Science Atlantic 2024-2025 Student Awards Yearbook

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Executive Director's Message

Welcome to the 2024–2025 Science Atlantic Student Awards Yearbook!



I'm delighted to share the 2024–2025 Student Awards Yearbook with you. Each year, this publication celebrates the accomplishments of outstanding students from across Atlantic Canada.

The students recognized this year exemplify how deep, engaged learning extends far beyond the classroom. From mapping marine ecosystems and probing cosmic phenomena to discoveries in health, technology, and the environment, their research broadens our knowledge and helps shape our future. Every project and award winner highlighted in these pages makes a unique contribution to the ever-evolving puzzle of scientific achievement.

Our conferences and competitions provide valuable platforms for students to engage with peers and mentors, share ideas, and receive valuable feedback. For many participants, these events are their first opportunity to present to a broader scientific audience—a formative experience that cultivates confidence and the collaborative spirit that drives scientific progress.

Of course, none of this would be possible without the support of our universities, faculty members, and sponsors. Science Atlantic's logo, a set of interlocking puzzle pieces, symbolizes our mission to connect people, ideas, and disciplines to build a stronger post-secondary STEM community. Your involvement strengthens our shared mission. Thank you for your contributions.

Please join me in congratulating the outstanding students listed in the following pages!



Lois Whitehead
Executive Director

MSCS

Science Atlantic Mathematics, Statistics, and Computer Science Conference

October 4 and 5, 2024
Hosted by Acadia University



Science Atlantic Undergraduate Research Award



FIRST PLACE

Errol DaRocha
Acadia University

Comparing Autoencoders and Variational Autoencoders for Anomaly Detection in Dermoscopic Images

Errol DaRocha [1]
[1] *Acadia University*
Supervisors: Andrew McIntyre, Lydia Bouzar-Benlabiod

The early detection and diagnoses of skin abnormalities are crucial for effective treatment and management of skin diseases. This paper explores the application of deep learning techniques for skin tissue analysis, focusing on the detection of abnormalities from dermoscopic images. Unsupervised learning methods like Autoencoders (AE) and Variational Autoencoders (VAE) save resources by eliminating the need for labeled data, making them more efficient and scalable than supervised learning. We compare the performance of AE and VAE architectures in developing a robust model capable of distinguishing between benign and malignant skin lesions.

This study uses the HAM10000 dataset of 10,000 dermoscopic images, divided into seven classes of benign and malignant categories. The dataset was split into benign (normal) and malignant (anomalous) cases. We train the models to learn the features of normal data and create output reconstructions of the images. The reconstruction error indicates how well the model interprets image features. A logistic regression model then determines the optimal decision boundary to classify images as benign or malignant based on their reconstruction error.

The AE and VAE models were evaluated using accuracy, F1-score, and False Negative Rate (FNR). Minimizing FNR is crucial in healthcare as it indicates missed malignant cases. Results show the VAE outperforms the AE, with higher accuracy and F1-score (72.50% and 71.85% vs. 69.80% and 68.74%) and lower FNR (29.80% vs. 33.60%). These findings suggest the VAE architecture is promising for automated skin cancer detection, potentially leading to more accurate and timely diagnoses and improved patient outcomes.

Science Atlantic Undergraduate Research Award



SECOND PLACE

Hayden Walker
Mount Allison University

Detecting and Resolving Feature Interactions in Cyber-Physical Systems Using Formal Methods

Hayden Walker[1], *Laurie Ricker*[1]
[1]*Mount Allison University*
Supervisor: Laurie Ricker

Feature interactions occur when different components of a system interact in unexpected ways. Cyber-physical systems (CPS) are typically defined as a collection of components that can interact with the physical environment and other devices over a network. Feature interactions in CPS have been studied, but research in detecting and resolving them at the modelling stage has been lacking. We use supervisory control theory with finite state machines (FSMs) to model CPS and detect feature interactions before physically building the entire system. This paper uses and extends an existing taxonomy of feature interactions that affect CPS and demonstrates an approach to detecting and resolving one kind of feature interaction: chaotic device management (Codema). Our example includes a smart light bulb and two disjoint device management channels (DMCs). We model each component using FSMs, compose them, and then employ supervisory control of discrete-event systems to synthesize a controller that will disable the unwanted behavior of the feature interaction.



THIRD PLACE

Kennedy Roland
St. Francis Xavier University

Temporal Based Text Prediction

Kennedy Roland[1]
[1] *St. Francis Xavier University*
Supervisor: Milton King

It has been found that people talk differently in different human states and because of this, language models could be improved by being trained on which state the person is currently in while typing. We elaborate on this idea to consider different times of day like being in a different state. We hypothesize that people talk differently at different times of day and suggest that if language models consider this metadata, there could be improvements around next-word prediction. We explored this theory, while limiting our hardware requirements, aiming to show that with even minimal change to the input, we were able to see improvements over time-agnostic models. We created our own dataset using English text from Reddit, which was separated by author. Each author's posts were then grouped into three-hour time-segments based on what time of day they were written. We used GPT2, a commonly used large language model, to pass through every post alone for control scores on perplexity and accuracy at k, where k was one through five. We then prepended each post with one of three types of text to test on, our main test group of posts from the same author and same time-segment, posts from the same author but different time segments and random other posts from the dataset (different authors). We compared these cases and found that prepending with text from the same time segment can improve performance in some cases with respect to perplexity and accuracy.

Science Atlantic Science Communication Award



Abdiaziz Aden Muse
Saint Mary's University

HFX3D: Comprehensive 3D LiDAR Data Acquisition and Analysis of Reflective and Transparent Glass Facades

Abdiaziz Aden Muse[1], *Prachi Kudeshia*[1], *Jiju Poovvancheri*[1]
[1] *Saint Mary's University*
Supervisor: Jiju Poovvancheri

Glass facades are integral part of modern architecture, contributing to energy efficiency, aesthetics, natural lighting, and structural design. However, their transparency, reflectivity, and complex geometries make them challenging for 3D data acquisition and analysis. Accurate mapping of glass surfaces is crucial for autonomous navigation, urban planning, structural assessment, and more. Despite their importance, research on glass facades has been limited due to the lack of comprehensive datasets addressing the unique challenges posed by these reflective and transparent glass materials. To bridge this gap, we introduce HFX3D dataset, comprising 857 million point clouds and 2,000 high-resolution RGB images. To our knowledge, HFX3D is the largest dataset of its kind in the field of glass facades using LiDAR. The dataset is collected using state-of-the-art Mobile Laser Scanning (MLS) technology in Halifax municipality and is designed to advance research in glass surface segmentation and analysis, 3D line regression for wireframe generation on point clouds, semantic segmentation, 3D reconstruction of lightweight models, and facade element classification, reflection and transparency analysis on glass facades. This dataset also provides comprehensive insights into how different glass materials affect reflection intensity, the occurrence of multiple reflections, and laser beam interactions with glass—challenges previously overlooked in similar datasets. We also present innovative techniques for efficiently capturing and processing glass surface data using LiDAR scanners, which are critical for ensuring high-quality data essential for Deep Learning algorithms. HFX3D will be publicly available soon serving as a vital resource for advancing studies in urban 3D modeling and glass facade analysis.

Atlantic Canadian Programming Competition Awards





FIRST PLACE

Sebastian Dionicio, Hoang Le

Dalhousie University

Dal Esperanza





SECOND PLACE

Logan Pipes, Farhan Probandho, Taranpreet Singh

Memorial University of Newfoundland

Mid-Competition MUNchies







THIRD PLACE

Anthony Arseneau, Brenden Cosman, Matya Stavnitzky

Mount Allison University

MTA Carpal Tunnel

Science Atlantic Undergraduate Research Award



FIRST PLACE

Erin Hughes
Acadia University

Cooling p-Caterpillars

Erin Hughes[1]
[1]*Acadia University*
Supervisors: Iain Beaton, Nancy Clarke

This presentation discusses the graph searching operation graph cooling which stems from the more well-known operation of graph burning. Graph cooling is the process of choosing vertices of a graph G and in each discrete time round allowing the cooling of the selected, or cooled vertices, to the spread to the neighbours of cooled vertices. The graph cooling problem focuses on maximizing the number of rounds before the process terminates. The topic of the presentation is centered around specific families of tree graphs and how the results of the cooling process of the families.

Science Atlantic Undergraduate Research Award



SECOND PLACE

Melanie Gauthier
Mount Saint Vincent University

Snort on Triangular Grid Graphs

Melanie Gauthier[1], *Svenja Huntemann*[1]
[1]*Mount Saint Vincent University*
Supervisor: Svenja Huntemann

Snort is a two-player graph colouring game where players take turns colouring vertices such that they are never next to one of the opponents colours. In combinatorial game theory the outcome class is who wins the game if everyone plays optimally. We will be looking at the outcome class of Snort played triangular grid graphs.

Science Atlantic Undergraduate Research Award



THIRD PLACE

Hudson Forance
St. Francis Xavier University

Teleparallel Geometry with Spherical Symmetry

Hudson Forance[1]
[1] *St. Francis Xavier University*
Supervisor: Robert van den Hoogen

Einstein's theory of general relativity (GR) is a very successful theory of gravity; however, it is not without its shortcomings. Since its inception in 1915, researchers have been met with various problems in the application of general relativity, primarily related to its prediction of singularities at the centre of black holes, along with theoretical and observational discrepancies in the limiting cases of the Lambda CDM model. As such, modified frameworks of gravity are of growing interest in the field of cosmology, f(T)-type gravity is one such framework, where instead of using curvature to describe the relationship between matter, energy, and space-time in the universe, we use torsion as the fundamental source field for gravitational effects. For this reason torsion-based (teleparallel) geometries have become a topic of interest for many mathematicians and physicists.

Expanding on previous work, I have found the local Lorentz transformation and the general purely inertial frame for a class of teleparallel geometries, specifically ones which are spherically symmetric. Starting with the spin connection for a general spherically symmetric teleparallel geometry, a system of matrix partial differential equations is established using the transformation laws for the spin connection. Solving these equations yields a transformation which can be applied to a generic spherically symmetric frame field, bringing it to a proper frame, where the spin connection vanishes and so all inertial effects are absent. Additionally, physically relevant sub-cases are explored.

Science Atlantic Science Communication Award



Joyce Jiao
Dalhousie University

Low T-Count Approximations of Single-Qubit Unitaries

Joyce Jiao[1]
[1] *Dalhousie University*
Supervisor: Peter Selinger

In quantum computing, a qubit can be represented as a point on the Bloch sphere. An arbitrary single-qubit operation can be represented by a rotation of the sphere, and can be approximated using Clifford+T circuits. These circuits are built from finite gates, including the T gate. Since the T gate is expensive, minimizing its usage is crucial and it makes the T-count a significant factor. We implemented an algorithm that achieves a T-count of 7 log (1/ϵ), which is an improvement over the previous algorithm, which achieved a T-count of 9 log (1/ϵ). In this talk, we will look into the details of how the improved algorithm works and provide a demonstration of the algorithm implemented in Haskell.

Science Atlantic Science Communication Award



Eleanor Friddell
Dalhousie University

Visualizing Isomorphisms Between Alternating/Symmetric and Polyhedral Rotation Groups via 3D Modelling and Printing

Eleanor Friddell[1]
[1] *Dalhousie University*
Supervisor: Theodore Johnson-Freyd

Visualization can be a key part of the learning process for mathematics students, as visual intuition can help contextualize difficult abstract concepts. Group theory lends itself particularly well to visualization, given the often geometric nature of groups as the symmetries of various objects and systems. There are many different methods for visualizing groups, each emphasizing certain structural elements and de-emphasizing others. The goal of this project was to learn about and visualize finite simple groups, which was accomplished through the development of a series of 3D models and corresponding 3D printed sculptures. These models serve as visual proofs of the isomorphisms between the three distinct polyhedral rotation groups, i.e. the rotational symmetry groups of the tetrahedron, octahedron and icosahedron, and the alternating and symmetric groups A4, S4 and A5, respectively. These models comprise a “wireframe” representation of each polyhedron, as well as four or five inscribed lines or cubes, depending on the group in question. By rotating each model, the relationship between the rotational symmetries of the polyhedron and the action of this group on the inscribed objects becomes clear, illustrating the relevant isomorphism. In this way, this project merges visual art and abstract algebra in order to create art pieces which also function as tools for mathematical education.

Science Atlantic Graduate Research Award



FIRST PLACE

Joseph Barss
Dalhousie University

Spatiotemporal Modelling of Lobster Abundance

Joseph Barss[1]
[1] *Dalhousie University*
Supervisors: Joanna Mills Flemming, Theo Michelot

A model for species abundance based on ecological survey data must properly account for the presence of spatial and temporal correlations in order to provide accurate abundance index estimates. Data on lobster abundance collected by trawl survey programs in the Bay of Fundy poses additional modelling complications, including the use of different types of sampling gear with unknown catchability coefficients, varying survey coverage by program and year, and a highly skewed data distribution with a high proportion of zero observations. The negative binomial geostatistical generalized additive mixed model fit to these lobster data includes Gaussian random fields for modelling spatial and spatiotemporal effects. The model is fit with the sdmTMB R package, which performs maximum likelihood estimation using the Laplace approximation to the marginal likelihood. The Gaussian random fields have a Matérn covariance function, and are fit as Gaussian Markov random fields using a triangular mesh laid across the study area. Model selection is informed by the use of residual analysis, Akaike's Information Criterion, and spatial block cross-validation. The main results of interest include the estimates of the model parameters, as well as maps of the predicted abundance at all locations in the study area for every year, and an index whose value at any year is the total abundance in the study area for that year. Simulation studies are also performed to examine the accuracy of the model under different scenarios of reduced data quality or quantity.

Science Atlantic Graduate Research Award



SECOND PLACE

Scott Wesley
Dalhousie University

Verifying and Simplifying Tietze Transformations

Scott Wesley[1]
[1] *Dalhousie University*
Supervisor: Julien Ross

Invertible operations are described by groups. Many examples, such as permutations and reversible circuits also admit nice combinatorial descriptions. These combinatorial descriptions often take the form of group presentations, which describe groups in terms of their generating elements, and the relations those elements satisfy. Unfortunately, identifying when two group presentations are isomorphic is known to be undecidable; that is, no algorithm can determine when arbitrary group presentations are isomorphic. In practice, people rely on Tietze transformations to build these isomorphisms by-hand. However, rigorously constructing proofs from Tietze transformations often proves to be tedious and time-consuming.

In this talk, we propose a new framework for building isomorphisms from Tietze transformations. We start by viewing Tietze transformations as a proof system for group isomorphisms. From this perspective, the validity of a Tietze-style proof is decidable. We show that basic semantic arguments and compositional reasoning can be added to the proof system, without losing the decidability of proof validity. We then implement a program, which we call Tietze, to automatically validate proofs in this proof system. We demonstrate the effectiveness of Tietze to solve real problems, and discuss directions for future work, such as proof visualization and interactive theorem proving.

Science Atlantic Graduate Research Award



THIRD PLACE

Aadesh Nunkoo
University of Prince Edward Island

A Split Questionnaire Design Approach for the HBSC Study

Aadesh Nunkoo[1]
[1] *University of Prince Edward Island*
Supervisor: Michael McIsaac

Excessively long questionnaires increase the response burden on survey participants and may result in a large nonresponse rate and increased measurement error. To address those concerns, the Split Questionnaire Design (SQD) was proposed where the long questionnaire is split into several sub-questionnaires and only a subset of the total sub-questionnaires is randomly assigned to each sampled participant. Typically, there exists a core component that contains vitally important questions (e.g. socio-demographic questions) from the original full questionnaire which is administered to all participants. The other questions, called split items, are only administered to varying subsets of the main sample, inducing missing data by design. Several combinations of these components are constructed, and the omitted questions are usually multiply imputed for all respondents to create a complete data set. The Health Behaviour in School-Aged Children (HBSC) study is a collaborative cross-national initiative led by the World Health Organization (WHO) to examine the health and well-being of adolescents. Over the years, concerns have been raised regarding the length of the HBSC questionnaire which increases respondent response, and low response rates in some countries. This talk will explore our proposal of an SQD as a potential solution to reducing the survey length with partially different sets of questions being asked to different students using different sub-questionnaires. We will explore how to split the items and topics from the full questionnaire into the core component and the different sub-questionnaires. This is a work in progress.

CANSSI Atlantic Undergraduate Research Award



Pierre Aucoin
University of Prince Edward Island

Estimating Heaps' Law for Large Document Collections: A Preliminary Study

Pierre Aucoin[1], Uyen Lai[1], Pouya Faroughi[1], Paul Sheridan[1]
[1] University of Prince Edward Island
Supervisors: Pouya Faroughi, Paul Sheridan

Heaps' law is an important law in computational linguistics relating how the number of distinct terms in a text (or collection thereof) increases with the total number of terms. Existing methods for modeling Heaps' law are best-suited for individual documents or moderately sized document collections. However, the proliferation of large-scale document collections, such as those commonly used for training generative AI algorithms, creates a need for a new crop of Heaps' law estimation procedures. In this presentation, we explore a computationally efficient heuristic method that can accurately estimate the Heaps' law exponent for large document collections. We evaluated the effectiveness of our method on three document collections: Project Gutenberg (75 documents), PubMed Abstracts (500,000 documents), and Wikipedia articles (250,000 documents). The results show that our method accurately recovers Heaps' law parameters. We consider these findings a promising starting point in estimating Heaps' law for large document collections.

Science Atlantic Mathematics Problem Solving Competition





FIRST PLACE

Eric Goulding, Gavin Hull

Memorial University of Newfoundland



SECOND PLACE

Hayden Lees, James Petersen

University of New Brunswick, Fredericton





THIRD PLACE

Rachel Reid, Zachary Saunders

Saint Mary's University

MSCS

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AUGC

Atlantic Universities Geoscience Conference

October 24 to 26, 2024
Hosted by Dalhousie University



Science Atlantic Best Paper Award



Brooke Reid
Dalhousie University

Carboniferous Sarcopterygian Fish Fossils and the Marine Paleoenvironment at Joggins Fossils Cliffs, Nova Scotia, Canada

Brooke Reid[1], Jade Atkins[2], Lauren Morris[1], Grant Wach[1]
[1]Dalhousie University, [2]Joggins Fossil Centre

Joggins Fossil Cliffs, a UNESCO World Heritage Site in Nova Scotia, Canada, is known for its Pennsylvanian coal seams and remarkably preserved ecosystems that represent terrestrial tropical Pangea. Of the five formations present, the most significant is the Joggins Formation (Fm.) which is divided into approximately 15 sedimentary cycles based on the flooding plains, coals, and channel bodies. While the site records cyclic terrestrial and marine deposits, the marine influence of the Joggins Fm. has rarely been studied. As a result, many fish fossils in the Joggins Fossil Cliffs collection remain unidentified, and there are ongoing debates about the source of the marine influence. We aim to (1) identify a selection of unidentified sarcopterygian fish fossils from the Joggins Fm., and (2) determine their habitat and depositional environment. We have selected sarcopterygian fish scales and bones that have previously been misidentified and will identify them to the family level using the literature. To learn more about the marine habitat, a carbonaceous limestone from the Joggins Fm. was chosen as a representative for the marine depositional environment based on its thickness and history of producing determinate fish fossils. A sedimentary log and thin sections are currently being made for the representational limestone, as well as a larger sedimentary log for the encompassing open water facies association for a greater marine influence context. This work will contribute to our understanding of the environment of this important site and the animals that lived within it.

Imperial Oil
Best Poster Award



Gabriela Fuentes Waye
Saint Mary's University

Timing of Mafic Magmatism and Nature of Metasomatism at Clarke Head, NS

Gabriela Fuentes Waye[1], *Erin Adlakha*[1], *Shawna White*[1], *Ryan Pippy*[1]
[1] *Saint Mary's University*

The main objective of this project is to constrain the timing of mafic magmatism at Clarke Head, Nova Scotia, and to discern its relationship to metasomatism along the Cobequid Chedabucto Fault Zone (CCFZ). Clarke Head is located within the CCFZ, a 300 km E-W striking, terrane bounding fault system that hosts numerous metasomatic iron ± copper, gold, and cobalt deposits. These occur within breccias with sodic and potassic alteration, suggesting an Iron Oxide Copper Gold (IOCG) mineralization model is relevant. The source of metasomatism along the CCFZ is speculated to be from the melting of Viséan-aged Windsor Group salts via magmatism. Field evidence and radiometric dates from mafic rocks north of the CCFZ indicate syn to post Viséan magmatism occurred. Undated mafic blocks at Clarke Head may be related to this magmatic pulse. Clarke Head exposes mélange, bounded to the north along an E-W striking fault splay of the CCFZ, that incorporates blocks of varying size, lithology, age, and deformation history. Field observations show that Na-rich scapolite veins with alteration haloes are constrained within mafic blocks in the mélange. Drone imagery was collected to create 3D models of the mineralization relationships observed in these mafic blocks and to reach inaccessible outcrop in cliff face. Future work will include micro-X-Ray Fluorescence (µXRF) mapping of host block lithologies and later mineralization to characterize alteration styles and build a paragenesis. Petrography of mafic blocks and scapolite veins will also be done to identify mineral geochronometers (e.g. apatite or rutile) to date magmatism and metasomatism using in-situ U-Pb Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS). These results will be compared to similar mineralization and alteration styles along the CCFZ to evaluate the timing of mafic magmatism in the area and its relationship to metasomatic deposits.

