



35th

ONTARIO

BIOLOGY DAY

Hosted by Brock University

March 25 - 26, 2023

ONTARIO
2023 **Biology Day**
@ BrockU/Niagara

Wi-Fi

Username: brockguest

Password: welcome2brock0323!

Land Acknowledgement

We acknowledge the land on which we gather is the traditional territory of the Haudenosaunee and Anishinaabe peoples, many of whom continue to live and work here today.

This territory is covered by the Upper Canada Treaties and is within the land protected by the Dish with One Spoon Wampum Agreement.

Today this gathering place is home to many First Nations, Métis and Inuit peoples and acknowledging reminds us that our great standard of living is directly related to the resources and friendship of Indigenous people.

Land Acknowledgements do not exist in a historical context. The need for direct action and systemic change towards decolonization is an ongoing journey. In the same spirit, the above Land Acknowledgement has been the collaborative and thoughtful work of the Aboriginal Education Council, which was the culmination of 10 years of discussions. It is important to continue engaging with what it means to be a researcher and settler on this land and to support and uplift Indigenous voices within our lives.

The “dish” in the Wampum agreement represents the land that is to be shared peacefully and the “spoon” represents the individuals living on and using the resources of the land. This agreement is one that celebrates the spirit of reciprocity, and such an agreement creates space for the awareness of ecological and environmental sustainability, along with the responsibility to ensure that the dish is never emptied as we take care of the land and all the living beings on it. The spirit of this agreement is something we can all take to heart. We can also take steps towards fulfilling the 94 calls to action from the [Truth and Reconciliation Council report](#).

We would also like to acknowledge that the delegates at this meeting are from diverse areas of Canada. You can see the traditional territory on which you live and work at <https://native-land.ca/>.

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Follow Your Passion

Dr. Lesley Rigg
President
Brock University

An accomplished academic leader, professor and research scientist, Dr. Lesley Rigg has served as Brock University's President and Vice-Chancellor since November 2022.

Previously a biogeographer/forest ecologist, Rigg led the research enterprise at Western University as the institution's Vice-President, Research. Prior to arriving at Western, she served as Dean of the Faculty of Science and Professor, Biological Sciences at the University of Calgary, where she led one of the largest Faculties on campus spanning six departments and five multidisciplinary programs.

Her experience also includes holding significant leadership positions at Northern Illinois University. There, she served as Vice-President for Research and Innovation Partnerships and other roles including Associate Dean Research and Graduate Affairs in the College of Liberal Arts and Sciences.

She is a Fellow of the Royal Geographical Society of Canada, a former executive committee member of the Ontario Council on University Research (OCUR) and the recipient of many honours, including the Alberta SHEInnovator Award and the Women of Inspiration, Vision Builder Award for Western Canada. She has spoken extensively and published works on forest dynamics, biogeography, and women in science.

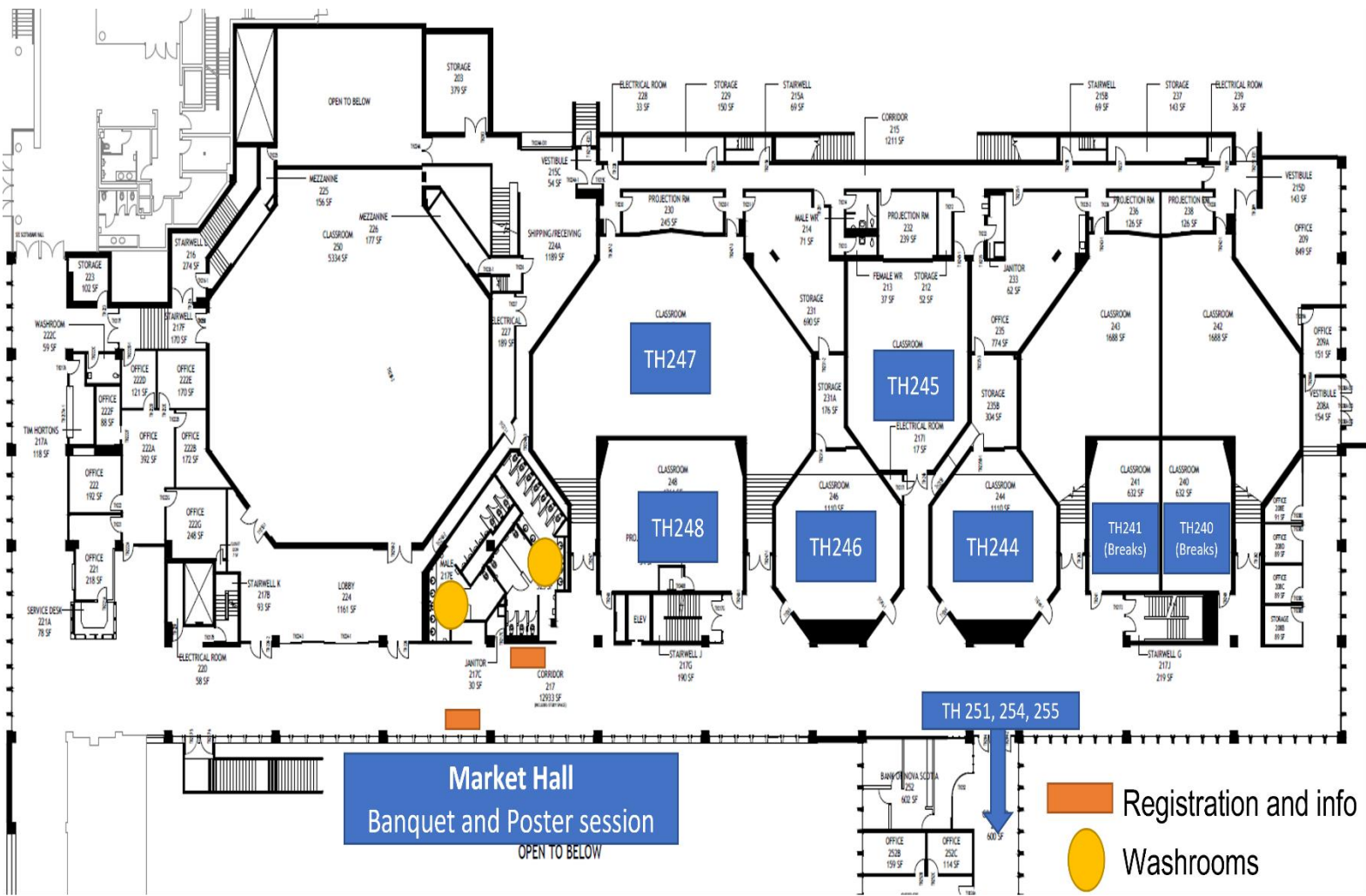
Rigg earned her bachelor's degree in geography and environmental studies from York University in Toronto, a master's degree in geography from the University of Colorado and a PhD in geography and environmental studies at Australia's University of Melbourne.

