catalysed fourcomponent reaction that leads to hydroxydihydroindenone products. 1 This cycloaddition occurs only under a carbon-monoxide atmosphere; in the absence of CO, a [5 + 2] cycloaddition occurs yielding 7-membered carbocycles. 2 We have employed density functional theory to elucidate the mechanism of this complex reaction system. Calculations were performed at the ωB97XD/def2TZVPP level of theory. Results suggest that this reaction proceeds via coordination of the vinylcyclopropane unit to the rhodium catalyst, followed by C-C bond activation. 3 Subsequently, the kinetically more favourable [5 + 1 + 1 + 2] pathway may predominate via a series of coordination and insertion processes, to incorporate 2 CO molecules and 1 alkyne. Reductive elimination leads to a Rh-coordinated 9-membered carbocyclic intermediate. Subsequently, Rh-catalysed oxidative cyclization, and Rh-catalysed MeOH elimination complete the sequence. [1] Wender, P. A.; Gamber, G. G.; Hubbard, R. D.; Pham, S. M.; Zhang, L. J. Am. Chem. Soc. 2005, 127, 2836. [2] Wender, P. A.; Takahashi, H.; Witulski, B. J. Am. Chem. Soc. 1995, 117, 4720. [3] Yu, Z.-X.; Wender, P. A.; Houk, K. N. J. Am. Chem. Soc. 2004, 126, 9154.

Synthesis and Characterization of Cyclometalated Ruthenium(II) Complexes for Applications in Photoactivated Cancer Therapy

Julia McCain (Acadia University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the Best Undergraduate Oral Presentation in Biological or Medicinal Chemistry

Cyclometalated Ru(II) complexes were synthesized and examined for their abilities to act as photoactivated cancer therapy (PACT) agents. A series of sixteen [Ru(bpy)2 (C^N)]+ complexes, where bpy is 2,2'-bipyridine and C^N is a cyclometalating ligand, were synthesized in 6.8% to 45% yield to determine structure-activity relationships. The corresponding cyclometalating ligands were also synthesized. Characterization was achieved using 1H and 1H- 1H COSY NMR spectroscopy, ESI(+) MS and HPLC. In vitro results from the [Ru(bpy)2 (C^N)]+ series indicated that increasing the π- conjugation of the cyclometalating ligand can dramatically decrease the toxicity of the complex in the dark, once a critical point of conjugation is attained. It was also found that the complex with cyclometalating ligand 4,9,16-triazadibenzo[a,c]napthacene (pbpn) gave the largest visible light phototherapeutic index (PI). Based on this result, an additional seven [Ru(LL)2 (pbpn)]+ complexes, where the coligand LL was varied, were synthesized in 1.0% to 28% yield and characterized to examine the effect of the coligand on cytotoxicity. It was determined that increasing the lipophilicity of the coligand increased the dark toxicity of the compound, which decreased the PI. Thus, [Ru(bpy)2 (pbpn)]+ gave the best performance as a PACT agent with its visible light PI of >300.

Petrology and Geochemistry of the Jeffers Brook Pluton

Katie M. Mcculloch (Acadia University)

Atlantic Universities Geosciences Conference, October 22-24, 2015

Winner of the Science Atlantic Best Paper Award

The Cobequid Highlands of northwestern mainland Nova Scotia have a complex tectonic history, and are considered to form part of the southern margin of Avalonia. The area is generally interpreted to have developed as a series of volcanic arcs and back-arc basins on the periphery of Gondwana. The highlands are divided into two distinct fault-bound crustal blocks - the Jeffers block to the north and west, where the Jeffers Brook pluton is located, and the Bass River block to the south and east. Although the Bass River block contains widespread late Precambrian plutons, the Jeffers Brook pluton is the only dated late Precambrian pluton in the Jeffers block. Although mineral analyses and petrological studies have previously been done, the field relations have not been examined in detail and the pluton has not been systematically compared to plutons of similar age in the Bass River block. For this study, the pluton was mapped and sampled for petrographic study. It consists dominantly of coarse-grained granodiorite, with quartz diorite and tonalite components. They all contain fine-grained enclaves of diorite, quartz diorite and tonalite. Preliminary whole-rock chemical data from 10 samples of the granodiorite indicate that they are a calc-alkalic suite likely formed in a continental margin subduction zone, similar to coeval and potentially co-genetic plutons in the Bass River block. This project will lead to better understanding of the significance and implications of the current lithotectonic subdivision of the Cobequid Highlands.