Frank S. Shea Memorial Award in Economic or Applied Geology



Tiernan Davies
Acadia University

Geology and Economic Mineral Potential of the Central Jeffers Block, Cobequid Highlands, Nova Scotia, Canada

Tiernan Davies[1]
[1]*Acadia University*

The geology of the central part of the Jeffers block in the Cobequid Highlands, northern mainland Nova Scotia, Canada, is not well known compared to other parts of Avalonia in the northern Appalachian orogen. Published maps show conflicting interpretations of the age and distribution of rock units, in large part because the older components are obscured by Devonian and Carboniferous volcanic and plutonic rocks. This study includes field mapping and petrological work to produce a new geological map that more accurately portrays the distribution of Neoproterozoic rock units, as well as to interpret their tectonic setting and assess their economic mineral potential. Three U-Pb zircon ages indicate that most of the area consists of early Ediacaran (ca. 625 Ma) volcanic and plutonic rocks but an older Tonian age of ca. 740 Ma for an intrusive porphyry shows that even older rocks are present. Preliminary petrographic study of the ca. 625 Ma volcanic units has revealed abundant rhyolitic to dacitic crystal and lithic tuffs with less abundant mafic tuffs. Associated plutonic units consist of coarse-grained tonalite with less abundant granodiorite and diorite. The host rocks for the dated ca. 740 Ma plutons have not yet been recognized. Field relationships demonstrate that the Neoproterozoic rocks have been contact metamorphosed by surrounding Carboniferous gabbroic dykes and gabbroic plutons. Current economic importance of these rocks is focused on aggregate quarries in both volcanic and plutonic rocks, but the abundance tuffaceous volcanic rocks suggests an unexplored potential for porphyry-type mineralization.

Atlantic Geoscience Society (AGS) Environmental Geoscience Award



Hayley Newell
Acadia University

Mercury in Soil Horizons from Southwestern Nova Scotia: Relationships with Vegetative Bioindicators and Mineralogy

Hayley Newell[1], *Nelson O'Driscoll*[1], *Deanne van Rooyen*[1]
[1]*Acadia University*

Mercury (Hg) is a highly toxic mobile element which has organic forms (e.g. methyl mercury - MeHg) which bioaccumulate and biomagnify in food webs. Southwestern Nova Scotia is a known hotspot for Hg bioaccumulation. There is extensive research on mercury in birds, fish, invertebrates, and water; however, there is less data on Hg in soils and plants. This study examines total mercury (THg) and mineralogy of soils as well as previously obtained THg in lichens. Samples were taken from 16 sites along a transect through southwestern Nova Scotia to examine relationships between THg in soils, soil mineralogy, and THg in lichens. Soil samples from the O, A, B, and E (if present) horizons were dried, sieved to a silt/clay fraction and analyzed for THg and loss on ignition (LOI) using thermal pyrolysis atomic absorption spectroscopy. Soil mineralogy of the A, B, and E horizons from seven sites with different bedrock were analyzed using scanning electron microscopy. The soil THg data will be examined using statistical analyses to test for significant differences between horizons and for correlations with soil mineralogy, and lichen THg. Preliminary results show that THg in soil ranges between 2.234 ppb and 323.890 and appears to be broadly correlative with THg in lichen. This work will help to clarify the relationship between soil mineralogy and THg soil and lichen, and relationships with bioindicators in SW Nova Scotia.

Canadian Energy Geoscience Association (CEGA) Award



Tess Gates-Flaherty
Acadia University

The Taxa World Sure Can Be Taxing! Creating an Open-Source Windsor Group Fossil Database

Tess Gates-Flaherty[1], *Morgan Snyder*[1]
[1]*Acadia University*

The late Paleozoic Maritimes Basin had a 120-million-year history that included folding, faulting, exhumation, and salt tectonism. This plethora of structural activity resulted in complicated stratigraphy across the basin and between adjacent sub-basins. One way to effectively correlate stratigraphy across the Maritimes Basin is using biostratigraphy and one of the most fossiliferous units is the Windsor Group. In addition to stratigraphic correlation, Windsor Group fossils are important paleoenvironmental and paleoclimatic indicators. Many researchers have studied these fossils; however, much of this work has not been published or is housed in governmental or industry reports that are inaccessible to the scientific community. The purpose of this project is to create an open-source Windsor Group fossil database by compiling fossil data from a variety of sources (e.g., journal publications, government reports, 3-D model websites). This project utilizes archival-based research alongside field work to focus on obtaining high-resolution images and creating 3-D models of the different fossil species observed in Windsor Group strata. This material will be compiled into an open-source, searchable database. This database can be used in future research projects as a comprehensive, coherent dataset and an effective tool for fossil identification, stratigraphic correlation, and data management.

Canadian Society of Exploration Geophysicists (CSEG) Award



Abbey Smith
Acadia University

"Get Off My Lawn": Coastal Erosion in Hantsport, NS

Abbey Smith[1], *Ian Spooner*[1]
[1]*Acadia University*

Coastal erosion is a natural process that can become an issue when there is no room to accommodate the retreat of a coastline, as is the case in many coastal communities in Nova Scotia. Addressing issues such as erosional processes have become a priority as environmental disturbances are increasing in both magnitude and frequency; an increase in these disturbances can threaten lives and infrastructure. Hantsport, Nova Scotia is a community located along the coast of the Avon River estuary which empties into the Minas Basin. Studies on the Avon River have explored the changes in bathymetry and sedimentation over time; however, erosional studies in this area have not been done. This site is unique for two reasons: it is part of a macrotidal environment (tidal range approximately 15 m), and has a long history of anthropogenic influence. This study uses quantitative methods of observation, photography and ground penetrating radar to better understand the sedimentology of the cliffs and to quantify the impact of erosional processes taking place. The properties along Avon Street are the most seaward locations in Hantsport, and are at the highest risk of being impacted by coastal erosion. Quantifying erosional processes in Hantsport will increase the level of understanding of erosion sites along the Avon River coastline, and will help inform remediation and mitigation efforts.

AUGC

Conference Sponsors



AUPAC

Atlantic Undergraduate Physics and Astronomy Conference

January 31 to February 2, 2025

Hosted by Memorial University of Newfoundland





FIRST PLACE

Maxwell MacNeil
St. Francis Xavier University

Detection of Cosmic Ray Muons With Teachspin and Cosmic Watch Muon Detector

Maxwell MacNeil[1]
[1] *St. Francis Xavier University*

Muons, fundamental particles within the Standard Model of Particle Physics, are produced as a result of cosmic rays colliding with the Earth's upper atmosphere. They only exist for 2.2 microseconds before they decay into other fundamental particles. However, they are moving at velocities near the speed of light, allowing them to reach the Earth's surface. Muons can be detected using scintillator-based detectors, which use photomultipliers to distinguish muons from other particles. The goal of this research is to investigate the muon flux in the Antigonish area, focusing on how altitude affects the flux. This data can be used to calculate other muon properties, like lifetime and energy.

Two different muon detectors were used for this experiment. The first of these is the Teachspin Muon Detector, which utilizes a photomultiplier tube to amplify signals generated by muons interacting with the scintillator. This detector was calibrated based on the well-established value for muon lifetime. The second detector, the CosmicWatch Muon Detector, was constructed by the research student following the guidelines of MIT's CosmicWatch outreach program, which guides students in building their own muon detectors. This inexpensive, portable detector excels at distinguishing muons from other particles, making it particularly well-suited for flux-related experiments.

This presentation will provide a theoretical background on muons, followed by an explanation of the detection process, including the design and operation of both detectors. The data collection process will be outlined, along with an analysis and presentation of the experimental results. Through this investigation, the goal is to contribute to a deeper understanding of muon behavior in this region.



SECOND PLACE

Tashi Wangchuk
University of New Brunswick, Fredericton

Non-Invasive Conductivity Measurements Using RF Probe Loading Technique

Tashi Wangchuk[1], *Andres Ramirez Aguilera*[1], *Bruce Balcom*[1]
[1] *University of New Brunswick, Fredericton*

Radiofrequency (RF) probes are vital in Magnetic Resonance (MR) research, as they play an essential role in both the transmission and reception of RF signals. We are exploring a non-invasive method to measure conductivity in water-based samples using the RF probe loading technique. We are not conducting an MR experiment; our measurements are simpler. The research focused on analyzing the response of an RF probe to varying conductivities in brine solutions by measuring the quality factor (Q) of the RF circuit using a network analyzer. This approach allowed us to directly correlate the sample's conductivity with the observed inductive losses, serving as a non-invasive method to determine the sample's conductivity. The study involved two distinct RF probe configurations: solenoidal probes with cylindrical samples and surface coils with effectively infinite planar samples. By comparing theoretical predictions with experimental measurements, we gained a deeper understanding of the relationship between probe design, sample geometry, and conductivity, ultimately contributing to the optimization of RF probe designs for specific applications. Building on the initial success, we investigated whether a flowing sample yields different conductivity measurements compared to its stationary counterpart and conducted the same experiment with various salts to evaluate its potential applicability in the field. Future work will focus on experiments involving real samples to further refine and apply this non-invasive technique. This research not only advances the optimization of RF probe designs but also opens avenues for practical applications in material characterization and biological studies.



THIRD PLACE

Samantha Ryan
Grenfell Campus, Memorial University of Newfoundland

Physics in the Rural Classroom (PiRC): Bridging Education Gaps With Curriculum-Aligned Virtual Workshops

Samantha Ryan[1], Svetlana Barkanova[1], Kathryn White[1], Japna Sidhu-Brar[2], Kevin Hewitt[2], Stephanie MacQuarrie[3]
[1]Grenfell Campus, Memorial University of Newfoundland,[2]Dalhousie University,[3]Cape Breton University

The Physics in the Rural Classroom (PiRC) pilot program (2024-2026) addresses the challenge of delivering quality physics education in rural Atlantic Canadian schools. Designed for educators teaching Grades 7-12, PiRC aims to enhance physics instruction through online curriculum-aligned workshops and career exploration sessions. Collaborating with teachers and STEM professionals, the program provides equitable access to physics content while exposing learners to diverse career pathways and inspiring role models, particularly from equity-deserving groups.

The pilot will deliver 64 interactive workshops annually, targeting physics curriculum objectives and supporting educators in schools lacking specialized physics teachers or resources. Educators gain access to tailored professional learning opportunities and an expanding network of peers. STEM volunteers contribute by delivering virtual talks, which are developed with comprehensive training in science communication and cultural inclusivity, ensuring engaging and meaningful student interactions.

Key outcomes include increased educator confidence in teaching physics, greater student interest in physics careers, and strengthened ties between STEM professionals and rural communities. With its scalable model and sustainability-focused partnerships, PiRC aims to create lasting impacts on physics education in Atlantic Canada and beyond.

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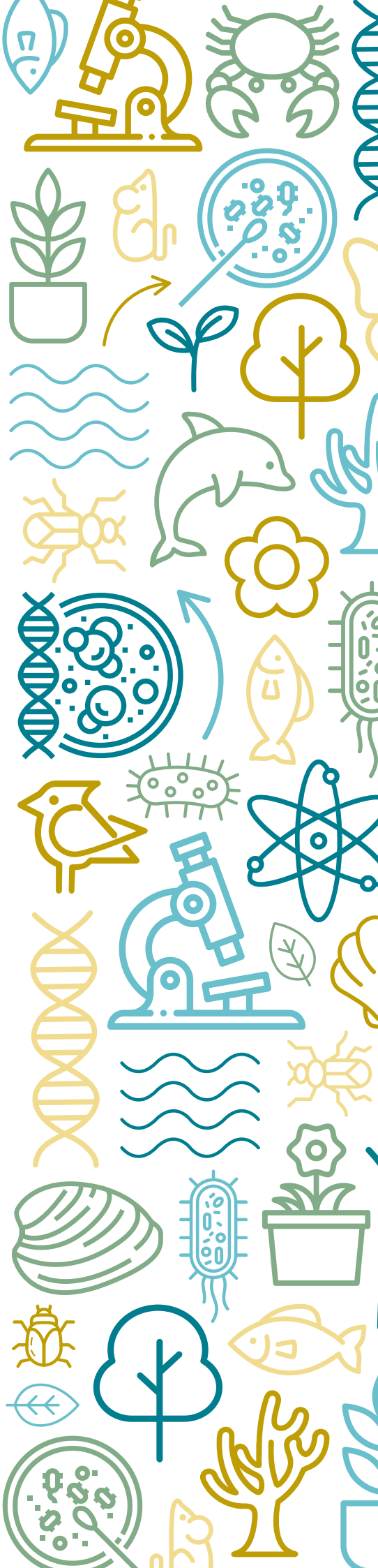

Science Atlantic
Undergraduate Research Award (Oral)



FIRST PLACE

Aaron Ulrick
Dalhousie University

Caught on Camera: Exploring Fish and Invertebrate Populations in Nova Scotian Kelp Beds Using Baited Remote Underwater Video Systems (BRUVS)

Aaron Ulrick [1]
[1] *Dalhousie University*

As the largest archipelago in eastern North America, the Eastern Shore Islands (ESI) support diverse marine life, including Nova Scotia's last healthy kelp beds. Slated for Marine Protected Area (MPA) designation, the ESI provide critical habitat for resident and migratory species. However, research on species assemblages across habitat types in this region remains limited. To address this gap, we examined species assemblages at three site types - High Kelp Coverage (HC), Low Kelp Coverage (LC) and Deep (DP) - across two islands - Long Island (LI) and Tuffin Island (TI). We deployed 23 BRUVS for 24-hours across all six sites and conducted 16 SCUBA transects at HC and LC sites to document faunal abundance.

We observed 24 species across both methods, with significant assemblage differences found between DP and HC/LC sites, but no difference between islands. Notable diurnal patterns were observed for Cunner (Tautogolabrus adspersus), Winter Flounder (Pseudopleuronectes spp.), and Jonah crab (Cancer borealis), which were mostly observed during daylight. BRUVS and SCUBA captured slightly different species assemblages, reflecting methodological differences between the two techniques.

Our findings highlight the importance of habitat structure in shaping marine animal communities, with kelp-dominant habitats supporting distinct assemblages compared to deeper sites. The observed uniformity in habitat use between islands underscores the need to protect larger geographic areas within the ESI. Temporal patterns observed highlight the complex nature of habitat usage by Nova Scotia's marine animals. These findings will inform policy decisions and conservation strategies as the ESI continues toward MPA designation.

Science Atlantic
Undergraduate Research Award (Oral)



SECOND PLACE

Jordyn Williams
Mount Allison University

Population Ecology of Eastern Painted Turtles and Snapping Turtles in the Jemseg Grand Lake Watershed

Jordyn Williams[1], *Julia Riley*[1]
[1]*Mount Allison University*

There are large knowledge gaps regarding the ecology of the two most abundant turtle species in New Brunswick (NB): Eastern Painted Turtles (Chrysemys picta picta) and Snapping Turtles (Chelydra serpentina). This research aims to understand the population ecology of these two species in the Jemseg Grand Lake watershed. During their active season in 2024, we conducted a mark-recapture study wherein we trapped turtles at four sites, collected data on their morphology, and uniquely marked individuals over multiple surveys. These data have been used to summarize these species' density, demographics, and generate estimates of population size. From these data, we can also identify potential threats to these populations by comparing our findings to those of protected populations of these species elsewhere in their native geographic range, as obtained with a systematic literature review. Common threats to turtles include (1) enhanced mortality of adult females during migrations to nesting sites and (2) elevated nest predation levels reducing or eliminating recruitment of offspring into the population. If the two study species are suffering these threats in NB, I expect that (1) there will be significantly more male turtles captured than females, and (2) that the number of juvenile turtles will be significantly less than expected levels based on life history tables. Our results show a female-biased sex ratio for both species, and a higher-than-expected proportion of Eastern Painted Turtle juveniles. Additionally, the population size and densities of the four Grand Lake sites did not significantly differ from those of other populations.

Science Atlantic
Undergraduate Research Award (Oral)



THIRD PLACE

Rajan Minocha-McKenney
Mount Allison University

The Cardiac and Osmotic Stress Response to Diel Cycling Hypoxia in Brook Char (*Salvelinus fontinalis*)

Rajan Minocha-McKenney[1], *Tyson MacCormack*[1]
[1] *Mount Allison University*

Diel cycling hypoxia (DCH), characterized by daily fluctuations in oxygen availability, poses substantial physiological challenges for aquatic species. This research investigates the biochemical and physiological mechanisms underlying brook char (*Salvelinus fontinalis*) tolerance to DCH, with a focus on taurine's role in cellular protection and homeostasis. Taurine, a key osmolyte and antioxidant, may contribute to hypoxia resilience by regulating oxidative stress and osmoregulation. Fish were exposed to controlled DCH and mean hypoxic conditions, followed by biochemical assays to assess metabolic markers, oxidative stress, and osmotic balance. Electrocardiograms were performed to evaluate cardiac function, measuring maximum heart rate and critical thermal maximum to assess cardiovascular performance under hypoxic and thermal stress. Plasma osmolality and tissue water content were also analyzed to investigate potential fluid imbalances associated with DCH. By identifying physiological and biochemical adaptations to fluctuating oxygen conditions, this research aims to improve our understanding of hypoxia tolerance in freshwater species. These findings will contribute to broader ecological and conservation discussions while informing aquaculture strategies for species facing environmental oxygen variability.

Science Atlantic
Undergraduate Research Award (Poster)



Madison Jordan
University of New Brunswick, Saint John

Investigating Copper Acclimation in Mummichog: Implications for Ionoregulation and Physiological Tolerance

Madison Jordan[1], *Alex Zimmer*[1], *Emil Senathirajah*[1]
[1] *University of New Brunswick, Saint John*

At elevated concentrations, copper (Cu) is toxic to aquatic organisms, disrupting biochemical and physiological processes such as ion and osmoregulation. At low concentrations, studies have demonstrated acclimation capacity, though this response may be species specific and underlying mechanisms of acclimation remain unclear. This study investigated effects of acute Cu exposure on osmoregulation in mummichog (*Fundulus heteroclitus*), and whether acclimation to low Cu levels alleviates toxicity, demonstrating acclimation capacity. Fish were acclimated in seawater to 0 or 0.1 mg/L Cu for 7 d, some were then euthanized, and others additionally exposed to 0, 0.01, 0.025, 0.05, 0.1, 0.2, or 2 mg/L Cu for 48 h. Following euthanasia and processing, muscle moisture (MM) in white muscle and carcass tissue Na concentration were measured as indicators of osmoregulatory status. Though MM appeared higher in acclimated fish at 0.2 and 2 mg/L Cu, neither acclimation nor exposure significantly affected MM in either treatment. There was no significant difference in tissue Na between groups with no acute exposure, though both acclimation and exposure had a significant effect on tissue Na in acutely exposed fish with a significant increase observed at 2mg/L. Findings suggest acclimation to 0.1mg/L Cu alters ionoregulatory capacity, and might aid at higher concentrations, but does not fully mitigate Cu-induced disruptions. Also presented are preliminary data exploring Cu effects on Na^+/K^+-ATPase (NKA) activity, responsible for active ion secretion in seawater. Results indicate NKA activity decreases with increasing Cu concentrations. Subsequent studies will explore the role of NKA desensitization to Cu in acclimation responses.



Amélie Guitard
Université Sainte-Anne

The Impacts of Co-Exposures of Environmental Stressors on Non-Model Organism *Brachionus plicatilis*

Amélie Guitard[1], *Jordan Park*[1]
[1] *Université Sainte-Anne*

In recent decades, environmental stressors such as climate change and pollutants have globally impacted marine ecosystems, altering the oceans' physical and chemical properties. Climate change will not only alter the temperature, salinity, and pH levels of the Atlantic Ocean but also affect environmental pollutants by shifting microplastic density through changing currents and increasing 6PPD-quinone runoff into rivers and oceans due to more frequent rainfall. However, few studies have examined the synergistic effects of climate change and environmental pollutants, including shifts in temperature, salinity, microplastic distribution, and 6PPD-quinone exposure. While previous studies on 6PPD-quinone were performed on salmon species, its toxic effects on smaller invertebrates remain largely unknown. Organisms such as zooplankton are more likely to be affected by these issues because they feed in surface waters, where temperatures are increasing more rapidly than in deeper waters and where the concentration of microplastics and 6PPD quinone are highest. The zooplankton *Brachionus plicatilis* was used due to its sensitivity to environmental changes and pollution. Reproduction, population growth, and development were measured under conditions simulating climate change. As preliminary data, we measured how differences in salinity changes life cycle parameters of rotifer and analyzed physiological endpoints including ROS, CAT, and SOD enzymatic activities. Additionally, we assessed the toxicity and chronic exposure effects of 6PPPD-quinone on rotifers. We continue to study the different types of environmental shifts caused by climate changes and their potential impact.