From Biology to Ballet: Connecting lessons from the stage and the field

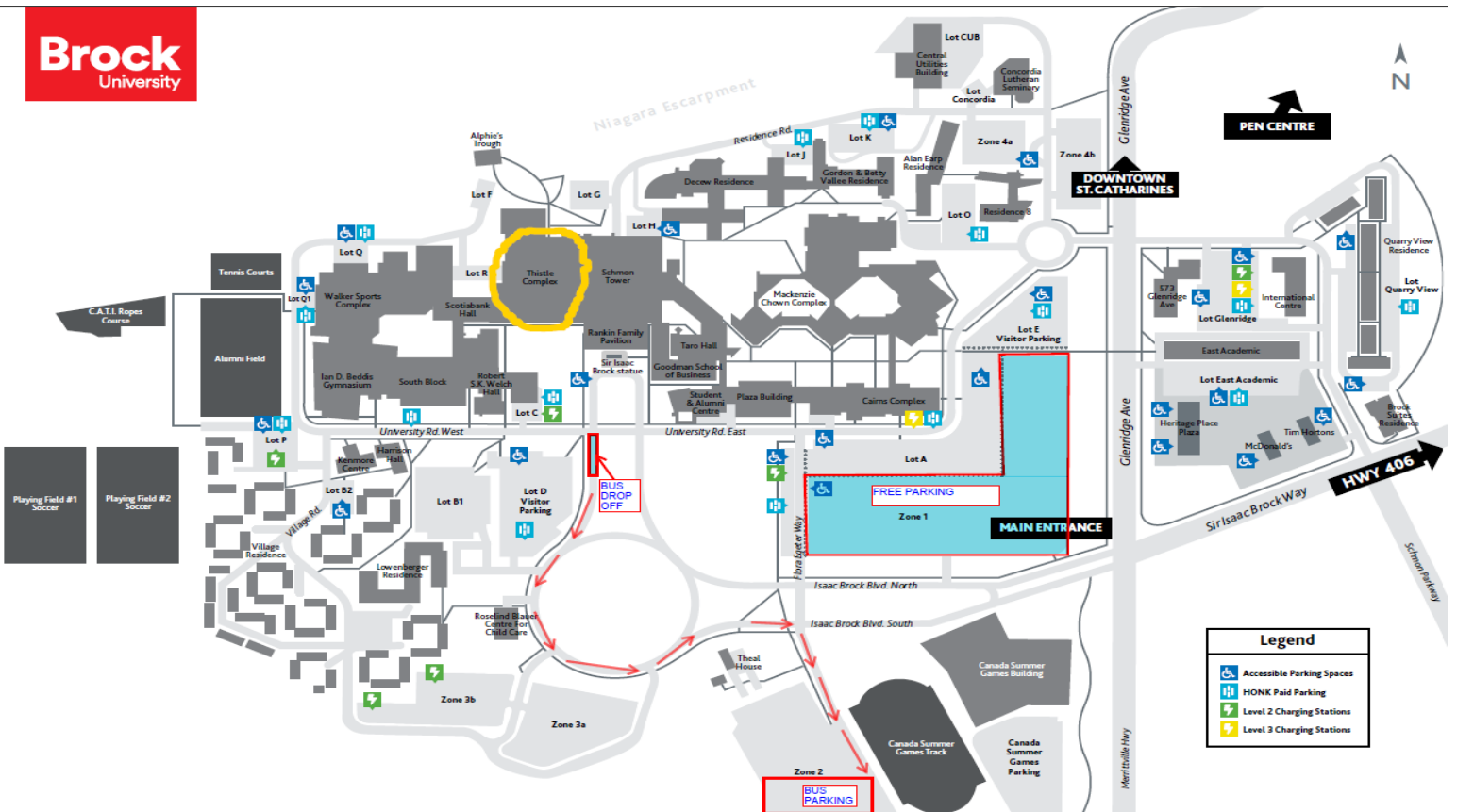


Dr. Kiyoko Gotunda
Assistant Professor,
Department of Biological Sciences
Brock University

I am a former professional ballet dancer who is now a researcher in the fields of evolution, behaviour, and ecology. After dancing with ballet companies such as the Joffrey Ballet of Chicago and Les Grands Ballets Canadiens de Montreal, I hung up my pointe shoes and went to McGill University for my BSc. I received my PhD from McGill University, and was a postdoctoral fellow at the University of Cambridge and Université de Sherbrooke. I am currently an assistant professor in the Department of Biological Sciences at Brock University. My third passion after science and dance is photography, which bridges the gap between my interests in art and science.



Brock
University



March 25 – Day One

Thistle Hallway

9:00 - 10:00 **Registration (Coffee, tea & snacks)**

TH247

10:00 - 10:20 **Welcome: Dr. Peter Berg, Dean of Mathematics and Science**

10:20 - 10:50 **Keynote Speaker: Dr. Lesley Rigg, President of Brock University, “Follow your passion”**

Hallway/Break rooms (TH240, TH241, TH254)

10:50 – 11:00 **Break**

SESSION 1

TH244 — Ecology

Moderator: Alysha Gullion

Judges: Dr. Kiyoko Gotanda, Alex Wilder

- 11:00 - **Monitoring the environmental abundances of multiple algal viruses using multiplex quantitative PCR**
Arguelles, D.A., Inamoto, I., Short, S.M.
Department of Biology, University of Toronto Mississauga, Mississauga, ON.
- 11:15 - **Establishing baselines for water quality and rotifer communities in frame lake, Yellowknife.**
Patenall, M.E., Andreola, N., Gray, D.
Wilfrid Laurier University, Waterloo, ON.
- 11:30 - **Assessing Toxicity of Lead from Recreational Fishing Gear**
St-Hilaire, S., Tetreault, G., Franka, R., Gilroy, E., Campbell, S., Miller, J., Sett, A., Leonard, E.
Wilfrid Laurier University, Waterloo, ON. Environment and Climate Change Canada.
- 11:45 - **The influence of invasive smallmouth bass (*Micropterus dolomieu*) on native lake trout (*Salvelinus namaycush*) diets in the Sudbury Basin**
Dawe, A.M. (1), Therrien, C.A. (2), Neff, B.D. (1)
1. University of Western Ontario, London, ON. 2. University of Waterloo, Waterloo, ON.

TH245 — Plant Biology

Moderator: Dr. Jim Willwerth

Judges: Dr. Liette Vasseur, Christene Cleland-Carpenter

- 11:00 - **Characterizing legume-secreted flavonoid profiles in response to inoculation with a model nitrogen-fixing symbiont**
Peragerasingam, M. (1), Sidhu, H. (2), Slater, G. (2), Batstone, R.T. (1)_1.
Department of Biology, McMaster University; 2. School of Earth, Environment, and Society, McMaster University.
- 11:15 - **The effects of warming temperature on tomato plant defence pathways in response to diverse bacterial lifestyles**
Liu, K., Marchetta, E., Snider, S., Weadge, D., Slawson, R., Yoshioka, K., and Castroverde, C.D.M.
Department of Biology, Wilfrid Laurier University, Waterloo, ON.
- 11:30 - **Chemical screams: understanding indirect effects of nematode-infected plants on their uninfected neighbours.**
Cristante, Z., Koprivnikar, J., Campbell, L.
Department of Chemistry and Biology, Toronto Metropolitan University, Toronto, ON.
- 11:45 - **Novel lycopene-based in vivo biosensor for γ -hydroxybutyric acid detection in *Saccharomyces cerevisiae*.**
Breckenridge, S., Tanner, N., Xiao, M., Chan, A., Chen, J., Heathcoate, A., Kaneshan, A., Rumpl, A., Pyne, M.
Department of Biology, University of Western Ontario, London, ON.
(Microbiology section)

TH246 — Physiology

Moderator: Zoe Gagnon

Judges: Dr. Ian Patterson, Ivan Drahun

- 11:00 - **Exercise recovery in native high and low altitude deer mice: the role of liver metabolites**
Tod, R., Dessureault, L., McClelland, G.B.
Department of Biology, McMaster University, Hamilton, ON.
- 11:15 - **Regulation of skeletal muscle carnitine palmitoyl-transferase I in high and low altitude deer mice (*Peromyscus maniculatus*)**
Steele, D., Baragar, C., McClelland, G.
McMaster University, Hamilton, ON.

- 11:30 - **Flight Muscle Fiber Type Composition in Various Songbird Species**
Chang, R.M., Ivy, C.M., Guglielmo, C.G.
 University of Western Ontario, London, ON.
- 11:45 - **Consumption of an invasive high-thiaminase prey fish may be causing thiamine deficiency and morphological changes in the hearts of lake trout (*Salvelinus namaycush*) in the Sudbury Basin**
Adeli, K.A., Baker, P.M., Therrien, C.A., Neff, B.D.
 Department of Biology, University of Western Ontario, London, ON.