Effects of Solid-to-Solution Ratio on Copper (II) and Zinc (II) Adsorption onto Natural Sediment: An Experimental and Modeling Study

Kazuhito Mizutani (Memorial University of Newfoundland)

Atlantic Universities Geosciences Conference, October 22-24, 2015

Winner of the Atlantic Geoscience Society (AGS) Environmental Geoscience Award

Adsorption of heavy metal ions to sediments in the subsurface significantly influences the fate and transport of heavy metals. Laboratory batch experiments, in which sediment samples are mixed with heavy metal-spiked solution, are frequently used to study heavy metal adsorption and to determinate partition coefficient (KD) for heavy metals. However, the solid-to-solution ratio in most laboratory experiments is much lower than that in natural soil or aquifers. Therefore, it is not clear that if those batch experiments can mimic heavy metal adsorption in natural environment. The objective of this study is to investigate if solid-to-solution ratio influences heavy metal adsorption. Copper and zinc adsorption onto a natural sediment was examined in the pH range of 3.0 to 8.0 using batch experiments at solid-to-solution ratio of 25 and 250 g/L respectively, and results showed that the partition coefficient (KD) is strongly influenced by solid-to-solution ratio for certain pH ranges. Cu and Zn adsorption to the sediment was simulated using surface complexation modeling approach via computer software Visual MINTEQ, and model prediction showed that Cu and Zn adsorption is controlled by solid-to-solution ratio under specific conditions, in agreement with the experimental measurements. This study demonstrates
that the partition coefficients (KD) of heavy metals measured by laboratory batch experiments could not be an appropriate proxy for partition coefficients (KD) in natural environments under certain conditions.

Agent-Based Simulation-Based Optimization

Federico Mora (Mount Allison University)

Presented at the Science Atlantic Mathematics, Statistics and Computer Science Conference, October 23-24, 2015

Winner of the Science Atlantic Undergraduate Research Award, computer science, third place

It is often the case that computer simulations are used not only to understand a complex system but also to find optimal inputs to it. Optimization algorithms tailored to simulations are common in the literature but treat a diverse group of underlying mathematical and computational models uniformly. One of these types of models, agent-based models, poses particularly challenging problems to optimization algorithms. In recent years, computing power has made agent-based models more feasible, and therefore popular, opening up the study of simulation-based agent-based model optimization. In this presentation I will introduce agent-based models, the problems they pose to optimization algorithms, and one particular algorithm that performs well under these circumstances. The presentation will be guided by a case study involving the optimal price choice for a firm with one product in a discrete-time competitive market over two periods.

Ice Nucleation in Simulations of Supercooled Water

Siobhan Morris (St. Francis Xavier University)

Atlantic Universities Physics & Astronomy Conference, February 5-6,, 2016

Winner of the ACEmat Award in Computational Modeling of Materials

Despite recent debate, free energy simulations of supercooled water using the ST2 potential have confirmed the existence of a liquid-liquid phase transition (LLPT) in this water model. However, the influence of the LLPT on the nucleation of ice in this model has not been quantified, in particular, the influence on the height of the nucleation barrier. To address this question, we carry out umbrella sampling Monte Carlo simulations of ST2 water to evaluate the free energy of formation of small sub-critical clusters of ice Ic. We estimate this free energy over a range of temperature and pressure in the supercooled region of the phase diagram straddling the so-called Widom line and approaching the region of the critical point associated with the LLPT. Our results reveal a crossover in the behavior of the free energy of formation of small ice clusters as the liquid moves from the high density to the low density regime. We also present evidence that small ice embryos are wetted by low- density liquid (LDL) even under conditions where the bulk LDL phase is neither stable nor Metastable.

Nonlinear Mixed-Effects Modelling of Ciona Intestinalis Population Growth, Dependent upon Abiotic Conditions

Kieran Murphy (St Francis Xavier University)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Graduate Research Award, third place, Aquaculture & Fisheries

Ciona intestinalis is a nuisance biofouling species due to its negative effects on the aquaculture industry, particularly mussel farming. I conducted a two-year observational study on the Atlantic coast of Nova Scotia to ascertain the relationship between abiotic conditions and the heterogeneous distribution and growth of C. intestinalis populations. Temperature, salinity, pH, and water flow were recorded with in situ data loggers at thirteen sites from May to October in 2014 and 2015, while C. intestinalis abundance was monitored on settlement plates. Nonlinear mixed-effects (NLME) modelling fit the most likely models to these data using a logistic growth function with parameter estimates determined by the abiotic variables. C. intestinalis' response to the abiotic variables exhibited inter-annual and inter-site variation. The best model fit to the 2014 data contained salinity variables only, while the best model in 2015 contained temperature, salinity, pH, and water flow. Intra-annual model validation resulted in c. 90 % model efficiency prediction. The inter-annual difference in C. intestinalis response meant that model predictions of alternate years were variable with reduced efficiency. The observed variability in this system has underlined the importance of continued long-term monitoring. All of the abiotic variables added valuable information to the models, possibly due to the lack of a dominant variable that would reduce the value of variables contributing less information. The use of random effects improved model fit compared to fixed effects alone, exhibiting that NLME modelling is an effective tool to explain the growth of C. intestinalis in stochastic abiotic environments.