People's Choice Award (Oral)



Parker Sullivan
Memorial University of Newfoundland

Highlighting Bycatch Risk: Spatiotemporal Overlap of Seabirds and Inshore Gillnet Fisheries in Newfoundland

Parker Sullivan[1], Jessika Lamarre[1], Robert Blackmore[1], Gail Davoren[2], April Hedd[1, 3], William Montevecchi[1]
[1]Memorial University of Newfoundland, [2]University of Manitoba, [3]Environment and Climate Change Canada

Among all types of fishing gear, fixed gillnets pose the greatest risk toward bycatch of diving seabirds. Despite this there is a lackluster amount of research dedicated toward seabird bycatch in inshore Newfoundland waters. These waters are a host to important breeding seabird colonies. In this experiment, we investigated the spatiotemporal overlap between inshore gillnets set for *Gadus morhua* and *Clupea harengus* and the foraging ranges of diving seabird species from colonies in Newfoundland waters. We hypothesize that overlap will be a function of colony proximity, fishing season, and prey density. Along with an individual prediction for each species. We mapped the radius of the mean maximum foraging ranges of seabirds from colonies and the distribution and abundance of set gillnets gathered from previous research and through collaboration with Fisheries and Oceans Canada. Polygons were drawn over NAFO subregions to indicate the monthly gillnet distribution when the fisheries were open and the percentage of overlap with seabird mean maximum foraging ranges was calculated. The final product output is a series of species specific heatmaps which illustrates the detailed levels of seabird risk to bycatch in Newfoundland's inshore waters. With this study we aim to acquire a better understanding of bycatch interactions between Newfoundland's seabirds and inshore gillnet fisheries. Future collaborations with these fisheries will be initiated, and we can work to mitigate the risk of bycatch for Newfoundland seabirds.

People's Choice Award (Poster)



Daniel Ng
Dalhousie University

High-Resolution Mapping of Pacific White Skate (*Bathyraja spinosissima*) Nursery Habitats at the Active Galápagos Hydrothermal Vent Field Iguanas-Pinguinos

Daniel Ng[1], Cherisse Du Preez[2, 3], John Jamieson[4], Craig Brown[1]
[1]Dalhousie University, [2]Institute of Ocean Sciences, Fisheries and Oceans Canada, [3]University of Victoria, [4]Memorial University of Newfoundland

Pacific white skate (*Bathyraja spinosissima*) nurseries were discovered in 2015 at the active Galápagos hydrothermal vent field Iguanas-Pinguinos. At these nurseries, skate eggs of various colours (i.e. yellow-green, brown, white) appeared to be close to active vents. These skates were hypothesized to utilize slightly elevated water temperature from vent fluids to accelerate their eggs' estimated 9.6-10-year incubation period, but specific environmental drivers that influence these skate egg distributions remain unquantified. Our study aimed to examine how seafloor morphology, geology and proximity to active vents relate to egg locations at Iguanas-Pinguinos. Utilizing 17.8 km^2 of high-resolution multibeam sonar, we processed bathymetry and backscatter data collected in 2010 by an autonomous underwater vehicle (depth: 1576-1762 m), and derived seafloor morphology maps for the site. From 3 remotely operated vehicle dives collected in 2023 aboard a Schmidt Ocean Institute expedition, high-resolution video footage was analysed using the software BIIGLE to georeference skate egg locations, which were subsequently imported into ArcGIS Pro and overlaid on seafloor environmental layers. Combining skate egg presence-absence with predictor layers, skate egg nurseries were predicted using a random forest habitat suitability model. Our model (accuracy: 94%; kappa: 0.94) confirmed high skate egg concentrations within 50 m from active vents at a narrow depth range of 1641-1692 m and were found on narrow-flat scarps. Our findings provide the first quantitative evidence of Pacific white skates laying their eggs near active vents at specific depths and seafloor structures, further contributing to our ecological understanding of these skates at Iguanas-Pinguinos.

Science Atlantic Undergraduate Research Award (Oral)



Gabrielle Fenwick
Mount Saint Vincent University

Impact of Assembly Factor for Spindle Microtubules (ASPM) Expression on Cell Cycle Timing in a Cancer Cell Line

Gabrielle Fenwick[1], *Lori Borgal*[1]
[1]*Mount Saint Vincent University*

The process through which cells proliferate, known as the cell cycle, is divided into 4 phases: a growth phase (Gap 1 or G1) is followed by DNA synthesis (S-phase), followed by a second gap phase (G2) and finally mitosis & cytokinesis (M-phase). This cycle is tightly regulated in multicellular organisms to ensure appropriate levels of cell proliferation. This project investigated the role of the human gene Assembly Factor for Spindle Microtubules (ASPM) in the timing of the cell cycle. ASPM mutations can lead to microcephaly, a disorder characterized by reduced brain size. Studies suggest that ASPM mutations impair neural progenitor proliferation by prolonging G1 or M phase, leading to premature differentiation or cell cycle arrest. Interestingly, ASPM is frequently overexpressed in cancers. It remains unknown how ASPM overexpression contributes to cancer progression, but it may be via a cell cycle timing-related mechanism mirroring the etiology of microcephaly. This project aimed to determine whether ASPM expression alters cell cycle timing in cancer cells. To address this question, an inducible CRISPR-Cas9 gene editing system was used to knock out ASPM expression in a clonal HeLa cell line. HeLa is a cancer-derived human cell line. The duration of cell cycle phases in the ASPM vs. wildtype cell lines was compared using a Fluorescent Ubiquitination-based Cell Cycle Indicator (FUCCI) system combined with confocal live-imaging. It was hypothesized that reduced ASPM expression would result in a prolonged G1 or M phase. The data collected contributes to our understanding of cell cycle regulation and cancer progression.

Science Atlantic Undergraduate Research Award (Poster)



Heather MacTavish
Mount Allison University

Past, Present, and Prevention: A Century of Communicable Diseases in Atlantic Canada

Heather MacTavish[1], *Vett Lloyd*[1], *Matthew Betti*[1]
[1]*Mount Allison University*

Canada's disease landscape has shifted over the past century, influenced by medical knowledge and public health interventions. While advancements improved disease control, they also introduced new challenges. Globalization has accelerated the transmission and management of infectious agents across borders. Urbanization has led to densely populated areas, creating environments where disease outbreaks can occur more easily. Vaccination has played a critical role in shaping modern trends by reducing the prevalence of infectious diseases. Using government case numbers and community science data collected by academics, this research examines the prevalence and contributing factors of communicable diseases in Atlantic Canada, focusing on both vaccine-preventable diseases and sexually transmitted infections. By analyzing historical and modern disease reports, this research explores the impact of globalization and vaccination programs. The rate per 100,000 of each disease was calculated and graphed to analyze trends. Vaccine coverages were compared to suggested thresholds for herd immunity. Vaccine-preventable diseases declined after the implementation of vaccinations, with occasional outbreaks. Sexually transmitted infections peaked in association with war, declined, and then increased in modern times. These findings highlight the importance of sustained public health efforts in controlling communicable diseases.

Science Atlantic Science Communication Award (Oral)



KC Collings
Dalhousie University

Does the Brain Remain the Same: Measuring Seasonal Neurogenesis in Wild Black-Capped Chickadees (*Poecile atricapillus*)

KC Collings[1], *Broderick Parks*[1], *Leslie Phillmore*[1]
[1] *Dalhousie University*

Songbird vocal behaviour changes across seasons - and these behavioural changes are often accompanied by changes (i.e., neural plasticity) in the vocal control system, a set of interconnected structures and circuits that support vocal behaviour. One measure of neural plasticity is neurogenesis - the proliferation, differentiation, migration and incorporation of new neurons into neural structures and circuits. Here, we evaluate seasonal differences in neurogenesis within four brain regions: two vocal control nuclei involved in the production and learning of vocalizations (HVC [proper name] and Area X), and two auditory perceptual regions involved in the processing of acoustic information (caudomedial nidopallium [NCM] and caudomedial mesopallium [CMM]). We captured wild male and female Black-capped chickadees (*Poecile atricapillus*) across three seasons: spring (March-April), summer (August-September), and winter (December-January). To quantify neurogenesis, we labelled brain tissue for doublecortin (DCX), a microtubule-associated protein expressed in newborn neurons. We measured both percent coverage of DCX+ staining and counted three morphologies of DCX+ cells: fusiform, multipolar, and round. We will then compare seasonal patterns of neurogenesis between regions with different functions (i.e., vocal control vs. auditory perception), between male and female Black-capped chickadees, and among cell morphologies. We will also consider how these differences can be understood in the context of changes in songbird vocal behaviour over the annual cycle.

Science Atlantic Science Communication Award (Poster)



Madeleine Kurtz
Dalhousie University

Spatial Ecology of the Common Nighthawk (*Chordeiles minor*) in the Halifax Backlands

Madeleine Kurtz[1]
[1] *Dalhousie University*

Located in southern Halifax, NS, the Halifax Backlands is an urban wilderness that is home to a diversity of species and ecosystems, including the Common Nighthawk (*Chordeiles minor*). The Common Nighthawk is a migratory bird that is widely distributed across North America during its breeding season, and is classified as Special Concern under Canada's Species at Risk Act. Between 1970 and 2018, Common Nighthawk populations declined 68% in Canada, likely due to breeding habitat loss and aerial insect prey declines. Currently, limited research exists on how habitat and prey abundance influence Common Nighthawk distribution in Atlantic Canada. This study aimed to determine the spatial distribution of Common Nighthawk foraging and nesting areas within the Halifax Backlands, and the influence of environmental characteristics on these distributions. Furthermore, the study aimed to examine seasonal and diurnal trends in Common Nighthawk activity. Between May and September of 2024, Common Nighthawks were sampled in the Halifax Backlands using Autonomous Recording Units (ARUs) and visual surveys. To detect auditory indicators of Common Nighthawks, recordings captured by ARUs were analyzed using BirdNET. Auditory detections were plotted to visualize trends in activity. Using location data collected during visual surveys, kernel density analysis was performed to estimate species' spatial distribution. The influence of habitat characteristics and insect prey abundance on Common Nighthawk spatial distribution was analyzed using a GLMM. Study results are important for improving understanding of the spatial ecology of Common Nighthawks in Atlantic Canada, and will inform future monitoring and conservation strategies in the Halifax Backlands.

People's Choice Award (Oral)



James Murphy
Memorial University of Newfoundland

The Meaning of Structural Variation in the Chick-A-Dee Calls of Black-Capped Chickadees (*Poecile atricapillus*)

James Murphy[1], *David Wilson*[1]
[1] *Memorial University of Newfoundland*
Supervisor: David Wilson

The information conveyed by animal signals exists on a continuum between referential and urgency-based signalling. Referential signals denote attributes of external stimuli, allowing receivers to tailor responses accordingly. Urgency-based signals reflect the caller's level of arousal, prompting generalized responses. The Black-capped Chickadee (*Poecile atricapillus*) produces chick-a-dee calls in response to predators and the discovery of food. Previous studies suggest these calls are referential signals that encode predator size and risk, since chickadees produce more calls and calls containing more D notes and lower fundamental frequencies in response to smaller, more agile raptors. However, this pattern is also consistent with an urgency-based model of communication. If chick-a-dee calls are referential, structural variants should exhibit productional specificity, whereby different external referents elicit different structural variants. If calls communicate urgency, they should vary with signaller arousal, and it should be possible for multiple stimuli to elicit common structural variants. Yet, no study has directly compared the structure of chick-a-dee calls elicited by food and predators. I recorded calls of wild chickadees in St. John's, Newfoundland, in response to the discovery of feeders and perched raptor models. More calls were produced in response to smaller predators, however these calls had a lower duration. Further structural analysis of calls, including analysis of the number of D notes and the fundamental frequency will determine if the call is a referential or urgency-based signal. Findings will clarify the nature of information conveyed in chick-a-dee calls and contribute to understanding the selective pressures shaping animal communication systems.

Emily Rushton
Mount Allison University

The Effect of Cholecystokinin and Leptin on Glutamate Signalling in the Rat Dorsomedial Hypothalamus

Emily Rushton[1], *Karen Crosby*[1]
[1]*Mount Allison University*

Appetite is regulated by a complex network of neurons in the brain, including the dorsomedial hypothalamus (DMH). Neurons in the DMH stimulate appetite and express receptors for a variety of satiety hormones including leptin and cholecystokinin (CCK). Previous work from the Crosby laboratory has demonstrated that CCK and leptin decrease the activity of DMH neurons in male rats, but nothing is known about how these hormones affect neuronal activity in female rats. The objective of this study is to determine how CCK and leptin act in the DMH in female Sprague-Dawley rats in naïve and fasted conditions. Rats were anesthetized and euthanized, and their brains were removed and slices containing DMH neurons were kept alive in a solution of oxygenated cerebrospinal fluid. Using patch clamp electrophysiology, we measured the amplitude of excitatory (glutamate-mediated) currents in naïve and fasted animals before and after application of CCK, leptin, or a combination of the two hormones. Our data suggests that CCK and leptin together decrease glutamate signalling significantly more than when either hormone is applied alone. This effect is mediated by both CCK_2 and leptin receptors. In fasted animals, glutamate signalling is inhibited less by CCK and leptin, compared to control animals. This research contributes to our understanding of appetite regulation in female rats with important implications for human health.

The Botany Award (Oral)



Jada Ripley
Mount Allison University

Pollinator Importance of a Specialist Bee, *Macropis nuda*, Versus Other Generalist Visitors to a New Brunswick Population of *Lysimachia terrestris*

Jada Ripley[1], *Emily Austen*[1]
[1] *Mount Allison University*

Foraging specialization is an important driver of many plant-pollinator relationships, making it an important determinant of pollinator effectiveness. *Lysimachia terrestris* (Primulaceae) is a wetland plant that produces specialized floral oils instead of nectar. These oils are collected exclusively by a genus of specialist bee, *Macropis* (Melittidae), which depends on the oils for its survival. *Macropis nuda* is documented in New Brunswick, but is not the only visitor to *L. terrestris*; *L. terrestris* is also visited by generalist bees (Halictidae) and generalist flies (Syrphidae). This study aims to understand whether the most important pollinator of *L. terrestris* is the specialist bee (*M. nuda*) or other generalist pollinators. We documented visitation to *L. terrestris* through ~103h of observation across the *L. terrestris* flowering season. Visited flowers were tagged - along with an unvisited control - and bagged with a pollinator exclusion bag. Fruit maturing from the tagged flowers were collected and dissected to measure seed set, a metric of pollinator effectiveness. To estimate pollinator importance, we standardized pollinator effectiveness by visitation frequency for each visitor group, which highlights visitors' overall contributions to the *L. terrestris* population. This study sheds light on the ecological importance of *Macropis nuda* and other generalist pollinators that support the reproduction of *Lysimachia terrestris*. As *Macropis nuda* is imperiled across most of its range, this new understanding of the *Macropis-Lysimachia* relationship could help inform conservation efforts and predict shifts in the range of *L. terrestris* in the face of climate change and pollinator declines.

The Botany Award (Poster)



Rowan Kernaghan
Saint Mary's University

Distribution Patterns of Bryophytes on Nova Scotian Farmland

Rowan Kernaghan[1], *Sean Haughian*[1]
[1] *Saint Mary's University*

Agricultural practices reduce biodiversity and degrade soil quality on farms. Millions of dollars are spent yearly on the upkeep of the carbon content, bulk density and texture of agricultural soils. These qualities are all associated with biological soil crusts in natural dryland habitats. Biological soil crusts on Nova Scotia farmland are comprised mostly of bryophytes, which represent a unique and diverse set of species. Non-crop life in agricultural fields is often dependent on the field margin. Patterns of agricultural bryophytes can give us insight into their effects on soil health and biodiversity. Our aim was to examine the relationship between bryophyte abundance and distance from the field margin on Nova Scotia farmland, and to determine whether a pattern in abundance is the result of challenges to bryophyte propagule spread or because of environmental conditions preventing germination. We gathered bryophyte abundance data from eight Nova Scotia farm fields at increasing distances from the field edge. In each plot, we tested the soil quality and germinated propagules from the top 2 cm of soil in laboratory conditions to test for the presence of bryophyte propagules. Bryophyte abundance decreased with distance from the field edge and the abundance of bryophyte propagules did not. Bryophyte abundance was not related to any of the tested soil conditions. Therefore we conclude that the decrease in bryophyte abundance farther from the field edge is because of environmental conditions maintained by the field margin.

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FIRST PLACE

Robyn Hirsch
Dalhousie University

Chemically Characterizing Native Nova Scotian Freshwater Turtle Nest Scents for Olfactory Misinformation Applications

Robyn Hirsch[1]
[1] *Dalhousie University*

All native species of freshwater turtle found in Canada are currently in decline, with high rates of nest predation being one of the major threats contributing to their decline. Current nest protection tactics have drawbacks; for instance, cages are difficult to deploy on a large scale, require regular site monitoring, and make nests visible to poachers. An improved method of predation prevention is needed to meet government mandates to protect these species. Following how mammalian predators primarily use scent to locate nests, this research investigates a conservation approach known as olfactory misinformation, where predators are habituated to unrewarded scents mimicking vulnerable prey species that camouflage their true location in the environment. The objective of this study was to identify the volatile organic compounds (VOCs) characteristic of nest scents of Blanding's, Snapping, and Painted turtles, to determine which compounds to use when formulating artificial nest scents for an olfactory misinformation approach protecting these species. Swabs were collected from 25 nesting females, 2 egg clutches, and 10 nests of hatchlings and analyzed using gas chromatography-mass spectrometry. In total, 160 unique VOCs were identified across 48 collected samples. Linalool oxide and 2-ethylhexanol were highly characteristic of cloacal fluids and epidermal tissues of adult turtles of all species; 2-ethylhexanol and frontalin were characteristic of eggs; Mesitylene and Limonene were characteristic of hatchlings. Due to differences between adults/eggs and hatchlings, two different scent solutions should be created for application during the spring nesting and fall emergence seasons, but can be applied to all species.



SECOND PLACE

Heidi-Lyn O'Connor
Mount Allison University

Breeding Origins of Shorebirds Staging in Nova Scotia and New Brunswick

Heidi-Lyn O'Connor[1], Diana Hamilton[1], Devin de Zwaan[2], Julie Paquet[2]
[1]Mount Allison University,[2]Environment and Climate Change Canada

Arctic breeding migratory shorebirds use stopover sites in Atlantic Canada to gain fat stores during their southbound migration. However, we currently lack information on the specific breeding grounds from which these birds are coming and the portion of their breeding range that is supported by this region. Given that shorebirds are experiencing massive declines, understanding migratory connectivity is a priority for conservation efforts. We collected feathers from juveniles of seven species of shorebirds in New Brunswick and Nova Scotia and performed stable Hydrogen isotope testing to obtain a deuterium signature. The signature can be used to assign a breeding origin to each bird. Ebird data was used to create a map of the Canadian breeding season range of each species and deuterium signature from caught birds were used to make cluster plots for comparison. We found that the Atlantic region supports a large breadth of the breeding range for Dunlins (*Calidris alpina*), Least Sandpipers (*Calidris minutilla*), Lesser Yellowlegs (*Tringa flavipes*), Sanderlings (*Calidris alba*), Semipalmated Plovers (*Charadrius semipalmatus*, Semipalmated Sandpipers (*Calidris pusilla*), and Short Billed Dowitchers (*Limnodromus griseus*). This highlights the importance of Atlantic Canada as a staging area during southband migration for a wide range of Arctic breeding shorebirds.