TH248 — Cell & Molecular Biology

Moderator: Georgina Gardner

Judges: Dr. Aleksandar Necakov, Dr. Athanasios Paschos

- 11:00 - **Phenotypic Non-Specificity of Signal Transduction Pathway Function in *Drosophila melanogaster***
Brabrook, C.B., Percival-Smith, A.
 University of Western Ontario, London, ON.
- 11:15 - **Role of Octopamine on reproduction in *Rhodnius prolixus***
Faisal, N., Lange, A., Finetti, L.
- 11:30 - **Salinity effects on a novel population of esophageal ionocytes in eelpout**
Ghaemian, A., Ferreira, P., Birnie-Gauvin, K., Aaerstrup, K., Wilson, J.
 Department of Biology, Wilfrid Laurier University, Waterloo, ON.
- 11:45 - **A Mysterious Case of a Somatic Gene Deletion in Select Endodermal Tissues: Single Copy Loss of the Developmental Gene, *hoxa13*, in a mouse family.**
Nagy, K., Hill, K.
 Department of Biology, University of Western Ontario, London, ON.

Decew Dining Hall

12:00-13:30

Lunch (included in Registration)

SESSION 2

TH244 — Cell & Molecular Biology

Moderator: Georgina Gardner

Judges: Dr. Aleksandar Necakov, Dr. Ian Patterson

- 13:30 - **Characterization of a tumour suppressor protein SHPRH through mutational analysis**
Lloyd-Ellis, S., Walker, J.R., Zhu, XD.
Department of Biology, McMaster University, Hamilton, ON.

- 13:45 - **Epigenetic regulation of PLK1-4, Spy1 and other proteins in multiple myeloma**
Madhavan, K.
University of Windsor, Windsor, ON.

- 14:00 - **Exploring the role of Spy1 in the development of Non-Alcoholic Fatty Liver Disease and progression to Non-Cirrhotic Hepatocellular Carcinoma**
Oschanney, L.S., Baker, A., Fifield, B.A., Porter, L.A
Department of Biomedical Sciences, University of Windsor, Windsor, ON.

- 14:15 - **Spy1-Mediated Cell Cycle Effects Enhance Oncogenic Transformation by Selected Drivers in Human Glioblastoma**
Boujeke, E., Lubanska, D., Porter, L.
University of Windsor, Windsor, ON.

- 14:30 - **Role of Biological Sex on Non-Alcoholic Fatty Liver Disease Progression to Hepatocellular Carcinoma**
Llancari, A.E., Fifield, B.A., Porter, L.A.
University of Windsor, Windsor, ON.

- 14:45 - **Investigating candidate La protein-protein complexes and their function in pre-tRNA 3'-end protection in *Tetrahymena thermophila***
Remnant, B. M., Kerkhofs, K., Bayfield, M. A.
York University, Toronto, ON.

TH245 — Microbiology

Moderator: Christene Carpenter-Cleland

Judges: Dr. Athanasios Paschos, Ivan Drahun

- 13:30 - **Investigating *Salmonella* biofilms under stress and exploring the synergistic relationship between bacterial enzymes and antibiotics in biofilm treatment**
Turner, AAB, Weadge, JT, Slawson, RM
Wilfrid Laurier University, Waterloo, ON.
- 13:45 - **Elucidating the structure of the CesT-EspJ complex and its implications in type III secretion system effector hierarchy.**
Mahendradeva, S., Birstonas, S., Pandya, M., Little, D.J.
Toronto Metropolitan University, Toronto, ON.
- 14:00 - **The effects of climate and geographic barriers on *Aspergillus fumigatus* isolates and population structure from British Columbia, Canada.**
Trajkovski, M.
McMaster University, Hamilton, ON.
- 14:15 - **The effects of sub-natural background radiation exposure on yeast *Saccharomyces cerevisiae***
Couture, L.E., Lapointe, M.R., Thome, C.P.
Laurentian University, Sudbury, ON; NOSM University, Sudbury, ON.
- 14:30 - **Deletion of FFH gene in *Escherichia coli* and its impacts on protein production and secretion**
Hilal, G. J.
Laurentian University, Sudbury, ON.
- 14:45 - **Identifying SecB-dependent periplasmic proteins in *Escherichia coli***
Pham, K., Saleh, M.
Laurentian University, Sudbury, ON.

TH246 — Bioinformatics

Moderator: Dr. Ping Liang

Judges: Dr. Alonso Zavaleta Fernandez de Cordova, Dr. Yifeng Li

- 13:30 - **Expanding the Machine Learning with Digital Signal Processing Pipeline for Classification of Novel Data: A Case Study on Bat Calls**
Charette, C.L., Randhawa, G.S., Olteanu, D.G., Hill, K.A.
University of Western Ontario, London, ON.

- 13:45 - **Computational Studies on Menopause: Aneuploidy and the Historic Changes to Fitness in Humans**
Abbas, D., Stone, J.
 Department of Biology, McMaster University, Hamilton, ON.
- 14:00 - **The Analysis of Genetic Diversity Derived from Transposable Elements in Mice**
Williams, D.
 Brock University, St. Catharines, ON.
- 14:15 - **Machine Learning Gone Viral: New Perspectives on Astroviridae Taxonomy with Alignment-Based and Alignment-Free Genome Comparisons**
Holmes, C. J.(1), Alipour, F.(2), Kari, L. (2), Hill, K. A.(1)
 1. Department of Biology, University of Western Ontario, London, ON.
 2. Department of Computer Science, University of Waterloo, Waterloo, ON.
- 14:30 - **Investigation of the Global Population Genetic Diversity of *Streptococcus pneumoniae* Using Archived Multilocus Sequence Typing Data**
Dalmieda, J., D., Hitchcock, M., Xu, J.
 Department of Biology, McMaster University, Hamilton, ON.
- 14:45 - **Isolation and characterization of microbes from Canadian soil and lake samples capable of naphthalene biodegradation**
 Seneviratne, S., Batra, H., Paschos, A.
 Mohawk College of Applied Arts and Technology
(Microbiology section)

TH248 — Neuroscience & Behaviour

Moderator: Anel Turgambayeva

Judges: Zoe Gagnon, Dr. Liette Vasseur

- 13:30 - **Investigating the neuroprotective efficacy of Ashwagandha root extract and Ubisol-q10 as treatment for mechanisms of Alzheimer's disease in double transgenic mouse models**
Dufault, K.M.
 Department of Biochemistry, University of Windsor, Windsor, ON.
- 13:45 - **Testing for enduring effects of fear in the brains of free-living meadow voles (*Microtus pennsylvanicus*) using Δ FosB**
Robinson, K.J., Witterick, L.E., Clinchy, M., Macdougall-Shackleton, S.A., Zanette, L.Y.
 Department of Biology, Western University, London, ON.
- 14:00 - **The Effects of Turbidity on Redside Dace Olfactory Sensory Neurons**
Jafarzadeh, K., Aurangzeb, Z. & Zielinski, B.
 University of Windsor, Windsor, ON.