An Updated Lagrangian Method with Error Estimation and Adaptive Remeshing for Very Large Deformation Elasticity Problems: The Three-Dimensional Case

Alexandre Pepin (Université de Moncton)

Presented at the Science Atlantic Mathematics, Statistics and Computer Science Conference, October 23-24, 2015

Winner of the Science Atlantic Undergraduate Research Award, mathematics, third place, & ACEmat Award in Computational Modeling of Materials

The use of the finite element method is quite widespread for the analysis of large deformation problems, notably in the field of pneumatics where numerical simulation is used to improve and accelerate the design of new tires. In this case and in many others, good numerical methods are essential. Industrial partners expect accurate, efficient and robust methods, and all of this preferably at a low computational cost. In this presentation, we therefore present an updated Lagrangian method where the error is estimated and adaptive remeshing is performed in order to reach high level of deformations while controlling both the accuracy of the solution and mesh distortion. A continuation method will be used to automatically pilot the complete algorithm including load increase, error estimation, adaptive remeshing and data transfer. A number of three-dimensional examples will be presented and analyzed.

A Photophysical Investigation of Cyclometalated Ruthenium Compounds for Photodynamic Therapy

Mitch Pinto (Acadia University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the CATC Award for the Best Undergraduate Poster Presentation in, Theoretical or Computational Chemistry

This study probed the photophysical characteristics of novel cyclometalated ruthenium (Ru) compounds grouped as four related families. It was hypothesized that incorporation of one bidentate cyclometalating ligand would cause a red-shift in the absorption spectrum of the metal complex - a desirable characteristic for photodynamic therapy (PDT) – and might lead to PDT effects. As part of this investigation, 21 cyclometalated Ru compounds with ligands differing in their degree of π-conjugation were characterized in terms of their photophysical properties: absorption, emission, 3MLCT lifetime, and singlet oxygen sensitizing ability. These photophysical properties were compared to those previously determined for their polypyridyl counterparts, and were also used to probe the effects of cyclometalating ligand π-expansion on such properties. It was observed that the longest wavelength absorption maxima of the cyclometalated compounds were typically redshifted by approximately 80 nm relative to analogous polypyridyl complexes. While the cyclometalated complexes demonstrated very little phosphorescence, they did produce ligand-centered fluorescence that could be used to track the metal complex inside living cells. These compounds were poor singlet oxygen sensitizers (10% efficiency compared to the near 100% efficiency of some related polypyridyl complexes) despite potent in vitro PDT effects generated by some of these members. Therefore, mechanisms other than singlet oxygen generation must be at operative, and future work is aimed at elucidating these other pathways using spectroscopic methods.

The Eastern Mountain Avens: A Survival Story

Jennifer Katlyn Poirier (St. Francis Xavier University)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Science Communication Award

The Eastern Mountain Avens (Geum peckii) is a globally imperiled flowering plant which is only found in two locations in the world. In Canada, the largest population of Avens is found within Big Meadow Bog on Brier Island, Nova Scotia. The Big Meadow Avens population has been in decline since the 1950s when three drainage ditches were dug to create agriculturally-friendly land. The ditches continue to drain Big Meadow today, reducing viable Avens habitat through shrub encroachment, competition, and gull destruction. In order to investigate the relationship between the depth of water table and the overall health of the Avens, 36 plants were removed from Big Meadow and transplanted to 8 locations across Brier Island with different water table levels. Transplant sites were revisited monthly throughout the summer of 2015 in order to quantify health measurements such as leaf number and discoloration, percentage of dead leaves, frequency of red petioles, and number of flowers. Fluorometric measurements were used to compare health of the Avens between treatments and to in situ plants. Initial results indicate that transplantation had little to no effect on the test plants, regardless of relocation to areas with or without natural Avens. The results also show a higher frequency of red petioles in areas with water tables near surface level, which may be an indication of stress. The measurements will continue throughout the Big Meadow restoration project, which is scheduled to break ground this spring.

Computational Simulations of Aminoglycoside Resistant Enzyme APH(3')-IIIa in complex with Antimicrobial Agents

Blake Power (Memorial University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the Best Undergraduate Poster Presentation in Biological or Medicinal Chemistry

Antibiotic drugs have had an extensive use in recent medical history for their ability to fight infectious diseases. Aminoglycoside antibiotics target gram positive and negative bacteria and are beneficial for several varying medical diseases. Misuse or overuse of these drugs has resulted in creation and over expression of aminoglycoside modifying enzymes (AMEs), which alter the drugs chemical structure, preventing the antibiotic from reaching the host DNA. The primary focus of this research is the chemical alteration of the aminoglycoside antibiotic paromomycin by the 3',5”- phosphotransferase aminoglycoside modifying enzyme, and the inhibitory effect of a group of antimicrobial peptides on the complex formation of the antibiotics with the AME. We have utilized both molecular docking and molecular dynamic techniques for the prediction of the complex structures of the AME with both aminoglycoside and inhibitor peptides. These simulations are used to analyze the binding and chemical alterations between these complex structures. This ongoing project is designed to prevail new information regarding the AMEs chemical structures and gain further insight into appropriate inhibitors that can be developed for prevention of antibiotics modifications.