HONOURABLE MENTION

Alex Crawford
University of New Brunswick, Fredericton

An Assessment of Fresh Water Mussel Survey Techniques

Alex Crawford[1], *Michelle Gray*[1]
[1] *University of New Brunswick, Fredericton*
Supervisor: Michelle Gray

Freshwater mussels are integral in aquatic ecosystems, they contribute to biofiltration, nutrient cycling, and habitat structure. Their populations face increasing threats, due to habitat loss, water quality degradation and invasive species competition. Understanding the extent of the threat to such an important pillar of aquatic life requires reliable survey techniques to assess distribution and abundance. This study compared the efficacy of five freshwater mussel survey methods: human visual surveys, tactile sampling, sediment sieving, and novel applications of a remotely operated vehicles (ROVs) such as underwater and aerial drones. Surveys were conducted at ten sites in Grand Lake, New Brunswick, targeting the Yellow Lampmussel (*Lampsilis cariosa*), a species of special concern. Site selection was informed by LiDAR data to identify suitable sandy deposition areas. Each site was assessed using all five methods, with survey order randomized to control for environmental variability. Mussel counts and detection efficiency were compared across techniques. Preliminary results indicate that visual surveys were the most efficient in both time and labour but were sensitive to turbidity and mussel embeddedness. Tactile and sediment sieving were best for buried mussels but are labour-intensive. The ROVs provided valuable habitat context as well as identification of host fish species but were limited by various environmental factors and mussel species identification. This study highlights the advantages and limitations of each method, providing insights for optimizing future species specific survey protocols. Modern technology integrated with traditional approaches offers a more complete and potentially less invasive approach toward improved mussel monitoring and conservation efforts.



William Chapman
Mount Allison University

Modelling *Vibrio parahaemolyticus* in the Gulf of Saint Lawrence

William Chapman[1], David Lieske[1], Clark Richards[2], Jeffery Clements[2], Joshua Kurek[1]
[1]Mount Allison University, [2]Fisheries and Oceans Canada

Vibrio parahaemolyticus (Vp) is a marine or estuarine bacterium that regularly infects shellfish around the world and can cause severe foodborne illness in humans. Despite past outbreaks involving oyster contamination in Canada and concern over increasing numbers of Vp tests failing regulations, little is known about when, where, or why Vp will show up in the Atlantic region. Vp levels are known to be dependent on several environmental factors, including water temperature, salinity, and chlorophyll-a. Using remote-sensed sea surface temperature and modelled salinity and chlorophyll-a for the southern Gulf of Saint Lawrence, along with archival Vp test results from oyster processing facilities, we developed a predictive random forest model for Vp outbreak occurrence with a misclassification error rate of 9.8%. Using the predictive model, we inferred a historical 25-year Vp climate to understand how Vp occurrence in the region has changed over time, corroborating an early monitoring study in the Atlantic region. We further developed short-term predictive models for predicting Vp outbreaks 7 days into the future. Predictive models for Vp are an essential tool to understanding the progression of Vp outbreaks in the southern Gulf of Saint Lawrence for the future, and for informing mitigation and management efforts in the face of this growing issue.



FIRST PLACE

Gaël Cidoine Vignon Bayo Dossou
Université de Moncton

Variation sur 20 ans d'indicateur environnementaux du territoire de la Péninsule acadienne

Gaël Cidoine Vignon Bayo Dossou[1]
[1] *Université de Moncton*

La rivière Pokemouche dans le nord-est de la province du Nouveau-Brunswick a fait l'objet d'un échantillonnage à 12 stations (représentant 12 sous bassins versants), quatre fois par année pendant les années 2001, 2002 (période 1) et, 20 ans plus tard, en 2021 et 2022 (période 2). Cette étude décrit comment 10 paramètres de qualité de l'eau varient dans le temps (entre les deux périodes) et spatialement (entre stations). On examine également l'influence des facteurs météorologiques (température, précipitations) et territoriaux (10 variables de couvertures forestières et non forestières) sur la qualité de l'eau. En 20 ans, la concentration de carbone organique total a augmenté en moyenne de 22%. Les changements dans les autres paramètres étaient moins importants. Cette tendance à l'augmentation du carbone organique s'explique en partie par les précipitations qui étaient plus marquées dans la période 2 que dans la période 1. En effet, les données montrent une forte corrélation positive entre le carbone organique et les précipitations. Le carbone organique avait aussi tendance à être plus élevé dans les sous-bassins versants qui présentaient de fortes couvertures de terres humides. Les caractéristiques territoriales anthropiques (couverture urbaine, agricole, industrielle) montraient au contraire peu de relations significatives avec les paramètres de qualité de l'eau.



SECOND PLACE

Lauren MacDonald
Saint Mary's University

Freshwater Mussels (*Pyganodon cataracta*) as Bioindicators of Contaminants and Effectiveness of In-Situ Remediation Strategy for Gold Mine Tailing Contaminated Wetlands

Lauren MacDonald[1], *Linda Campbell*[1], *Emily Chapman*[1], *Heidi Gavel*[1]
[1] *Saint Mary's University*

The Dynamic Ecosystem and Environmental Health Research group (DEEHR) at Saint Mary's University is developing an in-situ thin reactive amendment and protective capping (TRaP) application to reduce the bioavailability, toxicity, and mobility of arsenic (As) and mercury (Hg) in wetland ecosystems impacted by historical gold mining activities. The project presented here uses Eastern Floater mussels (*Pyganodon cataracta*) as representative macroinvertebrates to examine if TRaP is safe and can reduce the toxicity and bioavailability of Hg and As. Freshwater mussels are long lived, semi-sedentary, filter feeders that provide an accurate representation of the health of an ecosystem. Due to this, they are often used as bioindicators for ecotoxicology studies. In this experiment, mussels were exposed both in the laboratory and in the field to contaminated sediment, contaminated sediment treated with reactive amendment (R), contaminated sediment treated with reactive amendment and protective capping (TRaP), and uncontaminated reference sediment. Preliminary results indicate amendments improve survival rates of mussels exposed to the contaminated sediment. Mussels exposed to R and TRaP had decreased As concentration in both the visceral mass and gill tissue compared to the untreated contaminated sediment. Oxidative stress was elevated in mussels exposed to contaminated sediment and reduced in mussels exposed to the TRaP treatment. Finally, preliminary valvometry results indicate there is a difference in behaviour in mussels exposed to the different treatments, with mussels exposed to contaminated sediment demonstrating higher rates of closures than mussels exposed to the reference and TRaP treatments.



HONOURABLE MENTION

Emilie LeBlanc
Université de Moncton

Impact of Legacy Contamination on the Health of Aquatic Species in the Upper Baie des Chaleurs

Emilie LeBlanc[1], *Maxime Arseneau*[1], *Pier Jr. Morin*[1], *Céline Surette*[1]
[1] *Université de Moncton*

The Baie des Chaleurs remains impacted by persistent trace metal and metalloid contamination originating from former heavy industries. These legacy contaminants affect aquatic species and ecosystems, as well as the Mi'kmaq First Nation community of Ugpi'ganjig, who live and fish in this territory. Despite contamination concerns leading to local fishing closures, little research assessed aquatic biota health since the closure of many industrial sites, even though contaminants are continually remobilized in the water column and pose a threat to aquatic species. This project examines trace element accumulation and its effects on defence mechanisms in key commercial and cultural species. In collaboration with Mi'kmaq fishermen, crustaceans (*Homarus americanus* and *Cancer irroratus*) were sampled upstream during commercial and traditional fishing seasons, while bivalves (*Mya arenaria* and *Mytilus edulis*) were collected from coastal sites in summer 2024. Sampling will continue until fall 2025. Tissue samples are analyzed using ICP-MS for metal quantification and RT-qPCR, with validated primers targeting oxidative stress, antioxidant defence, and detoxification genes to quantify their expression in crustaceans. Preliminary results indicate variable bioaccumulation across trophic levels, with higher concentrations in crustaceans, while bivalves show spatial variations in metal burdens. We will assess whether these metal burdens influence the modulation of targeted gene expression, providing insights into the physiological responses of crustaceans to legacy contaminants. This study advances ecological understanding and informs environmental management policies under the Marine Environment Quality (MEQ) program, contributing to the preservation of essential fishery resources for the Ugpi'ganjig First Nation.

Best Poster Award



FIRST PLACE

Emma McGean
Cape Breton University

Policy Without Borders? A Comparative Analysis of Monarch Butterfly Conservation Frameworks in Canada, the U.S., and Mexico

Emma McGean[1]
[1] *Cape Breton University*

The IUCN and Canada list the Monarch Butterfly (*Danaus plexippus*) as endangered, yet the species remains only a candidate species under the U.S. Endangered Species Act (ESA) and has no formal listing in Mexico. This disparity in conservation status raises concerns about the effectiveness of existing protections, particularly given the monarch's transnational migratory behavior. Each year, monarchs migrate across Canada, the U.S., and Mexico, relying on habitats in all three countries for breeding, feeding, and overwintering, making coordinated conservation efforts essential. Canada enforces legal protection through the Species at Risk Act (SARA), but the U.S. and Mexico lack enforceable conservation measures, limiting the effectiveness of international conservation strategies. In the U.S., policymakers have resisted listing the species under the ESA, possibly due to concerns that herbicide and pesticide use restrictions would impact the agricultural sector. This study used thematic analysis to compare key monarch conservation frameworks, including Canada's SARA, Nova Scotia's Species at Risk Act, the U.S. ESA, the North American Monarch Conservation Plan, and NGO-led initiatives. The research examines habitat conservation, threat mitigation, monitoring practices, and cross-border collaboration. Qualitative data analysis software was used to identify policy alignment and gaps, particularly the consequences of weak legislative enforcement in the U.S. and Mexico. Findings from this study contribute to the understanding of international conservation governance challenges and offer insights into strengthening policy coordination for the protection of the monarch butterfly and other migratory species.



SECOND PLACE

Sasha Chilibeck
Dalhousie University

Defining the Timing of Early Breeding Phenology in Atlantic Leach's Storm-Petrels

Sasha Chilibeck[1]
[1] *Dalhousie University*

Leach's Storm-Petrels (*Hydrobates leucorhous*) are a federally threatened seabird in Canada with a declining population over the last four decades. The reasons for this decline are uncertain; there remain many knowledge gaps on the species' breeding biology due to their inaccessible nature via breeding on remote islands and nesting underground. Increasing understanding of *H. leucorhous* breeding phenology may be important for future studies assessing their breeding success, especially considering that a pair produces one egg per year if conditions are optimal. This study aimed to define the timing of early breeding phenology using remotely collected data from geolocator sensor (GLS) tags on *H. leucorhous*, and to determine if timing differed between latitudinally different colonies across the Maritimes. Breeding phenology of interest included first arrival to burrow, pre-laying exodus, and lay date of egg of birds from the following colonies: Kent in New Brunswick; Bon Portage and Country in Nova Scotia; and Baccalieau, Gull, and Kent in Newfoundland. Patterns light detection from GLS light waveform data was utilized to infer burrow utilization, from which we derived potential breeding activity. We then ran a linear mixed model to assess if year, colony habitat, latitude, or sex had the greatest effect on the timing of breeding phenology. Our preliminary results suggest that all colonies may share a similar window for lay date and are most affected by year. The findings of this study will contribute baseline knowledge to future reproductive biology studies on this seabird species by filling a knowledge gap on timing.

HONOURABLE MENTION

Jasmine McNairn-Hart
Mount Allison University

Differences in the Ecology of the Goldenrod Gall System Across Its Range: Observations from the New Brunswick/Nova Scotia Border Region

Jasmine McNairn-Hart[1]
[1] *Mount Allison University*

Due to varying ecological conditions, the range of a species interaction is not homogeneous. However, many ecological systems are studied in one location and then generalized across the range without extensive spatial studies. The tri-trophic goldenrod gall system has been extensively studied at the range core, but much less so at the range peripheries, where aspects of the natural history of the species involved are likely different. This study seeks to determine what aspects of the natural history of this system at the New Brunswick-Nova Scotia border differ from the range core, around Pennsylvania (US), by asking three questions. (1) What are the associations between the size of a goldenrod plant and the probability of either *Eurosta solidaginis* or *Gnorimoschema gallaeosolidaginis* inducing a gall on the plant? (2) What are the associations between gall size and probability of parasitism and predation on the ball gall induced by *E. solidaginis*? (3) What is the timing of insect emergence from these ball galls? Results show no significant relationship between plant size and galling probability for either species, going against predictions based on the plant vigour hypothesis for herbivory attack. Additionally, gall size appears to be more influenced by environmental factors than the parasitism/predation observed at the range core. Finally, insect emergence followed predictions, with emergence times shifted to about a week after the range core. These findings highlight the need for broader spatial studies when studying species interactions, since they can vary significantly across a geographic range.



Grace Kasouf
Dalhousie University

Modelling Forest Fire Vulnerability in Nova Scotia, Canada

Grace Kasouf[1]
[1] *Dalhousie University*

An effective method to quantify and monitor the changes to a forest ecosystem is the use of remote sensing and spatial analysis techniques. As the global climate changes, it is becoming increasingly important to monitor forest fire vulnerability. The study areas are defined as the Upper Tantallon and Barrington fire locations from the summer of 2023 in Nova Scotia, Canada. An ISODATA unsupervised classification was performed to identify patterns of similar spectral characteristics among biophysical variables that will be used to determine an index for forest fire vulnerability. Using the original burn scar, an error matrix was performed to evaluate the reliability of the model results. A similar accuracy assessment approach is performed to assess how well the vulnerability scores agree with the real burn scenario. A Kappa statistic of 0.905 for the Upper Tantallon study area suggests a high level of agreement between the burn classification and the reference data. There was a high level of agreement between burned and vulnerable areas in both the reference (71%) and the map (64%). Therefore, a significant number of areas classified as vulnerable did burn in the resulting fire. Although, there was low agreement between the not burned and not vulnerable areas in both the reference (15%) and the map (19%). This could have been caused by fire control efforts in those areas. The results of this study will help improve future wildfire science towards forest fire prediction to increase disaster preparedness and decrease the damages of forest fires.

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FIRST PLACE

Emily Dolan
Acadia University

Encapsulation of Allyl Isothiocyanate Using Both Freeze Drying and Spray Drying Techniques: Impact on Chemical Components, Sensory Properties, and Saltiness

Emily Dolan[1], *Nicoletta Faraone*[1], *Matthew McSweeney*[1]
[1]*Acadia University*

Introduction: Salt is a widely used food additive due to its salty taste and ability to enhance other flavours. However, excessive salt intake negatively impacts cardiovascular health. As such, food reformulation strategies have been explored to improve consumer acceptance of sodium-reduced foods. Allyl isothiocyanate (AITC), a chemical compound found in horseradish, has been shown to enhance perceived saltiness. However, its application is limited due to its bitter, sour, and metallic notes, poor water solubility, and strong aroma. Encapsulation is a common technique in the food industry to mask undesirable flavours, improve handling, and increase water solubility. However, the sensory effects of encapsulated AITC remain unknown.

Objective: This study aimed to assess the suitability of various AITC encapsulation formulations through quantitative and qualitative analyses and evaluate their impact on the sensory profile of a sodium-reduced food product.

Methods: AITC was encapsulated using maltodextrin (MD) and gum Arabic (GA), with and without Tween-20 (T20) or Tween-80 (T80), via spray-drying (SD) and freeze-drying (FD). Gas chromatography (GC-FID) quantified AITC retention. Microcapsules were analyzed for surface morphology, moisture, and surface oil content. Consumers evaluated eight formulations in tomato soup (0.500 mg AITC/100 mL) (SD trial: n = 79, and FD trial: n = 93).

Results and Discussion: SD formulations with surfactants showed the highest AITC retention. While no formulation significantly altered basic taste perceptions, FD formulations generally enhanced creaminess, tomato flavour, and other sensory qualities, improving consumer acceptance.

Conclusion: Encapsulation may reduce AITC's off-flavours but could also diminish its saltiness-enhancing properties.



SECOND PLACE

Matthew Code
Acadia University

One's Trash is Another's Treasure: An Investigation Into the Sensory Properties of Luffa Seed Flour Incorporated Into Cookies

Matthew Code[1], *Matthew McSweeney*[1]
[1]*Acadia University*

Introduction: The luffa gourd or *Luffa cylindrica* is traditionally processed by removing the seeds, sap and skin and then dried to create an exfoliator product. Luffa seeds are currently a nutrient dense waste product that are high in protein, fibre, antioxidants, and essential amino acids.

Objective: The study aimed to evaluate the consumer acceptability of luffa seed powder in a baking application (cookies).

Methods: The seeds were roasted at 160°C for twelve minutes, ground and passed through a 60-mesh sieve to produce the luffa seed powder. Cookies were created with increasing amounts of luffa seed powder substituted into the cookie formulation for flour. The samples contained 0% (control), 2%, 4%, 7%, and 9% luffa seed powder. The cookies were then evaluated by consumers(n=96) using hedonic scales, check-all-that-apply, and a comment question about their attitudes towards luffa seeds was also included.

Results and Discussion: The incorporation of luffa seed powder negatively impacted the hedonic scores of the cookies at all percentage additions. As the concentration of luffa seed powder increased, participants identified off-flavours and textures. The overall liking scores of the 7% and 9% samples were negatively impacted by textural properties (i.e. dry, hard, and grainy) as well as earthy flavour and aftertaste. The green colour of the luffa seed powder cookies also decreased liking. Participants identified that they would be interested in luffa seed powder if it had health benefits or if it was a sustainable ingredient.

Sodium Intake Is Associated with Poor Diet Habits and Increased Adiposity in Adults Aged 40 and Older in Newfoundland and Labrador

Ella Smith[1], *Morgan LeDrew*[1], *Zahra Farahnak*[1]
[1] *Memorial University of Newfoundland*

THIRD PLACE

Ella Smith
Memorial University of Newfoundland

Introduction: Recent evidence suggests that increased sodium intake is related to poor cardiovascular outcomes and hypertension, with obesity also being a risk factor.

Research Question: Whether increased sodium intake is associated with greater adiposity.

Objectives: To assess the relationship between dietary sodium intake and adiposity in adults aged 40+ in Newfoundland and Labrador.

Methods: Healthy male and female adults aged 40+ (n=51) were evaluated for fat mass, using BIA (TANITA). A 24-hour recall was completed using the ASA24 tool to assess dietary intake. Independent sample t-tests and Spearman correlations were performed.

Results: Participants were 57.6 ± 8.6 years (mean ± SD) of age, 77% were female, 75% were born in NL and 96% were white. Fat mass was 21.9 ± 1.6 kg in females vs. 20.3 ± 3.1 kg in males. Sodium intake was 2765.6 ± 227.1 in females vs. 3097.0 ± 311.0 in males. Other results will be shown in oral presentation.

Discussion: Our preliminary findings showed that our participants had high sodium intake, which was associated with increased fat and protein intake, as well as overall higher caloric intake. Additionally, the sodium-potassium intake ratio was correlated with increased measures of adiposity, such as BMI and visceral fat rating.

Conclusion: Our findings suggest that increased sodium intake is associated with increased adiposity and poor dietary habits in our participants.



Laura Gosine
Mount Saint Vincent University

Exploring the Use of Behavioural and Environmental Domain Nutrition Care Process Terminology by Registered Dietitians Working in Nephrology

Laura Gosine[1, 2], Karthik Tennankore[2, 3], Sarah Hewko[4], Jennifer Brenton-Peters[5], Patty Williams[1], Shannan Grant[1, 3, 6]
[1]Mount Saint Vincent University, [2]Nova Scotia Health, [3]Dalhousie University, [4]University of Prince Edward Island, [5]Te Whatu Ora Health New Zealand, [6]IWK Health Centre

Introduction: Millions of Canadians are living with chronic kidney disease (CKD). Dietetic intervention is crucial in preventing and treating CKD. The nutrition care process (NCP), and terminology (NCPT), is a tool used to communicate identified barriers to accessing food and gaps in nutrition knowledge. Registered dietitians RDs use NCPT when charting in the ADIME format (Assessment/Diagnosis/Intervention/Monitoring/Evaluation).

Objectives: Examine perceptions of RDs practicing in nephrology in NS on their use of the social determinants of health (SDoH) and the behavioural/environmental (B/E) diagnostic domains and capture the use in their medical charting.

Methods: A retrospective audit of RDs chart notes was completed (2015-2023) to capture the usage of B/E domain and SDoH terminology. A close-ended online questionnaire was distributed examining the perceived utilization of the B/E diagnostic domain in nutrition care. This data was analyzed descriptively.

Results: The audit demonstrated RDs primarily use the clinical diagnostic domain in their charting, accounting for 36% of the reviewed charts, only 22% of the RDs used the B/E domain. 20 RDs completed the questionnaire. 20% identified that they were unfamiliar with the B/E domain, with 30% recognizing that that they do not use this domain in their charting. 15% reported not using ADIME, which was demonstrated in the chart audit as many dietitians did not use the ADIME method.

Significance: A growing body of evidence has highlighted that it is crucial that RDs understand and assess the social determinants. Understanding RDs current application of the NCP/NCPT, will enhance subsequent research questions, job aides and education.