- 14:15 - **Developing the Parkinson's Physical Literacy Questionnaire (PPLQ)**
Nasir, N., van Wyk, P.M.
 Department of Kinesiology, Faculty of Human Kinetics, University of Windsor,
 Windsor, ON.
- 14:30 - **The impact of seismic noise on Acadian redbfish (*Sebastes fasciatus*),
 Deepwater redbfish (*Sebastes mentella*) and Atlantic cod (*Gadus
 morhua*) : A behavioural analysis**
Gregoire, E. H., Pieniazek, R. H., Higgs, D. M.
 University of Windsor, Windsor, ON.
- 14:45 - **Effects of Prenatal Exposure to Ionizing Radiation on Gene Expression
 in the Hippocampus and Cerebral Cortex of the *Mus musculus* Adult
 Offspring**
Lionel, G., C. Lalonde, S. Tharmalingam, Tai, T.C.
 School of Natural Sciences, Laurentian University, Sudbury, ON
 Northern Ontario School of Medicine University

TH255 — Ecology

Moderator: Alex Popescu

Judges: Dr. Kiyoko Gotanda, Alex Wilder

- 13:30 - **The influence of buildings on invasive common dandelion performance
 in its northern range limit**
Wong, B. Y. S., Kotanen, P. M.
 Department of Biology, University of Toronto Mississauga, Mississauga, ON.
- 13:45 - **The influence that wetland plant's family, clade, and occurrence in
 conjunction with presence in stormwater management ponds have on
 Arbuscular Mycorrhizae structures and colonization**
Plant, R., Stevens, K.
 Wilfrid Laurier University, Waterloo, ON.
- 14:00 - **Testing Germination Conditions of Common Milkweed (*Asclepias
 syriaca*) from different locations**
Abass, M., Vasseur, L.
 Department of Biological Sciences, Brock University, St. Catharines, ON.
- 14:15 - **Validating and Calibrating Indices of Canopy Gap Age**
Shafiquzzaman, S., Rubin, B.
 University of Western Ontario, London, ON.
- 14:30 - **Plasticity, protandry, and pollination: the interplay between sex phase
 transition & flower colour change in an invasive weed.**
Lewis, J., Friedman, J.
 Queen's University, Kingston, ON.

- 14:45 - **Frost tolerance in *Carex lasiocarpa* and *Dulichium arundinaceum***
Loane, E.A., Ryser, P.
Laurentian University, Sudbury, ON.

Hallway/Break rooms (TH240, TH241, TH254)

15:00 – 15:15 **Break**

SESSION 3

TH244 — Cell & Molecular Biology

Moderator: Georgina Gardner

Judges: Dr. Aleksandar Necakov, Dr. Ian Patterson

- 15:15 - **Exploring Principles of the Interplay Between Tumour-Initiating Cells and the Endothelial Component in Glioblastoma.**
Cieslukowski, A., Lubanska, D., Porter, L. A.
University of Windsor, Windsor, ON.
- 15:30 - **Anti-Cancer Activity of Piper longum and Camellia sinensis Extracts Against Human Glioblastoma in, in-vitro three-dimensional models; Cancer stem cell sensitivity to extracts with and without chemotherapeutic interactions.**
Konior, K.
University of Windsor, Windsor, ON.
- 15:45 - **Apoptotic effects of Long Pepper, Synthite Tea, and Rosemary extracts on colorectal cancer and their interaction with FOLFOX chemotherapy**
Neupane, S., Musliu, E.
Department of Biology, University of Windsor, Windsor, ON.
- 16:00 - **The Tumour Suppressor Tuberin and DNA Damage Response**
Vuong, V., Fidalgo Da Silva, E., Porter, L.A.
University of Windsor, Windsor, ON.

TH246 — Plant Biology

Moderator: Dr. Jim Willwerth

Judges: Ivan Drahun, Heather VanVolkenburg

15:15 - **Characterizing the membrane remodeling Glycerophosphodiester Phosphodiesterase (GDPD) family in *Eutrema salsugineum***

Latimer, J., Jia, H., Summers, P., Golding, B., Weretilnyk, E.
Department of Biology, McMaster University, Hamilton, ON.

15:30 - **Soybean response to copper and microplastic in soil**

Javier, L.J., Macfie, S.M.
University of Western Ontario, London, ON.

15:45 - **Fatal Fungicides: Examining the effects of applied copper on hydroponically grown *Brassica napus***

Clarizio, G., Macfie, S.
University of Western Ontario, London, ON.

16:00 - **Optimizing the Expression of TOC Complex Proteins**

Hume, J., Smith, M.
Department of Biology, Wilfrid Laurier University, Waterloo, ON.

TH248 — Neuroscience & Behaviour

Moderator: Anel Turgambayeva

Judges: Zoe Gagnon, Dr. Kiyoko Gotanda

15:15 - **Evaluating the Efficacy of Natural Health Products as a Treatment for Mechanisms Implicated in Parkinson's Disease**

Patel, M.
University of Windsor, Windsor, ON.

15:30 - **Cortical Gamma Activation and Cognitive Functioning: An EEG Study**

Branigan, K., Dotta, B.T.
Behavioural Neuroscience Program, School of Natural Sciences, Laurentian University, Sudbury, ON.

15:45 - **Infographics as knowledge translation tools to promote patient and family education of sex and gender effects in traumatic brain injury**

Tylinski Sant'Ana, T., Colantonio, A., Mollayeva, T.
Department of Biology, University of Toronto Mississauga, Mississauga, ON, Canada; Rehabilitation Sciences Institute, University of Toronto, Toronto, ON, Canada; KITE-Toronto Rehabilitation Institute, University Health Network, Toronto, ON, Canada.

- 16:00 - **All “Wrapped” Up in Reflection: How does supporting students’ self-regulated learning lead to improved academic performance?**
Ratnayake, A., Bansal, A., Wong, N., Saseetharan, T., Prompiengchai, S., Jenne, A., Thiagavel, J., Ashok, A.
Department of Biological Sciences, University of Toronto, Scarborough, ON.

TH253 — Ecology

Moderator: Alex Popescu

Judges: Kasia Zqurzynski, Dr. Liette Vasseur

- 15:15 - **Effect of a mixed feeding regime on the growth and boldness of guppy fry (*Poecilia reticulata*)**
Muraca, T., Wu, A., Gotanda, K.
Department of Biological Sciences, Brock University, St. Catharines, ON.
- 15:30 - **Anogenital Distance: Not a Predictor of Female Rodent Behaviour**
Goss, J., Schulte-Hostedde, A.
Laurentian University School of Natural Sciences, Sudbury, ON.
- 15:45 - **Through the camera lens: How are grey squirrels (*Sciurus carolinensis*) influencing red squirrels (*Tamiasciurus hudsonicus*) on Manitoulin Island?**
Barnes, C.T., Schulte-Hostedde, A.
Laurentian University School of Natural Sciences, Sudbury, ON.
- 16:00 - **Thinking inside the box: a study of the sensory innervations in raccoon forepaws and the role of water as a mechanoreceptor catalyst**
Sequin, J., Stone, J.
McMaster University, Hamilton, ON.

TH255 — Ecology

Moderator: Alysha Gullion

Judges: Christene Carpenter-Cleland, Dr. Athanasios Paschos

- 15:15 - **The relationship between neural gene transcription and the gut microbiome in Chinook salmon**
Lanoue, N., Heath, D.
University of Windsor, Windsor, ON.
- 15:30 - **Species diversity and abundance of beetles in various cover crops in organic vineyards**
Cook, P.E.
Brock University, St. Catharines, ON.

- 15:45 - **The Impact of Urbanization on the Spatiotemporal Distribution of Black-capped Chickadee**
Vlahiotis, K. E., Gotanda, K.M.
Brock University, St. Catharines, ON.
- 16:00 - **Recovery of fish populations in a highly degraded stream in response to improving water quality, in Sudbury Ontario.**
O'Meara, A.
Laurentian University, Sudbury, ON.

Market Hall

- 16:15 – 17:00 **Poster session 1 (Odd numbers)**
- 17:00 – 17:45 **Poster session 2 (Even numbers)**
- 18:00 **Cash Bar opens**
- 18:30 – 23:00 **Banquet**
- 18:30 – 20:30 **Dinner**
- 20:30 – 23:00 **Dancing and Socializing**

March 26 – Day Two

Hallway/Break rooms (TH240, TH241, TH254)

8:00 – 9:00 Coffee and snacks

SESSION 4

TH244 — Ecology

Moderator: Alex Popescu

Judges: Kasia Zgurzynski, Dr. Kiyoko Gotanda

- 9:00 - **Temporal analysis of genetic diversity in an isolated population of Bog Copper butterflies, *Tharsalea epixanthe***
Contursi, M.M., Keyghobadi, N.
Western University, London, ON.
- 9:15 - **How do mowing regimes affect tree cricket hatching success?**
Sehgal, J., Murray, R.L.*, Gwynne, D.T.*
Department of Biology, University of Toronto Mississauga, Mississauga, ON.
- 9:30 - **The ecological influence of dietary choice on the development and fitness of *Drosophila melanogaster* populations**
Akinbi, I.O., Long, A.F.
Wilfrid Laurier University, Waterloo, ON.
- 9:45 - **Hunting-induced selection on thornhorn sheep (*Ovis dalli*) horn morphology**
Sherbourne, A.M.G., Balsara, M.J., Coltman, D.W.
Western University, London, ON.