Student's Knowledge and Perceptions of Traditional and Cyberbullying

Laura Prichard (St. Thomas University)

Presented at the Science Atlantic Psychology Conference, May 12-13, 2016

Winner of the Science Atlantic Science Communication Award

There is a conflicting debate as to whether education or legislation can aid in preventing bullying behaviour and victimization. Bullying behaviour is not an isolated series of events, rather it can be performed through both traditional bullying (physical, verbal, and relational) and cyberbullying (bullying behaviour through online technology). However, knowledge of what constitutes as either traditional or cyberbullying may be indistinct. The current study aims to test first year psychology university students on their present knowledge and perceptions of both traditional bullying and cyberbullying. It is essential to gain insight on how the next generation of potential workers (be it teachers, or law enforcement) perceive, and construct as bullying behaviour. An overview of the method section (including participant information and questionnaire) will be discussed. The questionnaire consists of three sections. The first section examines students' comprehension surrounding traditional bullying and cyberbullying. In the second section, students were asked to differentiate between traditional and cyberbullying via a series of vignettes as though they were in a teaching, and the third section assesses their general perceptions of both types of bullying. The results section, future research, and limitations will be discussed at length.

Fisheries Stress and Temperature Influences the Cardiac Performance and Recovery of Migrating Sockeye Salmon *(Oncorhynchus Nerka)*

Tanya Prystay (University of British Columbia)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Undergraduate Research Award, second place, Aquaculture & Fisheries

Pacific salmon (Oncorhynchus spp.) are important to the economic, cultural and ecological fabric of Canada, yet populations are declining due to the combined pressure of fisheries harvest and climate change. To alleviate fisheries pressure, catch-and-release practices are being implemented among recreational and commercial sectors. However, despite the immediate benefits of catch-and-release, capture stress can result in post-release mortality minutes to days later. Past studies have used heart rate to quantify metabolic activity and physiological stress in salmon. The current study presents the heart rate data of 60 Fraser River sockeye salmon measured during catch-and-release simulations, conducted at three water temperatures (16°, 19°, 21°C). As cold-water adapted species, I hypothesized that sockeye salmon post-capture cardiac performance and recovery would be impeded at higher temperatures. Using experimental tanks and heart rate loggers, the fisheries simulation involved chasing individual, wild up-river migrating sockeye for three minutes, followed by a one minute air exposure and a 36 hour recovery period. Prior to the simulated capture, baseline heart rate increased with temperature. During the simulation, peak heart rate also increased with temperature. The resting scope for heart rate was higher in the 21°C treatment group compared to the 16°C group. Therefore, stress from fisheries capture increases with water temperature. Although temperature did not significantly affect the excess post-exercise heart beats and cardiac recovery time, the recovery profiles varied between treatments. This knowledge will be useful for salmon conservation management in rivers where temperatures now routinely approach the upper mortality threshold for sockeye salmon (~25°C).

Synthesis of Novel Cobalt-Pentadienyl Complexes

Chandika Devi Ramful (St. Mary's University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the CIC Award for the Best Undergraduate Poster Presentation in Organic Chemistry

Cobalt-pentadienyl complexes have been shown to undergo cycloaddition reactions with alkynes.1 The broader utility of these complexes has yet to be studied. We have embarked on the synthesis of a range of these aryl substituted cyclopentadienyl complexes and have so far prepared methoxy and dimethylamino substituted analogues. Our approach involves the reduction of the substituted cinnamaldehyde with vinyl magnesium chloride, to a dienol via a Grignard reaction. The subsequent reaction of the dienol with cyclopentadienylbis(ethylene)cobalt(I) yields the cobaltcyclopentadienyl complex (Scheme 1). The latter step being air and moisture sensitive, requires rigorously dried solvent, as well as an inert atmosphere. Upon the synthesis of more analogues, the properties of novel materials obtained via the intercalation of these complexes between layers of molybdenum sulfide will be investigated.