FIRST PLACE

Kavindya Samarakoon
Dalhousie University, Agricultural Campus

Development of Novel Functional Food Ingredients by Microbial Biotransformation of Grape Seeds

Kavindya Samarakoon[1], *H.P. Vasantha Rupasinghe*[1]
[1] *Dalhousie University, Agricultural Campus*

Introduction: Functional foods derived from food processing waste offer a sustainable approach to enhancing human health. Grape seeds, a by-product of the grape processing industry, are rich in polyphenols, among which proanthocyanidins (PAC) are the most abundant. However, the bioavailability of highly polymeric PAC is limited.

Hypothesis: It is hypothesized that probiotic microorganisms can break down high-polymeric PACs in grape seeds into postbiotics with enhanced bioavailability and potential health benefits.

Objectives: This study aims to biotransform PAC of grape seeds using different microorganisms and characterize their microbial metabolites to assess their potential for functional food development.

Methods: Six bacterial species (*Lactobacillus acidophilus*, *L. casei*, *L. rhamnosus*, *L. plantarum*, *Bifidobacterium animalis*, and *Akkermansia muciniphila*), two yeast species (*Saccharomyces cerevisiae* and *S. boulardii*), and two edible mushrooms (White Button and Shiitake) were used separately for biotransformation of grape seed powder (GSP). Submerged fermentation was conducted with GSP, while mushrooms were also used for solid-state fermentation. Samples were collected at defined intervals for analysis of total phenolic content, total PAC, and metabolites using high-performance liquid chromatography-mass spectrometry (HPLC-MS).

Results: HPLC-MS analysis revealed that microbial biotransformation led to the production of metabolites not detected in the initial substrate or microbial control. Additionally, the concentrations of certain compounds in GSP were changed during biotransformation, indicating microbial metabolism.

Discussion: The findings suggest that selected microorganisms effectively biotransform grape seed polyphenols, generating novel bioactive metabolites.

Conclusion: This biotransformation may enhance the bioavailability and functional properties of grape seed polyphenols, allowing their potential use in functional food applications.



SECOND PLACE

Sathya Amarasena
Memorial University of Newfoundland

Dietary Vitamin B6 Modulates the Gut Microbiome Composition and Short-Chain Fatty Acid Levels in a Mouse Model of Non-Alcoholic Fatty Liver Disease

Sathya Amarasena[1], *Ava Rasouli*[1], *Shyamchand Mayengbam*[1]
[1] *Memorial University of Newfoundland*

Non-alcoholic fatty liver disease (NAFLD), a leading cause of chronic liver disease, is linked with gut dysbiosis. NAFLD is associated with dietary vitamin B6 deficiency, and B6 supplementation improves hepatic pathology. While dietary vitamin B6 modulates gut microbiome, the role of B6 in ameliorating NAFLD through gut-related mechanisms remains unclear. The study aims to investigate how dietary vitamin B6 levels affect gut ecology in NAFLD-mice model. Thirty-two C57BL/6J mice were fed either a control, high-fat-high-sugar (HFHS) diet with modified vitamin B6 levels; HighB6-HB6 (70 mg B6/kg diet), optimumB6-OB6 (7mg B6/kg diet), and deficientB6-DB6 (0.07mg B6/kg diet) for 8 weeks. Cecal samples were collected for microbiome profiling and short-chain fatty acid (SCFA) analysis. The HFHS diet decreased the relative abundance of Actinobacteriota and Bacteroidota and increased Verrucomicrobiota and Firmicutes compared to control group. The HFHS-DB6 diet increased the relative abundance of Firmicutes and Bacteroidota while decreasing Verrucomicrobiota compared to OB6 group. Microbial alpha diversity was reduced in HFHS group compared to the control, with no significant effects across the dietary B6 levels. Beta diversity analysis showed significantly different microbial communities in HFHS-OB6, HFHS-DB6, and HFHS-HB6 groups compared to the control group and across B6 levels. Differential abundance analysis revealed significantly altered microbes among these groups at species level. Additionally, cecal butyrate levels were significantly higher in HFHS-OB6 group compared to the control, while the HFHS-DB6 group exhibited significantly reduced cecal acetate compared to all others. In conclusion, dietary vitamin B6 influences gut microbial composition and SCFA content in NAFLD-mice model.



THIRD PLACE

Chandrika Chaturvedi
Dalhousie University, Agricultural Campus

Turning Food Waste Into Value: Optimizing Sulforaphane Extraction From Upcycled Broccoli Using Response Surface Methodology

Chandrika Chaturvedi[1], *H.P. Vasantha Rupasinghe*[1]
[1] *Dalhousie University, Agricultural Campus*

Introduction: The agri-food industry increasingly recognizes upcycled fresh produce as a valuable source of bioactive compounds. Broccoli (*Brassica oleracea* var. *italica*), rich in glucosinolates (sulforaphane) show potent anti-inflammatory and antioxidant activities.

Hypothesis: Optimizing extraction parameters (temperature, time, and ethanol concentration) of the ultrasonic-assisted extraction will maximize sulforaphane recovery from upcycled broccoli.

Objective: To determine optimal extraction conditions for sulforaphane from upcycled broccoli by evaluating the effects of temperature, ethanol concentration, and extraction time.

Methods: Response surface methodology and central composite design were used to optimize extraction parameters. The extract from optimum conditions was compared with eight literature-reported extraction methods using total phenolic content, glucosinolate content, carotenoid content, total antioxidant capacity (FRAP and DPPH), and glucosinolates (sulforaphane, glucobrassicin, glucoraphanin) quantified using high-performance liquid chromatography-electrospray ionization mass spectrometry (HPLC-ESI-MS).

Results: The optimal conditions (36 °C, 23% ethanol, 38 min) predicted from the model resulted in sulforaphane (383.9 ± 0.83 µg/g DW), glucobrassicin (32.45 ± 1.93 µg/g DW), and glucoraphanin (18 ± 5.47 µg/g DW). Among the tested extraction variables, ethanol concentration had the most significant impact on sulforaphane extraction ($p < 0.05$). Compared to eight previously reported extraction methods, the optimized extraction process in this study provided the highest sulforaphane recovery.

Conclusion: Optimal ultrasonic-assisted ethanol extraction achieved highest sulforaphane recovery in a shorter time at lower temperature. The sulforaphane-rich extract can be used for formulating dietary supplements and nutraceuticals. These extracts show promise for preventing and treating chronic diseases, offering sustainable solutions for enhancing human health and well-being.

Three-Minute Poster Presentation Award



FIRST PLACE

Cindy Yu
Dalhousie University, Agricultural Campus

Berries vs. Fatty Liver: How Flavonoids Activate the Body's Defense System

Cindy Yu[1], *H.P. Vasantha Rupasinghe*[1]
[1] *Dalhousie University, Agricultural Campus*

Introduction: Metabolic dysfunction-associated steatotic liver disease (MASLD) is a rapidly rising chronic liver disease characterized by excessive hepatic lipid accumulation without significant alcohol consumption. Its global adult prevalence is projected to rise from the current 38% to over 55% by 2040. MASLD is associated with lipid dysregulation, oxidative stress, and inflammation. AMP-activated protein kinase (AMPK) and Nuclear erythroid 2-related factor 2 (Nrf2) are critical regulators of cellular energy metabolism and redox balance, respectively, with emerging evidence suggesting their cooperative role in metabolic diseases. Flavonoids, abundantly found in berries, are known activators of AMPK and Nrf2. We examine how selected flavonoids target the AMPK/Nrf2 signalling axis for MASLD management, filling the knowledge gap in the associated mechanism and direct molecular targets involved.

Methodology: Using a fatty acid-induced hepatosteatosis cell model, selected flavonoids and their phase II metabolites will be screened for hepatoprotective effects, measuring lipid content, lipid peroxidation, and oxidative stress markers. Using AMPK inhibitor and Nrf2 knockout in mouse hepatocytes, we explore the molecular mechanism of the flavonoid-mediated AMPK-Nrf2 interaction. Molecular docking will reveal the binding affinity and interaction between flavonoids and target proteins. Efficacy of the flavonoids will be evaluated in a 12-week high-fat, high-sucrose, and high-cholesterol diet-induced obesity model using C57BL/6 mice, with an emphasis on AMPK-Nrf2 interaction.

Expected outcomes: We expect to identify specific binding site where flavonoids interact with AMPK/Nrf2, revealing potential therapeutic targets for MASLD. Results may provide mechanistic evidence supporting berry consumption as a dietary intervention for MASLD prevention.



SECOND PLACE

Adeola Oyagbohun
Mount Saint Vincent University

Cultural Foodways and Food Security: Exploring Adaptation and Resilience Among Newcomer Nigerian Mothers in Halifax, Nova Scotia

Adeola Oyagbohun[1], *Patty Williams*[1], *Irene Ogada*[1]
[1] *Mount Saint Vincent University*

Background: Food plays a central role in cultural identity, but migration often disrupts access to familiar foods, impacting dietary practices and food security. Food security refers to the availability, accessibility, affordability, and acceptability of safe and nutritious food, ensuring everyone has the necessary variety and amount for an active and healthy life. This study explored how mothers of Nigerian descent in Halifax Regional Municipality (HRM), maintain and modify their food traditions while navigating food insecurity.

Methods: This study used a qualitative multi-case study approach; data were collected through semi-structured interviews and cooking as inquiry (CAI) sessions from women who had immigrated from Nigeria, had at least one child aged 0-6, had lived in Canada for five years or less, and had experienced household food insecurity within the past 12 months.

Results: Findings reveal that Nigerian newcomer mothers face significant challenges in accessing culturally significant foods due to affordability, availability, and changing household dynamics. Despite these barriers, they adopt coping strategies to maintain their families' dietary and cultural identities.

Conclusion: This presentation will explore how these findings can help improve culturally inclusive food security policies and programs for Nigerian newcomer families in Halifax, with insights relevant to other newcomer communities in Nova Scotia.



THIRD PLACE

Rachel Windsor
Memorial University of Newfoundland

Sex-Specific Effects on Plasma Triglyceride Levels in Adult Offspring of C57BL/6 Dams Fed Diets High or Low in N-3 Fatty Acids and Subjected to Maternal-Immune Activation

Rachel Windsor[1], Nancy Rawal[1], Courtney Clarke[1], Innocent Okagu[1], Francis Bambico[1], Sukhinder Cheema[1]
[1] Memorial University of Newfoundland
Funding: NSERC

Introduction: Schizophrenia (SCZ) is a neurodevelopmental disorder linked to maternal inflammation during pregnancy, which disrupts fetal brain development and increases the risk of SCZ-like deficits in offspring. Omega-3 (n-3) polyunsaturated fatty acids (PUFAs) are essential for fetal brain development and have neuroprotective effects. They also regulate lipid metabolism, inflammation, and metabolic function in dams and offspring.

Hypothesis: Maternal immune activation (MIA) dams fed a low n-3 PUFA diet during late pregnancy, and lactation will exhibit dysregulated lipid metabolism and increased inflammation compared to MIA dams fed a high n-3 PUFA diet. Furthermore, offspring of dams fed a low n-3 PUFA diet will show dysregulated lipid metabolism and inflammation.

Objectives: To measure plasma triglyceride and IL-6 (inflammatory marker) in dams and offspring.

Methods: MIA mouse model was used to examine the effects of high- and low-n-3 PUFA diets on plasma triglycerides and inflammation. Pregnant C57BL/6 mice received intraperitoneal lipopolysaccharide (LPS; 0.1 mg/kg) or saline at gestation day 14.5 and were fed high-fat diets (20% w/w) with either 1% or 9% n-3 PUFAs until weaning. Offspring transitioned to a chow diet and underwent behavioural testing at postnatal day 70, and blood samples were then collected for triglyceride analysis.

Results: No significant differences were found in dam triglycerides; however, female offspring of saline dams fed a high n-3 PUFA diet showed higher triglyceride levels compared to LPS-dams fed a high or low n-3 PUFA diet.

Discussion: My findings suggest a sex-specific effect of diet and LPS on offspring lipid metabolism.



Abderrahmane Meziane
Université de Moncton

Profil des lipoprotéines plasmatiques en relation avec la carcinogenèse mammaire : étude cas-témoin

Abderrahmane Meziane[1], *Hawa Sidibé*[1,2], *Imane Hamam*[1], *Carole Tranchant*[1], *Abdelouahed Khalil*[2], *Slimane Belbraouet*[1]
[1]*Université de Moncton,*[2]*Université de Sherbrooke*

Introduction et hypothèse. La littérature suggère que des perturbations des taux de cholestérol plasmatique pourraient augmenter le risque de cancer du sein (CS). Ainsi, il pourrait exister une relation entre le taux de cholestérol plasmatique total (CT), ses fractions lipoprotéiques HDL-C et LDL-C, et la carcinogenèse mammaire.

Objectif. Cette étude cas-témoins visait à déterminer une possible relation entre le CT, ses fractions HDL-C et LDL-C, et la carcinogenèse mammaire.

Méthodes. Cent cinq femmes ont été recrutées au Centre hospitalier universitaire Dr-Georges-L.-Dumont, NB, et réparties en trois groupes selon les résultats de mammographie: témoins (n=67, sans tumeur, 58,1±9,2 ans), cas bénins (n=18, tumeur bénigne, 52,7±9,9 ans) et cas malins (n=20, CS, 61±9,8 ans). Un questionnaire et des mesures anthropométriques ont permis de caractériser les groupes. CT, HDL-C et triglycérides (TG) ont été dosés par méthode enzymatique automatisée, et les LDL-C calculées par l'équation de Friedewald.

Résultats et discussion. Les taux plasmatiques de CT, LDL-C et TG ne différaient pas significativement entre les groupes. Toutefois, les HDL-C étaient plus basses dans le groupe CS comparé aux groupes témoin et bénin (1,28±0,37 vs 1,53±0,36 et 1,63±0,39 mmol/L, $p<0,05$). Les HDL-C présentaient une association inverse avec le risque de CS après ajustement pour l'âge et le ratio TT/TH (OR=0,15; IC 95% [0,03-0,82], $p<0,05$). Plusieurs mécanismes pourraient expliquer ces résultats.

Conclusion. Cette étude suggère que les HDL-C joueraient un rôle protecteur contre le CS, tandis que les CT, les LDL et les TG plasmatiques ne semblent pas liés au risque de développer un CS.

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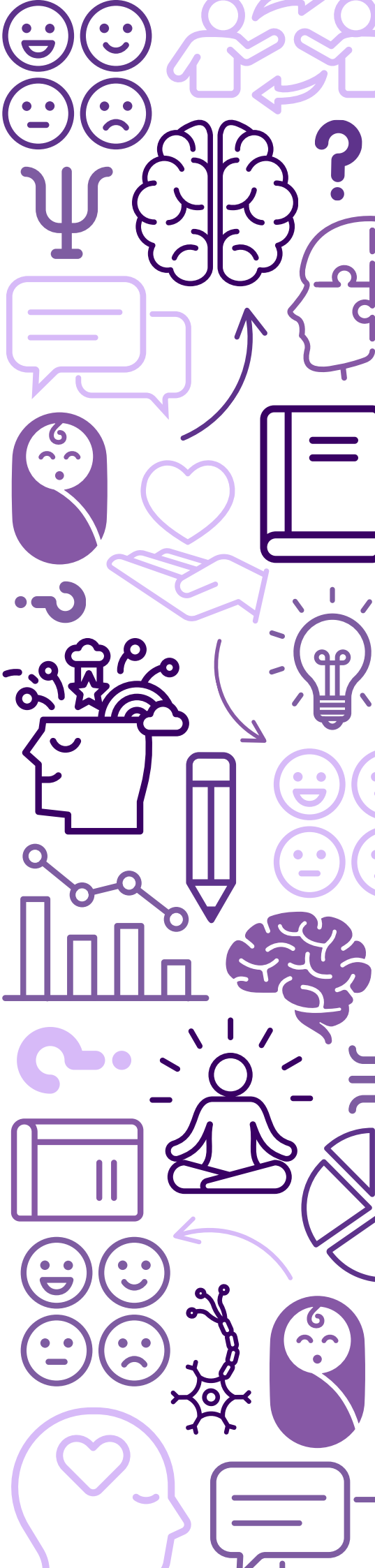



Gavin Woodward
St. Thomas University

Do Sounds Help Us Perceive More Accurately Across Eye Movements?

Gavin Woodward[1]
[1] *St. Thomas University*
Supervisor: Doris Chow

When people move their eyes (make saccades) to scan the world, they often fail to notice changes in the location of visual objects. In the lab, this perceptual phenomenon can be studied by asking participants to look to a visual target and displacing the target when the saccade is detected. Interestingly, when a brief gap in a sound associated with the visual target occurs, observers report the displacement direction more accurately compared to when no gap occurs; called the auditory blanking effect. Given that audiovisual integration—the binding of the visual target and sound into a coherent perceived event—affects many aspects of perception, we investigate whether it mediates the auditory blanking effect. If that were the case, we expect that weakening audiovisual integration should lead to a reduced auditory blanking effect. Data from 20 participants did not support this hypothesis. We replicated the auditory blanking effect, with improved sensitivity to displacement direction when an auditory gap was presented (d' = 0.47, SD = 0.48), compared to when no gap occurred (d' = 0.31, SD = 0.39; $p = .038$, $\eta^2 = .031$). However, we found that weakening audiovisual integration had no impact on the effect ($p = .266$, $\eta^2 = .007$). These findings suggest that audiovisual integration may not be necessary for the auditory blanking effect to occur and shed light onto how we use information from multiple senses to perceive a stable visual world despite frequent eye movements.



Madison Conrad
St. Francis Xavier University

Defending at a Cost: LGBTQ+ Youth's Overrepresentation in Witnessing and Defending Against Bullying

Madison Conrad[1]
[1] *St. Francis Xavier University*
Supervisor: Laura Lambe

Bullying is a prominent issue faced by many youth across Canada. Youth identifying as 2SLGBTQIA+, however, experience bullying victimization at a disproportionately high rate and thus might witness and defend against bullying more frequently. While many bullying prevention programs encourage peer defending, many fail to consider the inequities 2SLGBTQIA+ youth face and the potential mental health impacts. The objective of this research is to identify differences in witnessing bullying, peer defending, and mental wellness in 2SLGBTQIA+ youth compared to their peers. Results from 1200 youth in grades 7-12 across Canada suggest that 2SLGBTQIA+ youth witness all types of bullying more than their cisgender/heterosexual peers and engage in more frequent peer defending. Previous research indicates significant psychological consequences result from victimization. Witnessing bullying was negatively associated with well-being for all youth, however, this effect was stronger for 2SLGBTQ+ youth. We must consider these inequities when designing prevention programs encouraging peer intervention.



Alexandra Morrison
Mount Allison University

The Effect of Sensory Degradation on Visuo-Haptic Object Identification

Alexandra Morrison[1], *A. Butler*[1], *Genevieve Desmarais*[1]
[1] *Mount Allison University*
Supervisor: Genevieve Desmarais

Vision and touch both rely on shape information and may share memory representations for objects. Past research on multisensory object identification showed that incongruent inputs interfere with object identification. Typically, the visual component dominates over the haptic component, and incongruent visual information interfered more than incongruent haptic information. Similar studies with simple objects that differed in global shape showed that degrading an input interfered with integration. We investigated how sensory degradation impacts multisensory object recognition using complex objects that vary on individual features. Mount Allison students first learned to recognize objects by sight and by touch, then completed an identification task where they were presented with two objects: one they could see and one they could touch. Participants identified EITHER the visually-presented object or the haptically presented object and ignored the irrelevant object. Half of the trials, the objects were identical (congruent) and the other half they were different (incongruent). Participants performed the task twice: once as is (control) and once with either haptic degradation or visual degradation. Using repeated measures ANOVAs we found that when touch was degraded, degradation slowed down haptic identification and reduced the impact of incongruent stimuli on both haptic and visual identification. When vision was degraded, there was less interference from the incongruent visual stimuli during haptic identification but more interference from incongruent haptic stimuli during visual identification. These results differ studies using simple objects, suggesting that the re-weighting observed when inputs are degrading might depend on the type of features that determine object identify.



Sarah Kasprzak
St. Thomas University

"The System Is Broken, Not You": Advice From Psychology's Feminist Voices

Sarah Kasprzak[1], *Michelle Lafrance*[1]
[1] *St. Thomas University*
Supervisor: Michelle Lafrance

Psychology's Feminist Voices (https://feministvoices.com) is a project and archive dedicated to capturing and preserving the field of feminist psychology. Developed by Alexandra Rutherford, it features publicly available interview transcripts of prominent feminist psychologists reflecting on their experiences - 25 of these transcripts (those collected within the past 10 years) form the data for the present research. We investigated the ways in which feminist psychologists respond when asked for advice to newcomers to the field. Our approach to qualitative methodology was informed by critical thematic analysis as we examined, collected, and distilled common themes and types of language used in the advice. Through this work we have identified a problem/solution framework present in advice talk: participants use warning language and laughter when cautioning newcomers about problems in the field caused by toxic culture, pressure, and the rigid structures of academia and the field of psychology. Following the discussion of negative aspect of careers in feminist psychology, participants provide strategies to resist and survive these problems such as encouragement toward finding fellow feminist academics and forming communities, grounding in political and feminist beliefs, following one's passion, embracing an unconventional journey, and reconsidering one's relationship to academia. Corroborating advice from leading figures in the field can inform future generations of students who are interested in pursuing feminist psychology and illuminate experiences and perspectives of its members today.