TH245 — Cell & Molecular Biology

Moderator: Diana Tosato

Judges: Dr. Ian Patterson, Dr. Athanasios Paschos

- 9:00 - **Characterization of the Interaction of PLK4 and JAK2 Proteins**
Malakoti-Negad, N., Labute, B., Hudson, J.
Department of Biomedical Sciences, University of Windsor, Windsor, ON.
- 9:15 - **The Function of NKR-P1B and Clr-b receptor:ligand interactions in Kupffer Cells**
Nadeem, H., Rahim, M.M.
University of Windsor, Windsor, ON

- 9:30 - **Characterising the Expression and Function of Nicotinic Acetylcholine Receptors in B-Cells**
Bloom, N.L.(1), Simard, A.(2)
1. School of Natural Science, Laurentian University, Sudbury, ON
2. Medical Sciences Division, NOSM University, Sudbury, ON
- 9:45 - **Exploring the role of Cyclin B1 in Tuberin Stabilization**
Sharma, D., Fidalgo Da Silva, E., Porter, L.A
University of Windsor, Windsor, ON.

TH246 — Cell & Molecular Biology

Moderator: Anneliese Von Eicken

Judges: Dr. Aleksandar Necakov, Zoe Gagnon

- 9:00 - **The natural response of gut enteroendocrine cells to whole body ionizing radiation in mice**
Cooke, E., Gagnon, J.
Laurentian University, Sudbury, ON.
- 9:15 - **Effects of High-Dose Ionizing Radiation Exposure During Late Gestation on Mouse Placenta**
Hourtovenko, C (1)., Sreetharan, S (3) ., Tai, T.C (2) ., Tharmalingam, S (2) .
1. Laurentian University, Sudbury, ON
2. Northern Ontario School of Medicine University, Sudbury, ON
3. McMaster University, Hamilton, ON.
- 9:30 - **Catecholamine Biosynthesis and Regulation: The Influence of Progesterone**
Lee, J.(1), Gilchrist, J.(1), Tharmalingam, S.(2), & Tai, T.C.(2)
1. School of Natural Sciences, Laurentian University, Sudbury, Canada
2. Division of Medical Sciences, Northern Ontario School of Medicine University, Sudbury, Canada.
- 9:45 - **A Local Ca²⁺ and RhoA Signaling Crosstalk Facilitates Cell Migration by Reinforcing Actin Network in the Lamellipodia.**
Bogatch, A., Lu, E., Plotnikov, S.
Department of Cell & Systems Biology, University of Toronto, ON.

TH248 — Physiology

Moderator: Brittany Kalbfleisch

Judges: Alex Wilder, Dr. Liette Vasseur

- 9:00 - **Assessing the Safety and Tolerability of a Multi-Target Dietary Supplement (MTDS) in an Aging Population: A Clinical Trial**
Levert, K.J. (1), Lemon, J.A. (2), Boreham, D.R. (2), Rollo, C.D. (1, 3)
1. Laurentian University, Sudbury, ON.
2. NOSM University
3. McMaster University, Hamilton, ON.
- 9:15 - **Multiple exercise bouts increase GLUT4 expression in cardiac tissue following doxorubicin treatment**
Thompson, T.* (1), McCue, M. (1), & MacLean, D. (2)
1. Laurentian University, Sudbury, ON
2. NOSM University
- 9:30 - **Optimization of a dye-based feeding assay to quantify changes in food intake using *Drosophila melanogaster***
Taylor, C, Merritt, T.J.S.
Laurentian University, Sudbury, ON
- 9:45 - **The ventilatory responses to hypoxia in migratory and non-migratory sparrows**
Mohns, M., Ivy, C., Guglielmo, C.
Advanced Facility for Avian Research, Western University, London, ON.

TH253 — Plant Biology

Moderator: Christene Carpenter-Cleland

Judges: Dr. Jennifer Kelly, Heather VanVolkenburg

- 9:00 - **The Changes in Gene Expression Induced by Nickel Toxicity**
Mutambara, PK., Nkongolo, K
Laurentian University, Sudbury, ON.
- 9:15 - **Root growth in the wetland sedge, *Carex lasiocarpa*, in the late growing season**
Misic, K.P., Ryser P.
Laurentian University, Sudbury, ON.
- 9:30 - **Within-branch order of leaf senescence in four North American tree species**
McCaffrey, S., Ryser, P.
Laurentian University, Sudbury, ON.
- 9:45 - **Senescence Affected by Nutrient Availability in Monocot Wetland Species**
Muller, M., Ryser, P.
Laurentian University, Sudbury, ON.

TH255 — Neuroscience & Behaviour

Moderator: Janelle Montague

Judges: Dr. Gaynor Specer, Alicia Piazza

- 9:00 - **Patterned electromagnetic field and chemical exposure influences regeneration and aversive behaviours in planaria**
Rideout, C.N., Dotta, B.T.
Laurentian University, Sudbury, ON.
- 9:15 - **Effects of Red LED Light on Planarian Regeneration**
Brandt, T. G., Dotta, B. T.
Laurentian University, Sudbury, ON.
- 9:30 - **Effects of cross-fostering on neural development in degu (*Octodon degus*) pups**
Atlas, G. (1), Duprey M. (1), Boadi K. (2), Ellah S. (2), Bauer M.C. (2), Duarte-Guterman P (1).
1. Department of Psychology, Brock University; ON .
2. Department of Biology, Swarthmore College, PA USA.
- 9:45 - **The enduring effects of the fear of predation on neurogenesis in free-living meadow voles (*Microtus pennsylvanicus*)**
Chung, M., Witterick, L. MacDougall-Shackleton, S. Clinchy, M. Zanette, L.
Department of Biology and Department of Psychology, Western University.,
London, ON.

Hallway/Break rooms (TH240, TH241, TH254)

9:45 – 10:00 **Break**

SESSION 5

TH244 — Ecology

Moderator: Christene Carpenter-Cleland

Judges: Kasia Zgurzynski, Dr. Athanasios Paschos

- 10:15 - **Using passive acoustic monitoring for individual identification in a vulnerable and non-oscine species, the Great Curassow (*Crax rubra*)**
O'Leary, L.D., Zapata, D., Sánchez, N.V., Mennill, D.J.
University of Windsor, Windsor, ON.
- 10:30 - **Characteristics of recent field-based conservation translocation programs.**
Mohamad, J. (1), Ibrahim, S. (1), Maclsaac, H.J. (2)
1. Great Lakes Institute for Environmental Research, University of Windsor, Windsor, ON
2. Great Lakes Institute for Environmental Research, University of Windsor, Windsor, ON., Canada and School of Ecology and Environmental Science, Yunnan University, Kunming 650091, P. R. China
- 10:45 - **Examining Benthic Macroinvertebrate Communities as Indicators of Stream Ecosystem Health in the Sydenham River Watershed, Ontario, Canada.**
Lachance, N.J., Febria, C
University of Windsor, Windsor, ON.
- 11:00 - **Marine biodiversity assessment around the Maiden Islands using Baited Remote Underwater Video (BRUVs)**
Vos, A.J., Mensink P.J., Collins, P., Garbett, A., Houghton J.
Western University, London, ON.