The Habitat Characteristics Associated with Redroot (*Lachnanthes Carolianiana*) in Southwestern Nova Scotia

Amanda Ring (Dalhousie University)

Presented at the Science Atlantic Environment Conference, March 18-19, 2016

Winner of the K.C. Irving Environmental Science Centre Award

Redroot (Lachnanthes caroliniana Lam.) is a member of the Atlantic Coastal Plain Flora (ACPF), a group of taxonomically unrelated plants occupying similar habitat types along the eastern coast of North America. These species are typically poor competitors, and thus thrive in very particular nutrient-poor and high-disturbance environments. Redroot has been listed as Threatened under the Nova Scotia Endangered Species Act and as a COSEWIC Species of Special Concern, and gaining a greater understanding of its habitat is one of the key conservation goals listed in management plans for the species. In the summer of 2015, transects and grids were established at seven lakes in southwestern Nova Scotia, measuring the abundance of redroot and other vegetation, as well as substrate type and elevation. Spatial pattern analysis was conducted using univariate and bivariate wavelet analysis, and found that redroot tends to grow in two-dimensional patches near the edge of the water. No significant spatial covariation with other species of herbaceous ACPF has yet been found. According to preliminary regression analysis, redroot abundance increases with increasing shoreline width, decreasing lake area, and increasing amounts of gravel on shorelines. This study will help confirm habitat trends described in the 2010 COSEWIC status report and complement them through an increased understanding of redroot's habitat characteristics on the microhabitat scale. These findings can be used to determine suitable regions for redroot growth which could be protected in order to prevent the extirpation of the species.

Determining Abalone Body Weight Using Structured Light Scanning of Shell Morphology as well as Regular Photography

Matthew Robertson (Dalhousie University)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Undergraduate Research Award, first place, Aquaculture & Fisheries

A study was conducted on a hybrid farmed abalone, Haliotis sp. to identify an improved method of determining individual body mass without physical manipulation, therefore minimizing abalone stress and mortality. Individual abalones were photographed and the photographs were subsequently transformed into 3D images using the structured light software package. These images were used to analyse the morphometry of the shells of the abalone, which then allowed for the calculation of the volume of half of a spherical-ellipse as a proximate shell shape. Volume was determined to be very close to body mass for 100 abalone of five different size classes. However, the processing of structured light images was determined to be slow, and required a very specific hardware set-up. It seemed unrealistic to expect that such an approach would be routinely used in a real aquaculture application. A second project was conducted to determine if a reasonable approximation of body mass could be derived from simpler, typical 2D images. Using information from the 3D images, an equal proportion between all age classes was identified, in which shell height appeared to be predicted fairly well as ~20% of the sum of the length and width vectors. This allowed for approximate volume calculations to be done on 2D images using the software ImageJ. This method yielded slightly more variable individual results than what was seen with the structured light approach, but allowed for a much faster and simpler measurement have useful applications in aquaculture operations.

Exploring the Influence of Nature Exposure on Risk-Based Decision-Making

Rachel Shin (Dalhousie University)

Presented at the Science Atlantic Environment Conference, March 18-19, 2016

Winner of the Science Atlantic Undergraduate Research Award, second place, oral

Maintaining contact with nature in a largely urbanized world is important, as it enhances mood through cognitive restoration and stress reduction. Mood is critical when making decisions in situations where outcomes are uncertain (e.g., situations of probability or risk). A positive mood (e.g., happiness) typically results in risk taking behaviour through decreased risk aversion, and helps overcome biases (e.g., framing) when decisions are required. The framing bias is present when inconsistent decisions are made about risks that have the same outcome. Such biases are problematic, as they interfere with effective decision-making. The objective of this study was to determine if being exposed to artificial nature eliminated the framing bias and increased risk aversion by facilitating positive mood. Undergraduate students (n=120) were recruited and randomly assigned to one of three conditions (i.e., nature, urban, and control) that consisted of a five- minute slide-show of images and sounds. Participants filled out pre- and post- exposure questionnaires to assess their nature relatedness and mood. After the condition's slideshow, participants answered a series of risk-based decision questions drawn from Kahneman and Tversky (1984). Preliminary results show significant differences between results from this study and those published by Kahneman and Tversky, which may be related to mood. Exposure to nature may be a useful priming mechanism to improve mood and reduce issues associated with loss aversion and framing bias as part of important decision-making processes.

Testing the Waters: Harnessing Adaptive Developmental Plasticity to Improve Hypoxia Tolerance

Christopher Small (University of New Brunswick, Fredericton)

Science Atlantic Aquaculture & Fisheries and Biology Conference, March 11-13, 2016

Winner of the Science Atlantic Graduate Research Award, & the Science Atlantic Science Communication Award