Lea Kiechle
Dalhousie University

Mental Health and Sexting: Cross-Sectional and Longitudinal Associations with Behaviours, Motivations, and Outcomes

Lea Kiechle [1], Silvia Marin-Dragu [1], A. Setterington [1], L. Mason[1], N. Rowarth[1], S. Dolek[1], J. McArthur[1], S. Stewart[1], N. Rosen[1], J. Chorney[1], Sandra Meier[1]
[1] Dalhousie University
Supervisors: Sandra Meier, Silvia Marin-Dragu

Sexting ("sex" + "text") is common among emerging adults, with approximately 40% of 18-to-29-year-olds reporting having sent or received a sext. While having been linked to negative consequences and poor mental health, such as higher levels of anxiety, depression, and non-suicidal self-harm, sexting may also provide benefits, like increased sexual pleasure, relational intimacy, and body satisfaction. Motivation appears to play a moderating role. Sexting for autonomous reasons is associated with better outcomes, whereas controlled motivations predict poorer outcomes. Despite the relationship between mental health and motivational factors, fewer studies have linked mental health to sexting as a predictor rather than an outcome. This study recruited 422 emerging adults from Canadian universities to examine the relationship between mental health and sexting behaviours, motivations, and outcomes. It was hypothesized that poorer baseline mental health would predict sexting habits both at baseline and at a six-week follow-up in the form of more high-risk sexting behaviour, lower autonomous but higher controlled motivation, and more negative but fewer positive outcomes. Regression models confirmed the cross-sectional association between poorer mental health, decreased autonomous and increased controlled motivation, as well as more negative outcomes related to sexting. Structural equation models supported the hypothesized directionality, showing that poorer baseline mental health predicted non-primary partner sexting, higher controlled motivation, lower autonomous motivation, and more negative outcomes at the follow-up. These findings highlight the role of mental health as a predictor of sexting habits, suggesting that strategies aiming to minimize negative sexting consequences may benefit from targeting mental health support.

The Karen Nicholson Award in Neuropsychology



Wesley Jones
Dalhousie University

Quantifying Astrocyte Activation in the Cat Primary Visual Cortex Following Monocular Retinal Inactivation

Wesley Jones[1], *Kevin Duffy*[1]
[1] *Dalhousie University*
Supervisor: Kevin Duffy

Disruption of binocular vision early in postnatal development can cause amblyopia, a lasting visual impairment typically affecting one eye and considered untreatable beyond about the first year of life. In animal models, monocular inactivation (MI) of the dominant eye using tetrodotoxin (TTX), which silences retinal activity, promotes superior recovery from amblyopia compared to conventional treatment. Despite profound sensory deprivation, the inactivated eye maintains normal structure and connectivity within the primary visual pathway. Astrocyte activation has been proposed as a homeostatic mechanism supporting synaptic preservation during MI. Astrocytes are involved in neural maintenance, injury response, and adaptation to reduced activity. A previous study from our lab reported increased expression of glial fibrillary acidic protein (GFAP), a marker of astrocyte activation, in layers of the dorsal lateral geniculate nucleus (dLGN) serving the inactivated eye. The current study examined whether astrocyte activation also extends downstream to the primary visual cortex (V1). GFAP levels were first measured across normal development (n=15), showing minimal expression early in life, with significant increases later and a peak in adulthood. We then assessed the impact of MI by comparing GFAP expression in V1 between normally reared animals and those subjected to 10 days of MI at different postnatal ages (n=12). Although MI had no significant effect in very young animals, older animals exhibited significantly lower GFAP expression in V1 compared to controls. We propose that this reduction reflects an overcompensation at earlier synapses within the dLGN, helping to preserve upstream connections during MI-induced activity loss.

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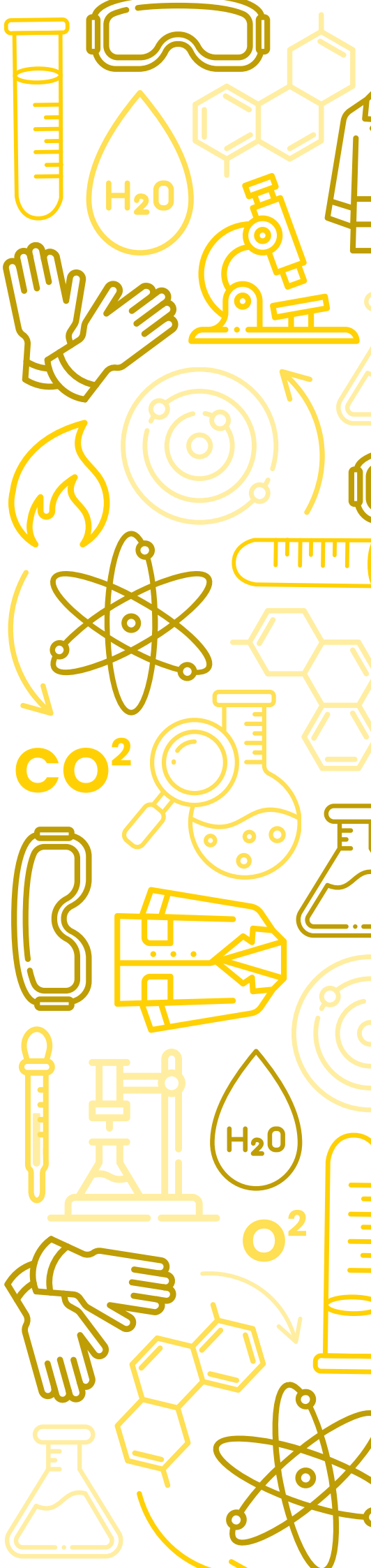




Gazi A. Bushra
University of New Brunswick, Fredericton

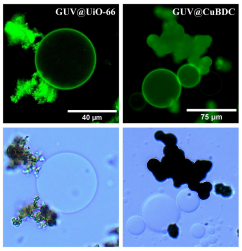
Immobilizing Giant Unilamellar Vesicles with Metal-Organic Frameworks

Gazi A. Bushra[1], *Aroosha Faheem*[1], *Mason Lawrence*[1], *Barry Blight*[1]
[1] *University of New Brunswick, Fredericton*

Metal-organic frameworks (MOFs) are a class of crystalline solid materials consisting of positively charged metal ions or clusters that coordinate to negatively charged organic ligands forming large frameworks that extend up to three dimensions. They have been under extensive research due to their well-defined structures, high internal surface area, high thermal stability, and high porosity (up to 90% free volume). These properties make them useful in many areas of chemistry such as gas separation, gas storage, and catalysis. Furthermore, the low toxicity and biocompatibility of some MOFs makes them of interest in biomedical research for applications such as drug delivery and disease diagnosis. Separately, giant unilamellar vesicles (GUVs) are a synthetic membrane model composed of phospholipids that form into a lipid bilayer in an aqueous solution due to hydrophobic forces. They are an important cellular membrane model due to their similar size (5 - 100 µm) and properties to eukaryotic cells.

Previously, our team has found that zirconium-based MOFs, Zr-BTDZ and MOF-808, are capable of anchoring to and immobilizing GUVs on a timescale of minutes to hours. To expand on this phenomenon, we investigated more MOFs made up of different metal nodes, different organic linkers, and therefore different topologies to generate a library of MOFs that can anchor to GUVs of varying compositions.

We discovered that UiO-66 and CuBDC anchored to GUVs and did so on a timescale of minutes to hours showing that this interaction is stable for a long period of time. This lipid-MOF interaction inspired us to further explore their potential therapeutic applications as ionophore candidates for the treatment chronic diseases such as cancer and cystic fibrosis.





Brandon MacDonald
Cape Breton University

Surf and Turf to Save the Earth, Turning Crab Shells and Wood Chips to Biochar

Brandon MacDonald[1], *Stephanie MacQuarrie*[1], *Marzieh Baneshi*[1]
[1] *Cape Breton University*

Two of the most important industries in Nova Scotia are fisheries and forestry, both of which generate significant byproducts or waste streams, resulting in a loss of valuable resources. Typically, harvested shellfish on average are roughly 40% meat and 60% shell, with the shell bodies being wasted through landfills, aquatic dumping and incineration. These methods of disposal create environmental issues and hazards such as air and water pollution, consequently impacting marine environments. As for softwood species that are harvested, such as those sold as firewood, fuelwood and sawlogs, roughly 20% of the harvest wood is unused and left to decay in landfills, where it is presumed to be returning the carbon to the environment in a few decades following its decomposition. While the two industries generate products, both leave biomass streams that are currently underutilized.

A deep dive into the literature shows woody biomass to be primarily composed of cellulose, hemicellulose, and lignin. Whereas snow crab shells are primarily composed of calcium carbonate, chitin, and minerals, which are high in nitrogen, carbon and inorganic salts. Snow crab shells and woody biomass have been extensively studied on their own, through pyrolysis of these materials to form byproducts such as biochar, biooil and biogas, though very little work has been done on co-pyrolysis of the two materials.

For this study, slow co-pyrolysis of snow crab shell and larch wood chips was performed at 500°C on five different ratios: 100% crab, 80 crab:20 wood, 50 wood:50 crab, 80 wood:20 crab, and 100% wood. To investigate the properties and potentials, the resulting biochars were characterized through Attenuated Total Reflectance, Thermogravimetric Analysis, and Brunauer-Emmett-Teller.

Cape Breton University
Cameron Forbes Memorial Award



Stephen Silliphant
University of New Brunswick, Fredericton

Engineering Alkaloid Biosynthesis in Yeast Using CRISPR-Cas9

Stephen Silliphant[1], *Yang Qu*[1]
[1] *University of New Brunswick, Fredericton*

Monoterpene indole alkaloids (MIA) are a vast class of natural products well known for their medicinal properties, serving as a strong anchor in the world of medicinal research and are known to derive from a single precursor, strictosidine. When the glucose unit of strictosidine is removed, strictosidine aglycone is formed, which is stabilized through an enzyme catalyzed reduction reaction to produce a number of alkaloid intermediates. In this study, I used CRISPR-Cas9 technology to integrate several strictosidine reductases into the genome of a yeast strain previously engineered to produce the substrate strictosidine aglycone. First, gene expression cassettes containing a galactose-inducible promoter, reductase gene, and terminator were amplified from plasmids by polymerase chain reaction (PCR) to create the donor DNA fragments. Then individual donor DNA was co-transformed with a helper plasmid encoding an integration site-specific guide RNA (gRNA) into the yeast strain, which has been engineered to contain the Cas9 nuclease. In yeast, the Cas9 nuclease cleaves yeast genomic DNA at a specific site dictated by the gRNA in the helper plasmid, allowing the yeast to repair its DNA using the donor DNA containing homologous DNA flanking sequences introduced by the above PCR. This process results in the reductase gene expression cassette being integrated into yeast genome. Successful genomic integration was confirmed by detecting strictosidine aglycone reduction product by liquid chromatography-mass spectrometry (LC-MS). Through genome integration of corresponding enzymes, the modified yeast has been found to be capable of producing various alkaloids. Analyzing LC-MS chromatograms, 60% of associated yeast transformants produced ajmalicine, 100% produced geissoschizine, and 60% produced Rauwolscine. These findings show promise for the future use of CRISPR-Cas9 in producing a multitude of pharmaceutical compounds.

Canadian Journal of Chemistry: Best Student Oral Presentation Award



Rachael Ball
Saint Mary's University

Multiresidue Analysis of Fungicides in Produce Items Using Two-Dimensional Liquid Chromatography (2D-LC)

Rachael Ball[1], *Christa Brosseau*[1]
[1] *Saint Mary's University*

The broad term 'pesticide' encompasses a variety of chemicals belonging to subcategories including insecticides, herbicides, and fungicides. The latter, fungicides, is the type of pesticide studied in this thesis research. Despite the beneficial properties of pesticides for regulating crop pests, they have also been shown to threaten the health of human organs and systems. The health concerns of pesticides are widespread and can be both acute and chronic. Acute health effects include irritation and burning of the skin, mouth or nose, and more urgent responses such as impaired cognition and seizures. Potential chronic repercussions include detriment to reproductive, pulmonary, and neurological health. In recent years, pyrimethanil (PYRI), fludioxonil (FLU), boscalid (BOS), and pyraclostrobin (PYRA) were commonly detected in produce items by the Environmental Working Group (EWG).

This research focuses on developing a two-dimensional liquid chromatographic (2D-LC) method for the separation, detection, and quantification of PYRI, FLU, BOS and PYRA in produce items. With this goal in mind, a 2D-LC heart-cutting method was developed, which produced properly resolved, symmetrical and sharp peaks in both separation dimensions. A modified Quick, Easy, Cheap, Effective, Rugged, and Safe (QuEChERS) clean-up procedure was employed for the clean-up of produce samples. Internal standard calibration was completed for all fungicides using phenanthrene as the internal standard. The coefficient of determination (R2) for all four calibration curves ranged from 0.990 - 0.992. For 2D analysis, the limits of detection (LOD) ranged from 0.043 - 0.131 mg/mL, while the limits of quantification (LOQ) ranged from 0.143 - 0.436 mg/mL. Using the optimized method, a Nova Scotian and a Peruvian blueberry sample were analyzed.

Canadian Journal of Chemistry: Best Student Poster Presentation Award



Hadil Hamza
St. Francis Xavier University

Etude de nanostructures à base d'étain pour la réduction électrochimique du dioxyde de carbone en formate

Hadil Hamza[1], *Erwan Bertin*[1]
[1] *St. Francis Xavier University*

La réduction électrochimique du dioxyde de carbone (CO_2) en produits à valeur ajoutée tels que le formate présente une stratégie prometteuse pour atténuer les effets des changements climatiques, tout en permettant de stocker de l'énergie renouvelable. Parmi les matériaux catalytiques explorés, l'étain (Sn) se distingue par son abondance, son faible cout et sa bonne sélectivité pour produire du formate.[1] Cependant des limitations subsistent concernant la stabilité et l'efficacité à long terme de ces catalyseurs.

S'appuyant sur les travaux antérieurs.[2, 3] avec des catalyseurs à base d'étain, cette étude explore la synthèse et les performances des nanostructures Sn_xM_{100-x} (M =Bi ou Cu) préparées par ablation laser pulsée en liquide qui est une méthode verte et sans agent réducteur et qui garantit en plus une grande pureté des nanoparticules.[4] Notre étude commence par la synthèse de nanoparticules d'étain par ablation laser pulsée en milieu liquide, puis de nanostructures de Sn_xBi_{100-x} et Sn_xCu_{100-x}. Ces nanostructures sont étudiées pour leur potentiel à améliorer l'activité catalytique et la durabilité lors de la réduction électrochimique du CO_2. L'introduction des métaux secondaires comme le bismuth (Bi) et le cuivre (Cu) vise à améliorer à la fois la stabilité et les performances électrochimiques des nanoparticules produites.[5-9]

Cette approche innovante se concentre sur l'évaluation des propriétés structurales, des performances électrochimiques et de la stabilité à long terme de ces nanoparticules. Le produit voulu, le formate, présente un intérêt pour l'industrie et pourrait servir de vecteur énergétique stable dans des piles à combustibles facilitant ainsi l'intégration des énergies renouvelables intermittentes. Donc l'étude s'inscrit dans une démarche de valorisation du CO_2 par le développement de nouvelles solutions catalytiques.

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CIC Best Presentation in Chemistry Education

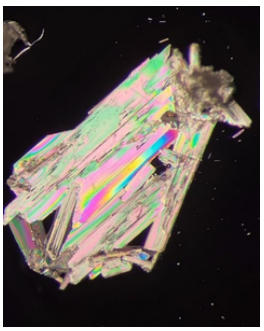


Tanner George
Saint Mary's University

Coordination Chemistry of Bismuth and Cation Dependent Complex Polyanion Formation

Tanner George[1], *Jason Masuda*[1]
[1] *Saint Mary's University*

Labs often utilize well established experiments in order to showcase known concepts in chemistry. As the Inorganic Chemistry lab instructor at SMU for the past 3 years, I have developed two new lab experiments - one of which I showcase during this talk. This lab was developed following very serendipitous and exciting discoveries while performing reactions with bismuth trichloride in personally directed research. In this talk, I will explain the story of how I got into this exploratory chemistry of bismuth anions, and how I went about incorporating what was learned into the Inorganic Chemistry curriculum, giving students in many cases their first opportunities to design experimental procedures and use available methods such as NMR, IR, melting point analysis, literature, and single crystal X-ray diffraction to characterize their products. In each lab group, students were given an amine that was available, cheap, with limited toxicity issues, and with limited studies into its particular ability to act as a counter ion for bismuth halide clusters. Reaction of the amine and bismuth trichloride solutions in acidic media afforded, in one group, a pure, novel, unreported compound which is actively being studied further alongside other research groups specializing in non-linear optics, computational chemistry, and complex thermal properties.



CIC Best Undergraduate Presentation in Analytical Chemistry (Oral)



Jamey Toney-Gagne
Cape Breton University

Phytochemical Analysis of *Cornus canadensis* (L.) Leaves Used in Indigenous Healing Practices: A Two-Eyed Seeing Approach

Jamey Toney-Gagne[1]
[1]*Cape Breton University*

Cornus canadensis (L.), a native dwarf dogwood plant, has been used by Indigenous North Americans as a medicinal plant for generations. Investigation into the phytochemistry of *Cornus canadensis* (L.) has been limited, and research into the bioactivity of phytochemicals present is even less. This study aimed to tentatively identify bioactive phytochemicals present within *Cornus canadensis* (L.) leaves that may be responsible for the medicinal properties described by Indigenous healing practices; using a two-eyed seeing approach (Etuaptmumk).

CIC Best Undergraduate Presentation in Analytical Chemistry (Poster)



Amaya Giraudier
St. Francis Xavier University

Investigation of Copper-Based Catalysts for the Electroreduction of Nitrate to Ammonia

Amaya Giraudier[1], *Anna Chisholm*[1], *Craig Bennett*[2], *Brian MacLean*[1], *Erwan Bertin*[1]
[1] *St. Francis Xavier University,*[2] *Acadia University*

The Haber-Bosch process is one of the most important chemical processes in use today and remains the primary method for producing ammonia—a compound essential for fertilizers, pharmaceuticals, textiles, and with potential as a hydrogen carrier. While vital to modern industry, this process consumes nearly 2% of global energy and emits around 450 million tons of CO_2 annually.[1] Electrochemical ammonia synthesis presents a promising green alternative to the Haber-Bosch process, with the most efficient yields achieved by recycling nitrogenous pollutants such as nitrates.[2] The use of nitrates as a precursor for ammonia synthesis not only offers a more sustainable production method but also helps mitigate water contamination caused by NO_3^- pollution, a widespread issue stemming from both natural and human activities.[2]

In this work, we used pulsed laser ablation in liquids (PLAL) to synthesize copper-based catalysts, including Cu and Cu_xM_{100-x} nanoparticles (where M = Ni, Fe, or Co), for the electrochemical reduction of nitrate. PLAL is a surfactant-free method that produces clean, high-surface-area nanoparticles by ablating a metal target in liquid, minimizing chemical contamination and batch variability.[3] These nanoparticles were characterized by TEM and MP-AES to assess their size and composition. Cu, $Cu_{50}Co_{50}$ and $Cu_{50}Ni_{50}$ nanoparticles were approximately 12 nm in size, while $Cu_{50}Fe_{50}$ particles were larger at 21 nm, and all compositions were copper-rich relative to their targets. While all catalysts showed some activity, performance varied significantly: Cu, $Cu_{50}Fe_{50}$, and $Cu_{50}Ni_{50}$ primarily produced nitrite, whereas $Cu_{50}Co_{50}$ achieved up to 86 ± 9% selectivity toward ammonia. Catalyst performance was influenced by applied potential, support material, and catalyst-to-carbon ratio.

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CIC Best Graduate Presentation in Analytical Chemistry (Oral)



Lauren Grant
Saint Mary's University

Linking Regional Yeasts to Wine Metabolite Profiles in Nova Scotian Natural Wines

Lauren Grant[1], *Clarissa Sit*[1]
[1] *Saint Mary's University*

The Nova Scotia wine industry contributed $254.3 million to the provincial economy in 2019 and is projected to grow to $49 million by 2030. L'Acadie Vineyards, a local producer of natural wine, employs spontaneous fermentation—relying on resident vineyard yeasts and bacteria present on the grapes at harvest—rather than inoculated starter cultures. This natural fermentation approach introduces complexity and unpredictability to the final wine profile, as the specific microbial species involved remain largely uncharacterized.