TH246 — Ecology

Moderator: Diana Tosato

Judges: Alex Wilder, Dr. Ian Patterson

- 10:15 - **Investigating trophic ecologies and mercury bioaccumulation in the apex predators walleye (*Sander vitreus*) and northern pike (*Esox lucius*) in northern lakes**
Bateman, D. S., Johnston, T. A.
Laurentian University, Sudbury, ON.
- 10:30 - **Microplastics as an Emerging Risk to the Health of Amphibians**
Loiselle, N., Martinez, M., Lesbarrères, D.
School of Natural Sciences, Laurentian University, Sudbury, ON.

- 10:45 - **The Brimstone Factor; Muscle Sulphur Compositions and Mercury Concentrations in Freshwater Fishes**
Miller, S.J., Johnston, T.A.
Living With Lakes Centre, Laurentian University, Sudbury, ON.
- 11:00 - **The effects of temperature and time on soil enzymatic activities in the City of Greater Sudbury**
Lougheed, A. & Nkongolo K.
Laurentian University, Sudbury, ON.

TH248 — Ecology

Moderator: Dr. Liette Vasseur

Judges: Dr. Gaynor Spencer, Heather VanVolkenburg

- 10:15 - **Evaluating the consequences of urbanization on the dental health of the North American Raccoon (*Procyon lotor*)**
Thomas, Lauren.C. (1), Schulte-Hostedde, Albrecht.I.(1, 2)
1. Laurentian University, Sudbury, ON.
2. Center for Evolutionary Ecology and Ethical Conservation.
- 10:30 - **The Effect of Distance to Anthropogenic Structures on Rodent Pace of Life and Behaviour**
Duval, K.F., Schulte-Hostedde, A.I.
Laurentian University, Sudbury, ON.
- 10:45 - **Is maternal body condition correlated with clutch variables in Blanding's (*Emydoidea blandingii*) and Snapping (*Chelydra serpentina*) turtles?**
Campbell, K., Moxley, K., Litzgus, J.
School of Natural sciences, Laurentian University., Sudbury ON.
Scales Nature Park, Oro-Medonte, ON.
- 11:00 - **Hatchling Turtle Behavioural Responses to Rip-rap used on Road Embankments to Prevent Turtles from Nesting**
Drektraan, L., Kentel, J., Burke, T., Litzgus, J.
School of Natural Sciences at Laurentian University.
School of Natural Sciences at Laurentian University.
Georgian Bay Biosphere.
School of Natural Sciences at Laurentian University.

TH253 — Cell & Molecular Biology

Moderator: Anneliese Von Eicken

Judges: Dr. Aleksandar Necakov, Alicia Piazza

- 10:15 - **Investigating TPP-linoleic acid (TPP-LA) as a treatment for Barth Syndrome using a mouse myoblast model**
Bagshaw, O., Andrade, M., Fajardo, V., LeBlanc, P., Gardner, G., Stuart, J. Faculty of Mathematics and Science and Faculty of Applied Health Sciences, Brock University, ON.
- 10:30 - **The Unique Role of DnaJC7 in Cellular Protein Quality Control**
Subramaniam, M., Ofiara, S., Stoltz, M. K., Janozeski, C., Andary, C., Rutledge, S. B., Duennwald, M. L.
1. Faculty of Science, Western University, London, Ontario, Canada.
2. Department of Biochemistry, Western University, London, Ontario, Canada.
3. Department of Anatomy and Cell Biology, Western University, London, Ontario, Canada.
4. Faculty of Science, Western University, London, Ontario, Canada.
5. Schulich School of Medicine and Dentistry, Western University, London, Ontario, Canada.
6. Department of Biochemistry, Western University, London, Ontario, Canada.
7. Department of Anatomy and Cell Biology, Western University, London, Ontario, Canada.
- 10:45 - **H₂S protects rat cardiac cells from rotenone-induced mitochondrial damage and labile iron accumulation**
Linjacki, S., Yang, G.
Laurentian University, Sudbury, ON.
- 11:00 - **The impact of cystathionine-gamma-lyase knock out and H₂S reduction on the physiology of intestinal cells**
Pelen-Tobar, K., Gagnon, J.
Laurentian University, Sudbury, ON.

STH204

- 11:20 – 11:50 **Keynote Speaker: Dr. Kiyoko Gotanda, Assistant Professor, Brock University, “From Biology to Ballet: Connecting lessons from the stage and the field”**
- 12:00-13:30 **Lunch**
Award Presentations: Dr. Tim Kenyon, Vice-President Research

Poster Session A – 16:15 to 17:00

Number	Category	Presentation
1	Bioinformatics & Computational Biology	Foundations for Transcription Factor Inference from Three Dimensional Structures in <i>Escherichia coli</i>. Channe, S.K., Moreno-Hagelsieb, G. Wilfrid Laurier University, Waterloo, ON.
3	Cell & Molecular Biology	Can Macrophages Differentiated from Conditionally Immortalized Myeloid Progenitors be Used to Study Lysosome Remodeling? Asgher, N., Saaimatul, H., Botelho, R.J. Department of Chemistry and Department of Biology, Toronto Metropolitan University, Toronto, ON.
5	Cell & Molecular Biology	Deciphering The Role of MBOAT7 in Modulating PI3K/AKT Signalling Pathway Hoque, J. (1), Zheng, Y. (1,2), Botelho, R. J. (1,2), Antonescu, C. N. (1,2) Department of Chemistry and Biology Toronto Metropolitan University, Toronto, ON.
7	Cell & Molecular Biology	Design and creation of a whole cell biosensor for γ-hydroxybutyrate (GHB) in <i>Saccharomyces cerevisiae</i> Chen, J., Kaneshan, A., Breckenridge, S., Chan, L., Heathcote, A., Rumpl, A., Tanner, N., Xiao, M., Pyne, M. E. Department of Biology, Western University, London, Ontario, Canada
9	Cell & Molecular Biology	Characterizing plant immunity and physiological phenotypes in temperature-sensitive and -resilient accessions of <i>Arabidopsis thaliana</i> Patel, D., Rossi, C., Castroverde, C.D.M Department of Biology, Wilfrid Laurier University, Waterloo, ON.
11	Ecology & Environment	Changes in herbivory and evolution of antiherbivore defenses in <i>Trifolium repens</i> along an urban-rural gradient in Toronto Vessio, I.E., Caizergues, A.E., Johnson, M.T.J. University of Toronto Mississauga, Mississauga, ON.
13	Microbiology	How macrophages control the growth of <i>Aspergillus fumigatus</i> hyphae: the role of reactive oxygen species Khaitin, A., Moussaoui, S., Terebiznik, M. Department of Cell and Systems Biology, University of Toronto Scarborough, University of Toronto, Toronto, ON.

15	Moved to oral presentation	<p>Novel lycopene-based in vivo biosensor for γ-hydroxybutyric acid detection in <i>Saccharomyces cerevisiae</i>.</p> <p><u>Breckenridge, S.</u>, <u>Tanner, N.</u>, <u>Xiao, M.</u>, Chan, A., <u>Chen, J.</u>, Heathcoate, A., <u>Kaneshan, A.</u>, Ruml, A., Pyne, M.</p> <p>Department of Biology, University of Western Ontario, London, ON.</p>
17	Microbiology	<p>Enzymatic analysis comparing BcsZ, an endo-β-1,4-glucanase from <i>Pseudomonas fluorescens</i> and Bacteriophage-derived cellulase as biofilm control agents</p> <p><u>Peralta, A.</u>, Weadge JT.</p> <p>Wilfrid Laurier University, Waterloo, ON.</p>
19	Neuroscience & Behaviour	<p>The creation of an inducible, isoform specific SDK1 viral vector for the study of SDK1 isoforms in neurons</p> <p><u>Malagi, M.C.</u>, Walters, B.J.</p> <p>Department of Biology, University of Toronto Mississauga, Mississauga, ON.</p>
21	Neuroscience & Behaviour	<p>Memory Processing- at a snail's pace</p> <p><u>Wimmer, J.</u>, Ibrahim, Z., Spencer, G.</p> <p>Brock University, St. Catharines, ON.</p>
25	Neuroscience & Behaviour	<p>Using guided reflections and active learning to reduce the fear of failure in an undergraduate biochemistry course</p> <p><u>Massad, J.</u>, Johnson, A.E., Nunes, K.A.</p> <p>Department of Chemistry and Biology, Toronto Metropolitan University, Toronto, ON.</p>
27	Cell & Molecular Biology	<p>Oncological and morphological implications of SARS-CoV-2 in the onset of lung adenocarcinoma</p> <p>Badie, V.</p> <p>McMaster University, Hamilton, ON.</p>
29	Cell & Molecular Biology	<p>The Effects of PIKfyve Inhibition on ER Hitchhiking</p> <p><u>Almasri, N.</u>, Jenkins, N., Adamji, Z., Botelho, R.J.</p> <p>Department of Chemistry and Biology, Toronto Metropolitan University, Toronto, ON Graduate Program in Molecular Science, Toronto Metropolitan University, Toronto, ON. The Botelho Lab, Toronto Metropolitan University, Toronto, ON. Department of Chemistry and Biology and Graduate Program in Molecular Science, Toronto Metropolitan University, Toronto, ON.</p>
31	Cell & Molecular Biology	<p>Pharmacological activators of TFEB in macrophages to stimulate immune function</p>