Many organisms display a degree of adaptive developmental plasticity in which embryonic rearing conditions influence phenotype, thereby generating an organism better suited to its environment. For instance, exposing zebrafish (Danio rerio) embryos to short pulses of hypoxia 24 to 48 hours post-fertilization (hpf) increases larval hypoxia tolerance highlighting a critical window of plasticity during early development when physiological tolerances are being set, but the mechanisms underlying this plasticity are unknown. Hypoxia inducible factor 1 (Hif-1a) regulates hypoxic signalling and blocking this signalling pathway in zebrafish embryos causes 1) upregulation of hematopoietic genes, 2) more circulating red and white blood cells, and, intriguingly, 3) expanded populations of hematopoietic stem cells (HSCs). This apparent plasticity in the number of HSCs seems limited to early development as adults respond to hypoxia using strategies 1 and 2, but not 3. In order to develop a better understanding of the mechanisms underlying this plasticity, sibling embryos from transgenic zebrafish expressing HSC-specific green fluorescent protein were reared in hypoxia (5% DO) and normoxia (95% DO) for a range of durations between 24 and 48 hpf, and HSCs quantified using confocal microscopy. This experiment will test the idea that early exposure to hypoxia 'primes' the fish for a hypoxic environment, thereby leading to faster growth rates. Understanding these mechanisms for plasticity could lead to rearing strategies that produce fish optimally suited for aquaculture.

Does the Addition of Biochar to Nitrogen-Enriched Soils Alter Greenhouse Gas Emissions and the Leaching of Nutrients?

Samantha Stachiw (St. Francis Xavier University)

Presented at the Science Atlantic Environment Conference, March 18-19, 2016

Winner of the Science Atlantic Undergraduate Research Award, first place, poster

Agricultural soils tend to have an excess amount of nitrogen through the additions of organic and inorganic fertilizers, resulting in increased of greenhouse gas emissions, and nutrient leaching. Biochar amendments have been proposed as a tool for maximizing the retention of nutrients in soil, but there is limited understanding of how biochar amendments may alter greenhouse gas emissions and leaching of nutrients to aquatic systems. The objective of this research was to determine if the addition of biochar to nitrogen rich agricultural soil would alter nitrous oxide emissions and nitrate leaching. Laboratory soil core experiments were conducted on agricultural soil that was untreated, treated with inorganic nitrogen, and treated with biochar plus inorganic nitrogen. Fluxes from the cores were collected over a one month period, before and after wetting periods, to try and determine if the released of nitrous oxide was significantly different from nitrogen rich soil with and without the addition of biochar. The gas was analyzed using gas chromatography. Equivalent samples were kept under the same treatments and conditions and leached to test for nutrient losses as nitrate using colorimetric analysis. The results show that soils amended with biochar plus nitrogen had the highest release of nitrous oxide and the lowest amount of leached nitrate. This suggests that addition of biochar to nitrogen enriched soils reduce nitrate leaching, but increases nitrous oxide Emissions.

Aluminum Complexes of the bis-N,N'-(2,6-diisopropylphenyl) Imidazolin-2-imine ligand

Angela Todd (St. Mary's University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the CIC Award for the Best Undergraduate Poster Presentation in Inorganic Chemistry

The imidazolin-2-iminato family of ligands has recently shown success as ancillary ligands in titanium-based olefin polymerization catalysts as well as other niche uses due to their strong electron donating capability as monodentate alternatives to cyclopentadienes.1 Overall the chemistry between these ligands and aluminum is fairly understudied, pertaining primarily in the field of aluminum hydrides.2,3 In attempts to synthesize a novel twocoordinate aluminum cation, several organoaluminum intermediates of the bis-N,N'-(2,6-diisopropylphenyl)imidazolin-2- iminato ligand have been isolated including the first structurally characterized primary imine coordinated to a triorganoaluminum (III) centre. Figure 1: Mesomeric forms of imidazolin-2-iminato ligands References [1] A. G. Trambitas, T. K. Panda and M. Tamm, Z Anorg Allg Chem, 2010, 636.12, 2156-2171. [2] D. Franz and S. Inoue, Chem. Eur. J., 2014, 20.34, 10645- 10649. [3] W. Wang, Z. Yang, X. Ma, H. W. Roesky, Y. Ju and P. Hao, Z. Anorg. Allg. Chem., 2015, 641, 684-687.

Stern Polynomials and Generalizations

Hayley Tomkins (Dalhousie University)

Presented at the Science Atlantic Mathematics, Statistics and Computer Science Conference, October 23-24, 2015

Winner of the Science Atlantic Undergraduate Research Award, Mathematics and Statistics, second place, & the Science Atlantic Science Communication Award

We investigate divisibility and irreducibility results for Stern polynomials, a simple but interesting recurrent sequence of polynomials with integer coefficients. In doing so we examine current conjectures, overview known results, and obtain new relations. We then consider a generalization, forming an explicit representation and expanding known identities for the Stern polynomials. Throughout our explorations we see connections with well-known ideas such as binary weight, the Sierpinski triangle, and Chebyshev polynomials of the second kind.