This project aims to identify the microorganism's driving fermentation and assess their influence on the chemical composition and sensory qualities of natural wine. Grapes were sampled during the 2019, 2020, and 2021 harvests for microbial isolation, with DNA identification of isolates currently underway. Amplicon sequencing of wine lees—the residual organic matter from fermentation—will be conducted to characterize the microbial communities active during fermentation. These data will be compared to vineyard isolates to identify which species persist through fermentation and contribute to the wine fermentation.

Select yeast and bacterial isolates will then be used in controlled in-lab fermentations of L'Acadie Blanc grape juice. The resulting wines will undergo chemical analysis using hydrophilic interaction liquid chromatography (HILIC) coupled with mass spectrometry (MS) to quantify key metabolites. Focus will be placed on profiling sugars, organic acids, higher alcohols, and esters—compounds known to shape the sensory profile of wine.

By linking microbial identity to chemical output, this project will provide insight into how natural fermentation drives wine chemistry. Longitudinal comparisons across vintages will help determine if a stable, resident microbiome is influencing wine character year-to-year. Ultimately, this research will not only inform production strategies at L'Acadie Vineyards but may also lead to the development of novel yeast starter cultures tailored to enhance regional wine characteristics—offering broader benefits to the Nova Scotia wine economy.

CIC Best Undergraduate Presentation in Environmental Chemistry (Oral)



Heath Patterson
Mount Allison University

Production of Dissolved Iron From Atmospheric Aging of Iron Oxides: Governing Factors

Heath Patterson[1], *Sarah Garrett*[1], *Jenny Wong*[1]
[1]*Mount Allison University*

Iron-containing particles influence oxidative potential and nutrient cycling, with their solubilization through atmospheric aging regulated by mineralogy, particle size, pH, and particle loading. In particular, dissolved iron is an important contributor to aerosol oxidative potential. Natural mineral dust, predominantly in the fine and coarse size ranges (~1-10 µm) and composed of iron oxides and iron-containing clays, has been extensively studied for its ability to produce dissolved iron. However, most of these studies have focused on mineral dust >250 nm. Anthropogenic sources, such as non-exhaust vehicle emissions, industrial activities, and solid biomass burning, also contribute iron oxide particles, including those in the ultrafine (<100 nm) range. Notably, iron oxides contribute to a large mass fraction of ultrafine particles emitted by emergent sources such as non-exhaust emissions. Despite the prevalence of iron-containing ultrafine particles, direct comparisons of iron solubility across different iron oxide minerals and particle sizes, specifically those in the ultrafine range, remain limited.

Here, we developed a semi-automated system using syringe pumps and a flow-through absorbance spectrophotometer to monitor dissolved iron produced during acid dissolution. This system was applied to systematically study iron dissolution from two iron oxides (magnetite and hematite), in both ultrafine (<100 nm) and fine (~1-2 µm) size ranges, under varying pH and particle loading conditions. Results show that iron dissolution was rapid, with dependence on particle size and mineralogy. Mineralogy effects were less significant under the most acidic conditions. By isolating the effects of particle size, mineralogy, loading, and pH conditions, this study provides new insight into the factors regulating the solubility of iron oxide-containing ultrafine particles.

CIC Best Undergraduate Presentation in Environmental Chemistry (Poster)



Sydney Palmer
St. Francis Xavier University

An Enlightening Approach to the Dementia Epidemic: Visible Light-Mediated Pollutant Remediation

Sydney Palmer[1], *Marzieh Baneshi*[2], *Ali Shafiee*[3], *Stephanie MacQuarrie*[2], *Geniece Hallett-Tapley*[1]
[1] *St. Francis Xavier University,* [2] *Cape Breton University,* [3] *Trent University*

Polycyclic Aromatic Hydrocarbons (PAHs) are of growing interest to scientists due to their negative health effects. PAH exposure has been linked to carcinogenicity, teratogenicity, neurodegeneration, and many other neurotoxic effects, the latter being primarily linked to elevated levels of dementia is areas of high contamination.[1] PAHs are often released into the environment during the incomplete combustion of fossil fuels.[1] Common methods of human exposure are vehicle exhaust, tobacco smoking, and improper industrial waste disposal[1] through both contaminated waterways and ground soil. These organic pollutants are composed of multiple fused benzene rings therefore they are notoriously difficult to degrade due to their rigid structure and aromaticity.[2]

Photocatalysis has emerged as a promising approach to degrading these pollutants. The use of carbonaceous materials such as biochar, when coupled with a semiconducting metal oxide has been investigated and are proving effective for the photocatalytic degradation of these toxins due to their high surface area and effective charge separation.[3] Semiconducting metal oxides are ideal photocatalytic catalysts due to their photoresponsive band gap.[3] Exposure to light energy results in the promotion of an electron from the valence band to the conduction band and the extra electron in the conduction band allows for the simultaneous oxidation of H_2O and reduction of H_2O_2, the latter through a process known as Fenton degradation.[4] This photoredox activity allows for the generation of reactive oxygen species (ROS) under light irradiation (Figure 1).[3] ROS are crucial for efficient PAH degradation, relying mostly on the formation of hydroxyl radicals (OH•) through radical coupling that slowly degrades the aromatic stability of the pollutant.[3] The following presentation will present the findings of using nanoparticle functionalized metal oxide/biochar composites for improving the energy sustainability of PAH photoremediation. The effect of light exposure time, PAH substrate, oxidant concentration and catalyst composition will be showed to be critical towards optimization of this light-activated pollution control approach.

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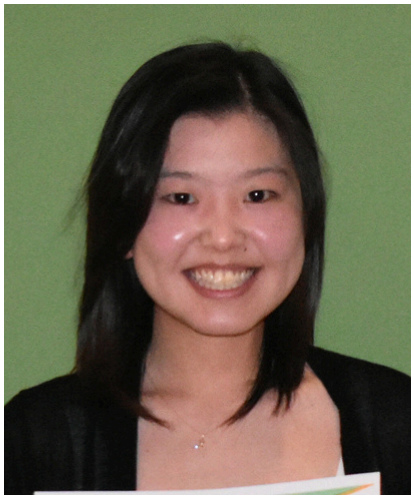
CIC Best Graduate Presentation in Environmental Chemistry (Oral)



Rin Takai
Mount Allison University

Factors Controlling Water-Soluble Iron in Fine Particulate Matter Air Pollution in Saint John, NB

Rin Takai[1], *Jenny Wong*[1]
[1] *Mount Allison University*

Human exposure to fine particulate matter (PM2.5) pollution is linked to acute and chronic cardiovascular, pulmonary diseases, with numerous epidemiological and toxicological studies demonstrating that water-soluble iron (WS-Fe) in PM2.5 is an important contributor to these adverse health effects. Although the predominant source of Fe from mineral dust is initially emitted in an insoluble form at the time of emission, Fe solubility measured in ambient PM is greater, indicating the contribution of unknown WS-Fe primary and secondary sources (i.e., atmospheric chemical aging resulting in the iron dissolution). While studies have shown that proton-mediated and ligand-mediated aging reactions convert insoluble Fe into a soluble form during atmospheric transport in Ontario, the factors controlling WS-Fe in Atlantic Canada, specifically in Saint John, New Brunswick (NB), remain unclear. Therefore, this study analyzes a ten-year historical air quality dataset provided by the National Air Pollution Surveillance Program (NAPS) to understand the major controlling factors of WS-Fe in Saint John. Results demonstrate that Saint John, as the largest port by cargo volume in Atlantic Canada, implementation of the North American Emissions Control Area (NAECA) low-sulfur fuel regulations shows impacts on WS-Fe production (1) directly, by decreasing emissions of WS-Fe from ships, and (2) indirectly, by a potential reduction in sulfur dioxide emission from large marine vessels, which influences aerosol pH by forming sulfuric acid, and consequently, iron dissolution through atmospheric chemical processes.

CIC Best Undergraduate Presentation in Inorganic Chemistry (Oral)

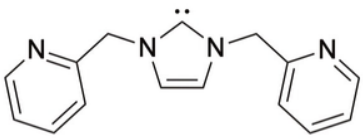


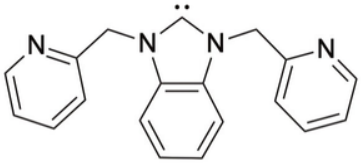
Liah Christie
Saint Mary's University

Exploring the Coordination Chemistry Between Bismuth (III) Salts and N-Heterocyclic Carbenes (NHCs) Derived From Imidazolium Salt-Based Pincer Ligands

Liah Christie[1], *Robert Singer*[1]
[1] *Saint Mary's University*

N-Heterocyclic carbenes (NHCs) are a novel class of compounds that have attracted considerable interest in synthetic chemistry due to their strong donating and weak accepting properties, as well as their characterization as soft Lewis bases. These features contribute to their enhanced stability and reactivity, making them valuable ligands in main group and transition metal chemistry. Synthesis of the ligands, which feature either an imidazolium or benzimidazolium core, is improved upon by employing the use of a microwave reactor rather than conventional heating. The generation of free NHC species through the deprotonation of these structurally distinct imidazolium salt-based pincer ligands and the formation of complexes with transition metals and main group elements will be discussed.







Ali Nasoudi
University of Prince Edward Island

Leveraging Secondary Coordination Sphere Lewis Acid Inclusion on PCP Pincer Frameworks for Reducing CO2 to Formate

Ali Nasoudi[1], *Marissa Clapson*[1]
[1] *University of Prince Edward Island*

Chemistry is experiencing a call to action concerning the development and implementation of sustainable chemical processes and transformations.[1] The development of base metal catalysts, in place of their precious metal counterparts, is one method to reduce both cost and toxicity while opening avenues for novel reactivity.[2] In recent years, pincer complexes have shown remarkable catalytic activity.[3] Milstein et al. provide excellent examples of metal ligand cooperation utilizing the secondary coordination sphere utilizing pyridine and acridine-based ligands which undergo an aromatization/de-aromatization sequence during bond activation.[4] Looking to further take advantage of the secondary coordination sphere, recent research has focused on the inclusion of Lewis basic and acid moieties into the ligand periphery as a means to tailor reactivity.[5] Herein, we describe preliminary results in the synthesis of a series of PCP pincer ligands featuring borane moieties in the secondary coordination sphere for applications in catalytic reduction of CO_2 to formate. The formation of strong B-O bonding interactions are leveraged to activate the CO_2 functionally, alongside π-bonding interactions with the base metal center.

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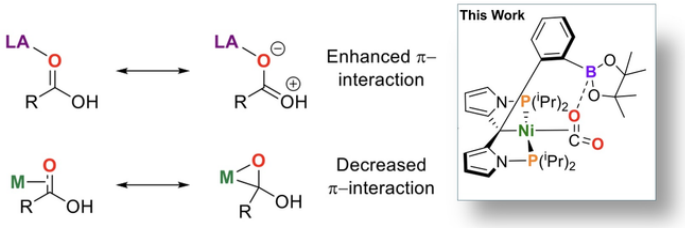

CIC Best Graduate Presentation in Inorganic Chemistry (Oral)



Deana Symes
Saint Mary's University

Carbene-Stabilized Pnictogen-Based Radicals

Deana Symes[1], *Jason Masuda*[1]
[1] *Saint Mary's University*

The use of N-heterocyclic carbenes (NHCs) and cyclic(alkyl)(amino) carbenes (CAACs) has allowed for the generation and isolation of radical-containing species, which otherwise could not be detected spectroscopically.[1] Carbenes effectively stabilize inherently highly energetic radical centers due to their tunable, typically bulky substituents, and a low-lying empty carbon p-orbital available to accept and delocalize the electron density of the unpaired electron.[2-5]

In our work, a series of carbene-stabilized pnictogen-based salts were prepared, utilizing carbenes with varying pi-accepting properties, and these salts were reduced to see if a stable radical could be isolated. Experimental evidence demonstrates the generation of carbene-stabilized pnictogen-based radicals. Radical decomposition products were identified by X-ray crystallography and NMR spectroscopy.

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CIC Best Graduate Presentation in Inorganic Chemistry (Poster)



Jay Tang
Dalhousie University

Phosphino(silyl) Nickel Complexes for Alkene Hydroboration Catalysis: Steric Tuning of Pre-Catalyst Provides High Regioselectivity

Jay Tang[1], *Laura Turculet*[1]
[1] *Dalhousie University*

Bis(phosphino)silyl nickel complexes featuring diethylphosphino donors on the tridentate PSiP ligand are effective pre-catalysts for room temperature alkene hydroboration with HBPin. Terminal and geminal alkenes, including a wide scope of vinyl arenes, reacted to afford exclusively the linear, anti-Markovnikov boronate ester product in all cases. Internal alkene substrates undergo Ni-mediated tandem alkene isomerization-hydroboration to afford the terminal borylation products with high selectivity. Deuterium labeling studies employing DBPin support a Ni-H based mechanism for this reactivity, whereby alkene isomerization occurs via reversible alkene insertion/β-hydride elimination steps. We propose that steric tuning of the PSiP ligand influences the observed regioselectivity.

CIC Best Undergraduate Presentation in Macromolecular Science and Engineering (Oral)



Olivia Van Hul
University of Prince Edward Island

Fluorescence-Based Investigations of Cyclodextrin Inclusion Complexes of Antimalarials

Olivia Van Hul[1], *Brian Wagner*[1]
[1] *University of Prince Edward Island*

Malaria is a parasitic disease estimated to have caused over half a million deaths internationally in 2023. Antimalarial drugs can be used to prevent or treat malaria, with many capable of doing both. These drugs are essential for the protection of travellers to malaria-endemic regions as well as for local, vulnerable populations who require seasonal malaria prevention and treatment options. Nonetheless, there are a variety of side effects and suboptimal characteristics of many antimalarials that render them unappealing for use, especially for children who are at high risk for severe malaria illness. Cyclodextrins, a class of cyclic glucopyranose oligomers, offer a potential solution to a variety of these poor attributes due to their cavity shape, which allows them to act as a host in host-guest inclusion complexes with drug molecules. This could potentially have benefits, including increased bioavailability, reduced side effects, and a longer shelf life. In fact, cyclodextrins are already implemented in various drug formulations on the market; however, research surrounding their compatibility with antimalarial drugs is limited. Host-guest inclusion complexes can be studied using various spectroscopic methods, including NMR and fluorescence spectroscopy, with the latter being the most sensitive technique for analysis. For this project, five antimalarial drugs were chosen to survey for UV-Vis and potential fluorescence properties, as well as to investigate their ability to form host-guest inclusion complexes with cyclodextrins in solution, with a focus on elucidating the respective binding constants for the host-guest complexes formed.

CIC Best Undergraduate Presentation in Macromolecular Science and Engineering (Poster)



Lauren MacDougall
Cape Breton University

Crabs to Crude: Repurposing Marine Waste Into Bio-Oil

Lauren MacDougall[1], *Stephanie MacQuarrie*[1]
[1] *Cape Breton University*

Over five million pounds of snow crab are harvested annually in Nova Scotia, with only the legs and shoulders typically processed for consumption. As a result, approximately 2/3 of the harvested biomass is considered waste, often discarded through landfilling, aquatic dumping, or incineration. This underutilized marine biomass is primarily composed of calcium carbonate, chitin, and proteins, making it a promising candidate for conversion into value-added products. In response to growing environmental concerns and the need for renewable resources, this project explores the transformation of crab waste into bio-oil through pyrolysis as a potential solution.

Pyrolysis involves the thermal decomposition of organic material in an oxygen-depleted environment, producing three by-products: biochar, biogas, and a complex liquid known as bio-oil. The bio-oil is of particular interest due to its chemically rich composition, which includes compounds with potential applications in renewable fuels and chemical manufacturing.

This study focuses on producing bio-oil from crab biomass and conducting preliminary analysis to characterize its key chemical constituents. To better understand the composition and potential value of this material, analytical techniques including gas chromatography-mass spectrometry (GC-MS) and infrared spectroscopy (IR) are used to examine the array of compounds present in the oil. Particular attention is given to nitrogen- and oxygen-containing organics, such as phenol and indole, which may influence both reactivity and overall chemical stability. In addition to compositional analysis, the degradation of the bio-oil is investigated to assess how its chemical profile changes over time. This information is crucial for evaluating storage stability, processing behavior, and potential applications.

Preliminary results indicate the presence of several nitrogenous and oxygenated compounds that may be relevant to further processing and application development. Observations on early-stage degradation also provide insight into the shelf life and handling requirements of the material.



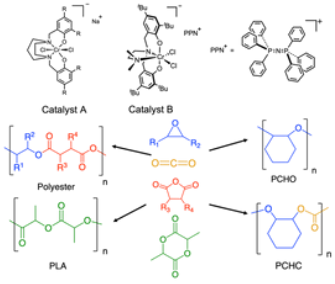
Cyler Vos
Memorial University of Newfoundland

Synthesis of Sustainable Polyesters, Polycarbonates and Terpolymers via Mononuclear Chromium(III) Diamino-Bis(phenolate) Catalysts and Multinuclear Zinc Catalysts

Cyler Vos[1], Christopher Kozak[1], James Beament[1], Aayush Anand[1,2]
[1]Memorial University of Newfoundland,[2]Indian Institute of Science Education and Research

Our group has previously reported using chromium(III) diamino-bis(phenolate) complexes as catalysts for the ring opening polymerization (ROP) of epoxides and ring opening copolymerization (ROCOP) of epoxides and CO_2. Currently, our focus is on expanding the polymer classes formed using these catalysts, as well as developing new multinuclear catalyst systems to accomplish similar polymerizations. This involves using different monomers that can be derived from renewable resources, such as cyclic anhydrides and lactones, for incorporation into copolymers. The use of renewable resources to form these polymers in a sustainable manner has been a focus of our research as the world drives to maintain a circular economy through sustainable production of useful materials. While our current research produced several different polyesters formed from renewable feedstock derivatives, we also formed a variety of terpolymers using these catalyst systems. These terpolymers incorporated CO_2, epoxides, and other monomers into their structure, resulting in tunable physical properties to be observed such as having a wide range of molar masses and glass transition temperatures. The formation of these terpolymers made from polycarbonate and polyester components gives hope for future terpolymer formation that has the thermoplastic behaviour typical for polycarbonates combined with the easily recyclable nature that is common among polyesters. The metal complexes' coordination geometry has also shown to be important for catalysis efficiency. The activity and selectivity for different monomers is influenced by whether a trans-ligand-inducing tetradentate diamino-bis(phenolate) ligand (ONNO) is used, or if a tripodal diamino-bis(phenolate) ligand (O_2NN') is used it enforces a cis-ancillary ligand orientation.

The influence of the ligand, choice of co-catalyst, catalyst loading, monomer-to-monomer ratio, and temperature will be discussed in this presentation, as well as the potential use of an additional renewable initiator to assist in less active copolymerization reactions giving rise to a larger array of polymers able to be produced efficiently in a sustainable manner. Furthermore, a brief exploration on using multinuclear diamino-bis(phenolate) zinc catalytic systems for sustainable polyester formation will be discussed as multinuclear catalytic systems have shown potential to be a more efficient alternative to the traditionally studied mononuclear catalytic systems.



CIC Best Undergraduate Presentation in Materials Chemistry (Oral)



Samuel Levesque
Mount Allison University

Towards the Tunable Bifunctionalization of PEGylated Gold Nanorods With Terphenyl Dithiol

Samuel Levesque[1], *Vicki Meli*[1]
[1]*Mount Allison University*

Gold nanorods exhibit unique optical properties due to the confinement of their free electrons to a small surface area. Upon excitation with light, localized surface plasmon resonance (LSPR) occurs, leading to the enhancement of electromagnetic fields on the surface of the particle, which makes the resonance sensitive to the local environment at the particle surface. Due to the anisotropic shape of the nanorods two distinct LSPR modes are observed, enabling their high versatility for optoelectronic applications. The ability to self-assemble the rods into specific architectures, which further enhance these fields, is attractive for many of these applications. Control over the physical properties (polarity, amphiphilicity) of the rods via composition of surface ligands is critical to achieving control over their self-assembly. In this project we describe the bifunctionalization of gold nanorods with the goal of achieving various degrees of amphiphilicity. The nanorods are originally synthesized with a cetyltrimethylammonium bromide (CTAB) ligand shell, required for shape control, which is displaced by carboxy-terminated polyethylene glycol thiol (PEG). PEG is used as a hydrophilic ligand and its polymeric structure maintains stability throughout further functionalization. However, PEG is a large polymer with a low packing density which leaves many open gold sites on the surface of the rods. The open gold surfaces can be backfilled by a smaller arylthiol (terphenyl dithiol), a hydrophobic ligand. The degree of bifunctionalization by terphenyl dithiol is qualitatively measured in real time using surface enhanced Raman spectroscopy (SERS). Other qualitative characterization methods include UV-Vis and IR spectroscopy, and zeta potential. These characterization methods confirm the presence of terphenyl dithiol on the gold surface and the loss of CTAB. Our efforts to quantitatively monitor the addition of TPD to the nanorod surface will be described.