		Cruz Li, V. (1), Inpanathan, S. (1, 2), Botelho, R.J. (1, 2) Department of Chemistry and Biology Toronto Metropolitan University, Toronto, ON Graduate Program in Molecular Science, Toronto Metropolitan University, Toronto, ON
33	Ecology & Environment	Bryophyte and lichen cover and diversity in relation to recovery of roads in the Nipissing Forest Bottoms-Cau, T.M., Dech, J. Nipissing University, North Bay, ON.
35	Ecology & Environment	Coordination of Sentinel and Foraging Roles in American Crows, <i>Corvus brachyrhynchos</i> Kerr, T. H. (1), Clark, B. A. (2), Popescu, A. G. (1), & Gotanda, K. M. (1) Brock University, St. Catharines, ON. Binghamton University, NY, USA.
37	Microbiology	Development of a Genetic Toolbox for <i>Haemophilus Influenzae</i> Shedeed, A., Hamadache, S., Karas, B. Western University, London, ON.
39	Microbiology	Hypergravity Signaling Effects in the Freshwater Eutradigrade Species <i>Graveenius annulatus</i> Whalen, C., Stone, J.R. Department of Biology, McMaster University, Hamilton, ON.
41	Microbiology	Using phenotypic growth characteristics to determine loci contributions in growth of <i>A. fumigatus</i> at varying temperatures and under oxidative and nitrosative stress Andre, E., Korfanty, G, Xu, J. P. Xu Lab, McMaster University, Hamilton, ON.
43	Neuroscience & Behaviour	Role and regulation of TrkB isoforms in autism spectrum disorder Wang, B. (1), Abdollahi, M. (2), Fahnestock, M. (3) Department of Psychiatry and Behavioural Neurosciences, McMaster University, Hamilton, ON.
45	Physiology	The Effect of Temperature on the Cardiovascular Development of Yellow Perch (<i>Perca flavescens</i>) Easwaramoorthy, M., Thompson, W.A., Wilson, J.Y. McMaster University, Hamilton, ON.
47	Physiology	The phenotypic plasticity of non-shivering thermogenesis and brown adipose tissue to photoperiod and temperature in low-altitude deer mice Chau, V.W., Wong, E.W., McClelland, G.B. Department of Biology, McMaster University, Hamilton, ON.

49	Ecology & Environment	Relationship of zooplankton community structure with dissolved ions in Saskatchewan lakes <u>Khan, L.</u> , Binning, A., Gray, D. Wilfrid Laurier University, Waterloo, ON.
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Poster Session B – 17:00 to 17:45

Number	Category	Presentation
2	Bioinformatics & Computational Biology	Does ‘pace of life’ have a genomic basis in kittiwakes? A candidate gene approach <u>Green, A. R.</u> , Boccia, C., Friesen, V. L. Department of Biology, Queen’s University, Kingston, ON.
4	Cell & Molecular Biology	Dose-dependant inhibition of morphology differs between brown (<i>H. vulgaris</i>) and green (<i>H. viridissima</i>) Hydra exposed to selective HDAC8 inhibitor PCI-34051 <u>Ayekun, N.A.</u> , Campos, A.R. Department of Biology, McMaster University, Hamilton, ON.
6	Cell & Molecular Biology	Exploring Loop Properties of the Transcription Factor USF1 <u>Edaibis, R.</u> , Shin, J.A. University of Toronto Mississauga, Mississauga, ON.
8	Cell & Molecular Biology	Metabolic Stress and AMPK Activation Regulate Cell Surface Membrane Traffic and Cell Migration <u>Mehrabi, A.</u> (1), Orofiamma, L.A. (1,2), Ivanova, A. (1), Antonescu, C.N. (1,2) 1. Department of Chemistry and Biology, Toronto Metropolitan University, Toronto, ON 2. Graduate Program in Molecular Science, Toronto Metropolitan University, Toronto, ON.
10	Ecology & Environment	Should I water my garden? <u>White, J.</u> , Grogan, P. Department of Biology, Queen’s University, Kingston, ON.
12	Ecology & Environment	Investigating mosquito abundance and species richness in the Georgian Bay Islands <u>Tremblay, M. (1), Chaudhry, F. (1), Du, S. (1,2), Hall, A. (2), Murray, R (1,2), McCauley, S. (1,2), and Fortin, M. (2)</u> Department of Biology, University of Toronto Mississauga, Mississauga, ON Department of Ecology & Evolutionary Biology, University of Toronto, Toronto, ON.
14	Microbiology	Filamentation of K12 <i>E. coli</i> With different overexpressed orthologs of QueE <u>Atakgayeva, G.</u> (1), Porco, N. (1,2), Little, D. (1,2) Botelho, R. (1,2), McPhee, J. B. (1,2). 1. Department of Chemistry and Biology, Toronto Metropolitan University, Toronto, ON. 2. Graduate Program in Molecular, Toronto Metropolitan University, Toronto, ON.

16	Microbiology	Isolation and Characterization of <i>Pseudomonas aeruginosa</i> from the Rhizosphere and Rhizoplane of Food Crops <u>Lamba-Rautapuro, N.H.M.</u> , Slawson, R.M. Wilfrid Laurier University, Waterloo, ON.
18	Microbiology	Exploring and exploiting Ontario's environmental genetic and chemical resources <u>Batra, H.</u> , Seneviratne, S., Paschos, A. Mohawk College of Applied Arts and Technology
20	Neuroscience & Behaviour	Effects of Early life stress on Hippocampal cell death and microglia morphology in degu pups <u>Carlson, C.</u> (1), Atlas, G. (1), Bauer, C.M. (3), Duarte-Guterman, P. (1) Brock University, St. Catharines, ON. Swarthmore College, Swarthmore, PA, USA.
22	Physiology	The Effects of Increased Embryonic Incubation Temperature on the Development of the Thyroid in Yellow Perch (<i>Perca flavescens</i>) <u>Sen, A. S.</u> , Thompson, W. A. and Wilson, J. Y. Department of Biology, McMaster University, Hamilton, ON.
24	Physiology	Examining the Association Between TNF-α Levels and Physical Activity in Children with Inflammatory Bowel Disease <u>Kandappa, S.</u> , Morin, S., Byra, M., Issenman, R., Zachos, M., Sherlock, M., Pai, N., Brackenridge, E., Timmons, B.W., Obeid, J. Department of Pediatrics, McMaster University, Hamilton, ON.
26	Bioinformatics & Computational Biology	Spatial and temporal meta-data analysis of <i>Vibrio cholerae</i> around the world <u>Chen, W.</u> , Xu, J. McMaster University, Hamilton, ON.
28	Microbiology	Pacifistic elimination of competition: The role type IV secretion system plays on interference competition in <i>Rhizobium etli</i> Mim1 during symbiotic interaction with host plant <u>Ibrahim, A.</u> , Finan, T., Kearsley, J., Batstone, R. Department of Biology McMaster University
30	Cell & Molecular Biology	Optimising A Directed Evolution System To Develop Protein Drugs <u>Jutard, C.J.C.</u> , Shin, J.A. University of Toronto Mississauga, Mississauga, ON.
32	Cell & Molecular Biology	Tissue-specific expression of HCN and its metabolic precursors in <i>Trifolium repens</i>