Polymetallic Ni-Co-As-Bi-Ag-U Veins with Co-Precipitating Bitumen at Copper Pass, Southern Slave Province, Northwest Territories

Corwin Trottier (Saint Mary's University)

Atlantic Universities Geosciences Conference, October 22-24, 2015

Winner of the the Frank S. Shea Memorial Award in Economic Geology

Polymetallic veins have a distinctive history of precipitation in stages. Nickel-cobalt arsenides are ubiquitous in their mineralogy while other elements such as uranium may be lacking due to absent stages. Similar polymetallic veins have been identified in few locations across North America and Europe. Historically economic varieties of these veins were mined in the ThunderBay and Cobalt districts of Ontario and the Great Bear Lake region of Northwest Territories. The latter was mined for native silver and uraninite. Veins at Copper Pass, near Great Slave Lake, do not contain economic volumes of either resource but do host an interesting relationship between a subdued uraninite stage and solid bitumen. Mineral and fluid inclusions are examined within vein quartz from Copper Pass. The uraninite stage, along with solid bitumen and Ni-Co arsenides, is hosted wholly within a specific layer of quartz growth. This study focuses on constraining the mechanisms for the co-precipitation of these elements and characterizing their fluid source using various petrographic techniques Microscope- cathodoluminescence (CL) was used to identify growth patterns within individual quartz grains, which were subsequently analysed with secondary ion mass spectrometry (SIMS; University of Manitoba) to identify their isotopic oxygen ratios. These ratios range from 3.9 to 21.8 ‰ $\delta^{18}O$ V-SMOW, increasing from core to rim with variations along specific growth zones, implicating a major physical or chemical shift during vein formation (e.g. fluid mixing or cooling). Micro-thermometry of fluid inclusions will compliment this data by reconstructing salinity and homogenization temperatures of source fluids for the different quartz growth zones. Compositional and textural features within the uranium bearing growth zone were identified using SEM and Raman spectrometry. The Raman spectrometer was also used to compare the chemistry of included organics with hydrocarbons from other deposits. This may provide insight into the role of organics in polymetallic deposits. Continuation of this study will focus on determining the nature of fluid mixing that triggered the co-precipitation of these phases.

Synthesis and Characterisation of New Bulky Chelating Cyclopentadienyl Ligands

Alex Veinot (St. Mary's University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the Best Graduate Poster Presentation

Since the discovery of the first sandwich complex ferrocene, the cyclopentadienyl (Cp) ligand has played a vital role in organometallic chemistry. The versatility of the Cp ligand is highlighted by the staggering number of complexes in the literature; including many of the main group elements, all abundant transition metals, and most f-block metals. Cp complexes have been employed in a myriad of catalytic transformations, most notably the "constrained geometry complexes" (CGCs) for the catalytic polymerisation of ethylene and other olefins. A CGC is defined as a complex in which the angle between the Cp π-centroid and secondary attached ligand is smaller than the related nonconstrained system. Modification of the angle strain has a drastic effect on the reactivity of the metal centre (e.g. higher catalytic activity). A new highly tunable, bulky chelating cyclopentadienyl ligand for use in CGC systems was prepared, and several metal complexes were also prepared and characterised both structurally using X-ray crystallography, spectroscopically by multinuclear NMR and UV-Vis spectroscopies, and theoretically using DFT calculations.

Increased Environmental Heterogeneity Affects Substrate Conditions and Alters Seedling Dynamics on Green Roofs

Emily Walker (Saint Mary's University)

Presented at the Science Atlantic Environment Conference, March 18-19, 2016

Winner of the Science Atlantic Graduate Research Award, first place, oral

Landscape development associated with urbanization disrupts ecosystem service provisioning in cities. Architects and engineers have responded to these urban challenges by designing green roofs that provide integrated solutions to many urban issues. Research suggests that functionally diverse plant assemblages improve the delivery of ecosystem services by green roofs, but few design modifications aimed at enhancing plant survival and diversity in this difficult growth setting have been evaluated. Through paired green roof and greenhouse experiments, we investigated the effect of increased heterogeneity on green roof substrate conditions and seedling dynamics on green roofs. The design modifications tested here included the addition of logs, pebble piles, and topographic heterogeneity. Surface features and topographic maxima exhibited decreased substrate temperature and increased moisture retention, creating unique microsites for seedlings. Seedling survivorship was increased at many of these sites, and species richness of communities associated with pebble piles declined at a slower rate, relative to locations with unmodified substrate, during an extended drought. Heterogeneous green roof conditions appeared to support more species relative to homogeneous conditions, although this difference was not statistically significant. The results of this research indicate that simple design modifications can increase the habitability of green roofs for native seedlings. Further research is required to clarify the seasonality of these effects and to assess the long-term trajectory of plant community development on heterogeneous green roofs.