CIC Best Undergraduate Presentation in Materials Chemistry (Poster)



Lauren Gatto
St. Francis Xavier University

The Design and Application of Light-Activated Nanomaterials for Sustainable Hydrogen Evolution

Lauren Gatto[1], *Geniece Hallett-Tapley*[1]
[1] *St. Francis Xavier University*

Greenhouse gases have been found to be detrimental to our planet. The most abundant greenhouse gases, such as carbon dioxide, methane, and nitrous oxide, interact with the Sun's energy in the Earth's atmosphere. These gases are capable of absorbing heat which overtime gradually increases the Earth's global temperature.[1] The most common source of greenhouse gases occurs through fossil fuel combustion - a finite source of the planet's energy. As a result, alternative energy sources are of high priority, with hydrogen gas having shown promise. Hydrogen gas - a clean energy source that liberates water as its primary byproduct - can be generated using a photocatalyst. These catalysts convert light energy into chemical energy by absorbing photons. The most common photocatalysts for hydrogen evolution are made from semiconducting metal oxides and nanoparticles. Here, the excitation of the nanomaterial can result in the formation of an electron hole pair affording a "photochemical cascade" responsible for hydrogen evolution (Figure 1). This study proposes using three-component catalysts comprised of metal organic frameworks, metal oxide, and platinum (PtNP) or cuprous oxide (Cu_2ONP) nanoparticles to generate hydrogen gas. Each component of the nanomaterial hold a specific responsibility correlated to substrate adsorption or improved longevity of the photoactivated state to improve overall light-activated hydrogen production. The hydrogen yield will be examined as a function of metal oxide, metal organic framework, nanomaterial, irradiation time and also reaction environment.

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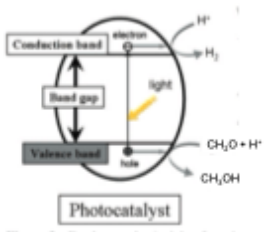



Pinelopi Tsami
Dalhousie University

Phosphaza-Adamantane Cages as Modular Ligands for Soft and Hard Materials

Pinelopi Tsami[1]
[1] *Dalhousie University*

The design of functional porous materials often relies on rigid, multidentate ligands with defined geometries and connectivity. Carbon-based ligands have been widely employed as building blocks for the synthesis of metal-organic frameworks (MOFs), hydrogen-bonded organic frameworks (HOFs), and porous organic polymers (POPs), enabling fine control over dimensionality, topology, and chemical functionality.

Recently, our group has introduced a new class of 3D multifunctional ligands based on phosphorus-nitrogen (PN) cage frameworks, namely the phosphaza-adamantane derivatives $P_2(NR)_6$ and $P_4(NR)_6$ (R=H, Me, Et, etc)[1]. These PN cages can be oxidised at their P(III) using organic azides (RN_3), allowing for the modular installation of functional groups[2]. Thus, these ligands exhibit a combination of rigidity, three-dimensional connectivity, and tunable functionality- making them ideal as scaffolds for making porous materials.

In a 2024 study, the Chitnis group also demonstrated the synthesis of a benzoic acid-functionalised $P_2(NMe)_6$ cage and its application as a ditopic linker in the construction of two-dimensional Co(II) and Zn(II) MOFs[3]. However, analogous derivatization of the $P_4(NMe)_6$ cage with benzoic acid yielded low product recovery.

In this work, I focus on improving the synthetic route and isolation of the tetra-benzoic acid-substituted $P_4(NMe)_6$ cage. Both tri- and tetra-substituted derivatives of the P_4 cage were prepared via the nucleophilic reaction of 4-azidobenzoic acid with the P_4 cage. Particular attention was given to optimising reaction conditions, in order to isolate the desired carboxylate ligands in higher purity and yield. The long-term objective is to establish P_4-based ligands as building blocks for the formation of extended frameworks.

Beyond their synthetic novelty, PN cages offer several advantages over traditional carbon-based ligands. Their high phosphorous and nitrogen content results in flame retardancy[4], and natural biodegradability. Also, the use of ^{31}P NMR spectroscopy provides a reliable and efficient method for characterisation. Owing to their unique size and connectivity, PN cage ligands complement existing ligand families and may facilitate the construction of high-porosity soft and hard materials with potential applications in gas sorption, separation, catalysis, and drug delivery.

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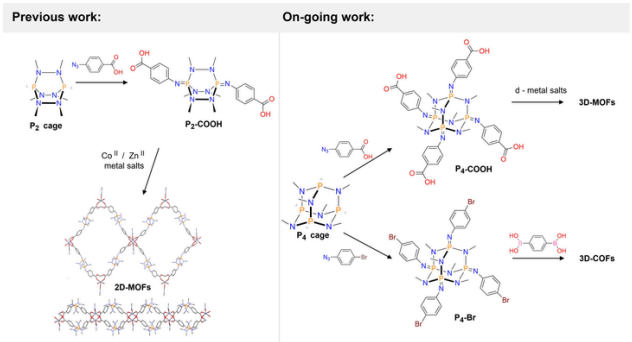

Katie MacLean
Acadia University

Finding the Goldilocks Zone for Excited State Intramolecular Proton Transfer (ESIPT)

Katie MacLean[1], *Matt Lukeman*[1], *Marcus Vaillancourt*[1]
[1]*Acadia University*

Phenols are weak acids with pKa values near 10, which become much more acidic when in the singlet excited state after the absorption of light. The increased electron density in the aromatic ring of phenols can promote a reaction known as Excited State Intramolecular Proton Transfer (ESIPT). This reaction involves an acidic hydrogen being transferred to a basic site on the same molecule in the excited state. ESIPT has many crucial applications including sunscreens, photostabilizers, and laser dyes. ortho-Alkylating groups are known to increase the efficiency of ESIPT due to a steric effect which places the acidic hydrogen in a conformation which favours a proton transfer, with the bulkiest groups (tBu) having the greatest effect. However, in the case of 2-phenylresorcinol, we have found that o-tBu groups decrease ESIPT efficiency, which we believe to be due to the “loose bolt” effect.

In this presentation, we will outline our efforts to increase ESIPT quantum yields in the 2-phenylresorcinol system by decreasing the size of the o-alkyl group from tBu to methyl. We were able to prepare and characterize the target compound, and our quantum yield measurements show that replacement of tBu groups with methyl groups increase the ESIPT reaction efficiency by a factor of 8, confirming that o-alkyl groups have an enhancing effect, and that smaller groups may be preferred to larger groups in some cases.

CIC Best Undergraduate Presentation in Organic Chemistry (Poster)



Anna Mulak
St. Francis Xavier University

Optimizing Solvent Selection for Enhanced Photochemical Hydrogen Generation

Anna Mulak[1], *Geniece Hallett-Tapley*[1], *Erwan Bertin*[1]
[1] *St. Francis Xavier University*

Hydrogen (H_2) shows great promise as an energy source due to its high energy capacity and absence of greenhouse gas (GHG) emissions. H_2 has an energy capacity three times larger than gasoline,[1,2] making it an attractive alternative to fossil fuels. As global energy demand grows yearly, so does the need for clean energy sources. Many countries have begun transitioning to H_2 energy to meet net-zero carbon emissions goals.[3] H_2 can serve as both a transportation fuel and a power. In contrast, most traditional energy sources, such as coal, emit harmful GHGs into the environment, including sulfur dioxide (SO_2), nitrous oxides (NO_x), and carbon dioxide (CO_2). Conventional H_2 generation processes depend on electricity grids and high-purity water, often inaccessible in remote areas. As a result, implementation of H_2 fuels remains challenging. While H_2 can be produced from natural gas, this method produces significant CO_2 emissions. H_2 produced through water electrolysis is clean but not cost or energy efficient.[2] This research aims to develop a green pathway for photochemically generated H_2. The findings presented build on previous work on photocatalytic H_2 evolution using a three-component photocatalyst (PtNP/TiO_2/UiO-66) comprised of platinum nanoparticles, a semiconductor (titanium dioxide) and a metal-organic framework (MOF, UiO-66). The pairing of this material with a small, abundant alcohol (methanol) afforded H_2 generation upon UV light exposure. Results have suggested that each component is necessary to maximize H_2 production. This study aimed to improve the sustainability of hydrogen evolution by replacing methanol with other small additional solvents: methanol, ethanol, propanol, tert-butanol, ethylene glycol, and glycerol. Glycerol, a biodiesel byproduct, was examined as a cosolvent because it is plentiful in the alternative fuel industry. Further experiments explored aqueous cosolvents that contained water and sodium salts of hydroxide, carbonate, bicarbonate, and acetate at different concentrations. Deuterated methanol was also evaluated to obtain mechanistic insight that could refine the choice of solvent. Finally, various aspects of the reaction, such as irradiation time, light source and catalyst recyclability, were studied to minimize waste. This work focuses on the benefits of photocatalytic H_2 generation and the advances in developing a clean hydrogen energy pathway that can be applied industrially.

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Leah Baylis
St. Francis Xavier University

Photoreduction of Nitroaromatics via In Situ Hydrogen Evolution

Leah Baylis[1], *Geniece Hallett-Tapley*[1], *Lauren Gatto*[1]
[1] *St. Francis Xavier University*

Canada is home to approximately one third of the world's fresh water. However, high pollution rates have rendered some of these reserves unsafe for human use. Nitroaromatic pollutants are difficult to remove or degrade from wastewater due to their high water solubility resulting from their polar nitro group. The first step in nitroaromatic pollutant degradation is the reduction of the nitro group to an amine group. Amines are an adaptable precursor for the synthesis of a variety of compounds used in industry; including textiles and dyestuff, surfactants, polymers and chelating agents, agriculture and fertilizers, and pharmaceuticals. Typical nitro transformations require the use oh strong acid, high temperatures/pressures, or precious metal catalysts. However, a multi-component Cu2O/TiO2/UiO66 heterogenous photocatalyst can be used to reduce nitroaromatic compounds to amino aromatic compounds at ambient temperatures and pressures upon UV irradiation. This transformation can occur within minutes on compounds containing either electron donating or electron withdrawing substituents.

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CIC Best Graduate Presentation in Organic Chemistry (Poster)

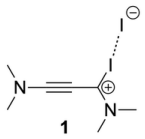


Lauryn Mason
Saint Mary's University

A Synthetic Investigation of Haloalkyne Iminium Cation Chemistry

Lauryn Mason[1], *Jason Clyburne*[1]
[1] *Saint Mary's University*

Haloalkyne iminium cations are highly reactive organic species with a plethora of potent functionality. In particular, the isolable salt 1,3-bis(dimethylamino)-3-iodoprop-1-ynyl iodide 1 and the transient 1,3-bis(dimethylamino)-3-chloroprop-1-ynyl cation 2 are of particular interest since they possess, in close proximity, a carbocation, a triple bond, and a halogen leaving group. It has been shown by our group that 1 will react with bis(phosphine) ligands to yield dicationic bent cyclic allenes, which are unprecedented, however the isolation of dicationic cyclic allenes of ring size less than 8 has not yet been successful, because rearrangement products are energetically preferred. Small rings may be able to be accessed via 2. Additionally, 1 is postulated to possess the potential for carbene-like reactivity, as the iodide anion is known to coordinate to the iodine moiety via a σ-hole effect, which is speculated to allow the abstraction of molecular diiodine either using transition metals or topochemistry to yield a very esoteric carbene species. I intend to study the synthesis of dicationic cyclic allenes from 1 and 2 using hindered bis(phosphino)amine ligands, as well as bulky dialkyl-bis(phosphino)methane ligands. I also intend to investigate the potential for carbene-like reactivity of 1 using high-pressure infrared and X-ray spectroscopy as well as transition metal chemistry. To date, a large quantity of precursor for both 1 and 2 have been prepared, as well as a quantity of bis(diphenylphosphino)amine, as these are multi-step synthetic products and are not commercially available. The synthetic method to prepare 1 and 2 has been optimized. This work will elaborate on the novel class of molecules prepared by our group, namely dicationic cyclic allenes.



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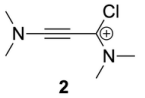
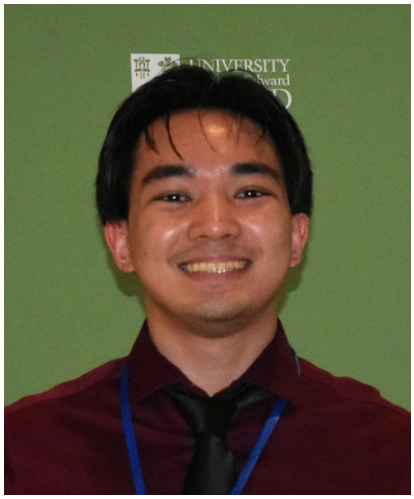


2

CIC Best Undergraduate Presentation in Physical, Theoretical, and Computational Chemistry (Oral)

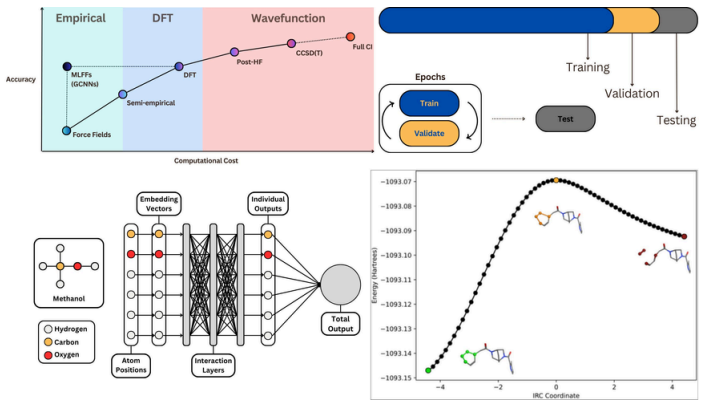


Stefano De Castro
University of New Brunswick, Fredericton

Analysis of Differently Trained Graph Convolutional Neural Networks Using Diels-Alder Reactions

Stefano De Castro[1]
[1] *University of New Brunswick, Fredericton*

The basis for many techniques and methods used by computational chemists lie on a spectrum ranging from Empirical to Quantum Mechanical. The method of choice is highly dependent on the size and complexity of the system because great accuracy and precision often comes at the cost of steep computational scaling. Machine Learning Force Fields (MLFFs) hold vast potential for use due to their ability to exhibit both Empirical-Level computational efficiency and Quantum-Mechanical-levels of predictive accuracy provided the availability of reliable data. However, MLFFs suffer from interpretability and explainability issues, such as the Clever Hans Effect where models may appear to be chemically accurate but for chemically implausible reasons. Initial energy prediction analyses show an incapability to properly represent transition-states, thus three training protocols and three model hyperparameters were tested in this paper to try to best recreate reaction pathways on both a quantitative and qualitative level while tracking the latent space to track the extent of clustering across models. Results revealed that training protocols which include both equilibrium and non-equilibrium states lead to better clustering within the latent space, and certain combinations of hyperparameters can lead to the success and failure of trained models. All this supporting the idea that a model can be made more robust with the inclusion of both types of states, but only in a certain fashion.



CIC Best Undergraduate Presentation in Physical, Theoretical, and Computational Chemistry (Poster)



Allison Clark
St. Francis Xavier University

1-D and 2-D NMR Investigations of Hydrophobic Counterions in Sodium Dodecyl Sulfate (SDS) Micelles

Allison Clark[1], *Gerrard Marangoni*[1]
[1] *St. Francis Xavier University*

Micellar systems have important commercial and industrial applications, including but not limited to, cosmetics, pharmaceuticals, soft-templating materials for nanoparticle synthesis, and cleaning, wetting, and foaming agents. The physiochemical properties of surfactant solutions depend on the size and shape of the surfactant molecules, as well as the temperature, solvent composition, and presence of additional electrolytes or other surfactants. Physiochemical properties influencing the micellar behavior of Sodium Dodecyl Sulfate (SDS) were examined in the presence of increasing amounts of tetraalkylammonium salts (TAAX, X = Br, Cl). At a certain minimum surfactant concentration, monomers will spontaneously aggregate via self-assembly into micelles, and we define that concentration as the critical micelle concentration (CMC). CMC values and the degrees of counterion dissociation (α) were obtained via conductometric titrations. 1-D 1H and 13C chemical shift changes and 2-D NOESY spectra were obtained with increasing hydrophobic counterion concentration to analyze the proximity of components within the micelles. The mass transport of the surfactant and hydrophobic counterions were examined by diffusion measurements (2-D DOSY) via NMR spectroscopy, to track the exchange of the counterions with the aggregates. The results are interpreted in terms of increasing counterion hydrophobicity, which decreases the CMC values of the micellar system.

CIC Best Graduate Presentation in Physical, Theoretical, and Computational Chemistry (Oral)



Emma Ramsay
University of Prince Edward Island

Synthesis and Fluorescence Studies of the Host Properties of a Water-Soluble Pillar[5]arene

Emma Ramsay[1], *Brian Wagner*[1]
[1] *University of Prince Edward Island*

Pillar[n]arenes are a relatively new class of macrocyclic compounds composed of n substituted phenyl rings linked by methylene bridges in the para position. They are of particular interest in host-guest chemistry, where smaller guest molecules are non-covalently encapsulated within the internal cavity of the host molecule - in this case, a pillar[5]arene. The formation of these complexes can be monitored through fluorescence spectroscopy. While non-water-soluble pillar[n]arenes are commercially available and have previously been studied by our research group, their water-soluble counterparts require in-lab synthesis. This project aims to synthesize a water-soluble pillar[5]arene and evaluate its host-guest inclusion properties using fluorescence-based methods with 1,8-ANS, 2,6-ANS, and 2,6-TNS as guest molecules. Inclusion will be assessed through changes in fluorescence intensity, from which the binding constant (K) will be determined. A new water-soluble pillar[5]arene has been successfully synthesized via a modified literature method and shows significant fluorescence enhancement upon binding each guest. Preliminary investigations of its binding characteristics will be discussed.



Kogie Esteban
Dalhousie University

Benchmarking and Accelerating the Discovery of Earth-Abundant Electrocatalysts for Water Splitting With Data-Driven Tools

Kogie Esteban[1], Samuel Hanuka[1], Sana Kashgouli[1], Shayan S. Mousavi M.[2], Ali Malek[2], Robert Black[2], Khalid Fatih[2], Michael Freund[1], Mita Dasog[1]
[1]Dalhousie University,[2]National Research Council Canada

Green hydrogen production via water electrolysis is a key technology for clean energy storage and conversion, enabling renewable electricity to be stored in the form of hydrogen fuel. This process is driven by the hydrogen evolution (HER) and oxygen evolution (OER) reactions. However, state-of-the-art catalysts for these reactions in acidic media typically rely on precious metals such as platinum for HER and iridium/ruthenium oxides for OER, which are both costly and scarce. This drives an urgent need to develop high-performance, earth-abundant alternatives with both high activity and stability in acidic environments. With the increasing volume of research in this field, efficiently gathering and analyzing relevant information has become a significant challenge. To address this, we have developed a tool that identifies all the relevant publications and extracts key data on earth-abundant electrocatalysts for HER and OER in acidic media. This framework starts by generating a domain-specific ontology and creates a knowledge graph for the detailed demonstration of data and high-quality information retrieval. The tool then ranks the publications based on relevancy and extracts the earth-abundant catalysts of interest, along with the required experimental details for water splitting. Recognizing the critical need for standardized benchmarking in acidic environments, the presented project builds upon established best practices to ensure rigorous, consistent evaluation of catalytic activity across laboratories.[2-4] The experimental protocol involves testing HER and OER on rotating disk electrodes using gold or glassy carbon electrodes, with thorough electrode surface pretreatment, standardized catalyst ink preparation, and accelerated stress testing in acidic electrolyte. Key electrochemical metrics such as overpotential, Tafel slope, electrochemically active surface area, impedance measurements, and stability under prolonged cycling will be assessed. Furthermore, the project will explore the impact of water impurities on catalyst performance, simulating real-world conditions to evaluate the robustness and practicality of these catalysts for large-scale electrolysis. By uniting AI-driven discovery with robust experimental benchmarking, this project aims to improve the efficiency, stability, and longevity of electrolysis systems for hydrogen production, while advancing materials discovery for cost-effective and sustainable electrocatalysts.

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