Monte Carlo Simulations of Kagome Lattices with Magnetic Dipolar Interactions

Andrew Way (Memorial University of Newfoundland)

Atlantic Universities Physics & Astronomy Conference, February 5-6, 2016

Winner of the Tindall/Steinitz Award in Research

The antiferromagnetic compound IrMn3, a crucial component of the read transducer in hard drives, can be characterized by a 3D stacking of kagome (corner-sharing triangles) planes of magnetic Mn ions. As bit dimensions shrink, a greater understanding of the thermal stability of these materials is desirable. Zero temperature ground state calculations, as well as finite temperature Monte Carlo simulations, of classical spins on kagome lattices with the long-range dipolar interactions are described. In the 2D case, sixfold-degenerate ground states and a phase transition to magnetic order, are revealed. Preliminary results which extend this analysis to the 3D case are presented.

Environmentally Benign Multicomponent Approach to Novel Splitomicin Analogs

Rachael Weagle (Acadia University)

Presented at the Science Atlantic-CIC Chemistry Conference (ChemCon), June 2-4, 2016

Winner of the CIC Award for the Best Undergraduate Oral Presentation in Organic Chemistry

In pursuit of molecules with novel carbon skeleton, we have devised a green methodology incorporating multicomponent cascade reactions to synthesize novel naphthalene-based oxapolycycles of medicinal importance. The overall reaction involves several individual reaction steps occurring simultaneously or in sequence in a single reaction vessel. This 6-component reaction involves Mannich reactions, deamination, Schiff's base formation, hetero-Diels-Alder reaction and hydrolysis, all in one-pot under microwave irradiation conditions. Subsequent oxidation leads to formation of novel splitomicin analogs. The methodology, the underlying mechanism and the results obtained thus far will be discussed.

An Analysis of Atmospheric Gas Concentrations and the Implications of Proximal Abandoned Oil and Gas Infrastructure at the Stoney Creek Oilfield, New Brunswick

James Williams (St. Francis Xavier University)

Presented at the Science Atlantic Environment Conference, March 18-19, 2016

Winner of the Science Atlantic Undergraduate Research Award, second place, poster

Approximately 168 oil and gas wells have been spudded at the Stoney Creek oilfield in New Brunswick, most of which have since been decommissioned. Most emissions from oil and gas production facilities are understood to originate from active oil and gas operations, but not much concern is given to abandoned infrastructure. Improperly abandoned wells can lead to well bore leakage, which can result in the contamination of shallow groundwater, soils and the atmosphere. Atmospheric gas analysis surveys were performed over the span of three days using a vehicle-based mobile surveying technique utilizing a Picarro G2201-i CRDS analyzer which provided real-time gas concentration measurements for methane, carbon dioxide and δ13C-CH4. Anomalous readings were determined by analyzing excess ratios of eCO2/eCH4 and δ13C-CH4 measurements. By coupling these real-time measurements with coordinates, climate data and well locations, we are able to visualize and interpret anomalous concentrations in relation to their proximity to abandoned well pads. A total of 39 well pads were within a 250-meter radius of a eCO2/eCH4 ratio lower than 100. Mean δ13C-CH4 was -35.91 ± 0.21‰ over all four surveys, and dropped to -32.35 ± 0.47‰ after the eCO2/eCH4 ratio filter was applied. This study shows that recurring methane anomalies are present in select locations in close proximity to abandoned oil and gas infrastructure. However, further analysis in proximity to the identified well locations is needed to confirm the decommissioned oil and gas wells as the source of these anomalous readings.

Multiplayer Online Battle Arenas as a Platform for Human-Computer Interaction Research

Jason Wuertz and Nikita Volodin (University of Prince Edward Island)

Presented at the Science Atlantic Mathematics, Statistics and Computer Science Conference, October 23-24, 2015

Winner of the Science Atlantic Undergraduate Research Award, Computer Science, second place

In this talk we introduce research into Multiplayer Online Battle Arenas (or MOBAs), a relatively new genre of video game that is distinct in its extremely high-paced action and reliance on tight coordination between teammates. One MOBA in particular, DOTA 2, is a professionally played e-sport, where competitors practice for hours a day, make game plans with their teammates, and play in front of thousands of paying spectators for large cash prizes. DOTA 2 also gives public access to millions of detailed game replay logs and thousands of online videos, providing researchers with unique opportunities to retrospectively examine player behaviour to address a number of research questions. For example: How do team communication functionalities allow a team to successfully coordinate? How can individual player behaviours be retrospectively analyzed to, for example, classify players and teams by their play style, or to create new AIs for in-game bots? Exploring these questions will not only inform the future design of MOBAs, but also provide lessons for other types of software. For example, studies about teamwork can be applied to the design of groupware, such as collaborative document editors; and, analyzing game behaviour can lead to new machine learning or visual analytics techniques. In this talk we will highlight two specific research projects that will start to explore MOBAs as an interesting new platform for human-computer interaction research.