		Bhachu, K., Emad, H., Johnson, M.T.J. University of Toronto-Mississauga, ON
36	Microbiology	Characterizing Type VI mediated killing in <i>R. elti</i> mim1 MacLean, L.T., Batstone, R.T., Colautti, J., Whitney, J. Department of Biology, McMaster University, Hamilton, ON. Department of Biochemistry & Biomedical Sciences, McMaster University, Hamilton, ON.
38	Microbiology	The impact of environmental stressors on biofilm formation potential Schultink, S.H., Weadge, J.T., Slawson, R.M. Wilfrid Laurier University, Waterloo, ON.
40	Microbiology	Antimicrobial Activity of Self-Assembled Sulfonamide Quaternary Ammonium Organophosphonates on Cotton Ladores, C.M. (1), Brennan, L.P. (1), Caschera, A. (2), & Foucher, D.A. (1) Toronto Metropolitan University, Toronto, ON. McMaster University, Hamilton, ON.
42	Microbiology	Investigating the symbiotic activity between <i>Medicago sativa</i> and rhizobia strains under soil and hydroponic conditions with varying nitrogen levels Saeedi, S. & Batstone, R. Department of Biology, McMaster University, Hamilton, ON.
44	Neuroscience & Behaviour	The Neurobiological Manifestation of Phenotypic Plasticity in Locusts: Is the Visual Acuity of Solitary Locusts Superior to Their Gregarious Counterparts? Davies, H., Dawson, J. Carleton University, Ottawa, ON.
46	Physiology	TFM exposure leads to Increased Oxygen Consumption in Larval Sea Lamprey D Souza, L., Flávio, H., Wilkie, M. Wilfrid Laurier University, Waterloo, ON.
48	Neuroscience & Behaviour	Experiential learning activities at Mohawk College covering environmental and water related topics Seneviratne, S., Batra, H., Paschos, A. Mohawk College of Applied Arts and Technology
50	Neuroscience & Behaviour	Impact of Allatostatin-C like neuropeptides nlp-67 on the mevalonate pathway in <i>Caenorhabditis elegans</i> Che, X., Torki, F., Boudreau, J., Quesnelle, D., Bendena, W. Department of Biology, Queen's University

Cell & Molecular Biology Abstracts

Session 1

Room: TH248

Phenotypic Non-Specificity of Signal Transduction Pathway Function in *Drosophila melanogaster*

Brabrook, C.B., Percival-Smith, A.

University of Western Ontario, London, ON.

Regulation of the rate of initiation of transcription is mediated by the binding of transcription factors (TFs) to DNA regulatory elements. TFs were thought to be specifically required for the phenotype that they induce. However, the phenomenon, phenotypic non-specificity, where multiple distinct TFs rescue or induce a phenotype, suggests extensive redundancy of TF function. The experimental goal is to determine whether phenotypic non-specificity is observed in *Drosophila melanogaster* signal transduction pathways. I hypothesize that the phenotype associated with loss-of-function alleles in the genes encoding the ligands of either the wingless (Wg) or decapentaplegic (Dpp) pathway can be rescued by expression of another secreted (non-resident) ligand. The *Drosophila* genome was searched for genes that encode secreted ligands. 23 different secreted ligands were expressed in flies and screened for phenotypic rescue of either the Wg or Dpp phenotype.

Role of Octopamine on reproduction in *Rhodnius prolixus*

Faisal, N., Lange, A., Finetti, L.

Octopamine is present in high concentrations in invertebrate species' neuronal and non-neuronal tissues. Octopamine acts as a neurotransmitter, neuromodulator and neurohormone. Here, we focus on the effects of the Octopamine Alpha 1 receptor (Oct α 1-R) on egg laying and egg quality in *Rhodnius prolixus*, the kissing bug. Through quantitative PCR analysis and FISH, we find that the Oct α 1-R is expressed in the front body and reproductive organs of the female *R. prolixus*. To investigate the Oct α 1-R signalling on egg-laying, the transcript expression was knocked down in adult female insects using double-stranded RNA, the effect on egg quality and egg laying was then assessed. It was found that downregulating octopamine was found to influence the number of eggs laid and the appearance in knockout females. The study of the physiological processes involved in reproduction in *R. prolixus* can have major implications for the control of insect populations and the transmission of Chagas disease.

Salinity effects on a novel population of esophageal ionocytes in eelpout

Ghaemian, A., Ferreira, P., Birnie-Gauvin, K., Aaerstrup, K., Wilson, J.

Department of Biology, Wilfrid Laurier University, Waterloo, ON.

Fishes use different osmoregulatory strategies depending on the salinity of their external environment to help maintain internal water and ion balance. Marine fish drink water to osmoregulate, with the esophagus helping start the process of desalinization by absorbing salts

in the ingested water. The eelpout (*Zoarces viviparus*) is a euryhaline fish with esophageal ionocytes displaying similar localization of salt transporters to gill chloride cells, suggesting a secretory function. This counter-intuitive function would likely hinder the process of osmoregulation by oversaturating the ingested seawater and increasing the threat of dehydration. Here we tested the hypothesis that the expression of osmoregulatory transporters in the esophagus is salinity dependent. The expression of salt transporters in various tissues of eelpout acclimated to different salinities were compared to elucidate the eelpout's osmoregulatory strategy and the role of these esophageal ionocytes.

A Mysterious Case of a Somatic Gene Deletion in Select Endodermal Tissues: Single Copy Loss of the Developmental Gene, *hoxa13*, in a mouse family.

Nagy, K., Hill, K.

Department of Biology, University of Western Ontario, London, ON.

Somatic mosaicism is the phenomenon of populations of genetically distinct cells, all derived from the same zygote. This is caused by post-zygotic mutagenesis, where early mutations in stem cells will increase the populations affected. Somatic mosaicism for a large-scale deletion was observed using genotyping array and digital-droplet PCR for tissues of a sire and three sons, showing similar copy number losses involving the *hoxa13* gene. Interestingly, this deletion is not inherited, as it is only seen in select endodermal tissues. To confirm the deletion is present, a copy number detection tool CNVkit was tested for single copy exon deletion in whole-exome sequencing data. WES data permits the confirmation of the gene deletion, whole-genome sequencing is underway for copy number detection and deletion junction characterization. Finally, PCR-based testing of the general occurrence of the deletion beyond this family will help determine its functional relevance and mutational mechanism.

Session 2

Room: TH244

Characterization of a tumour suppressor protein SHPRH through mutational analysis

Lloyd-Ellis, S., Walker, J.R., Zhu, XD.

Department of Biology, McMaster University, Hamilton, ON.

DNA replication is subject to many stressors. Human cells have evolved many mechanisms to repair and tolerate damage during DNA replication to maintain genomic stability. The SNF2, histone-linker, PHD, and RING finger domain-containing helicase (SHPRH) is an E3 ligase that has been implicated in the maintenance of genomic stability as a tumour suppressor. SHPRH is responsible for polyubiquitylating PCNA – an important step that is believed to promote fork reversal and template switching as mechanisms of DNA damage tolerance. Previous research has shown that SHPRH forms nuclear foci that co-localize with PCNA. We confirmed that both endogenously and exogenously expressed SHPRH localizes primarily to the nucleus and forms foci in U2OS cells. Subsequently, we investigated whether specific regions or domains within SHPRH are important for its nuclear localization and foci formation. This investigation will further our comprehension of SHPRH and the mechanisms maintaining genomic stability.

Epigenetic regulation of PLK1-4, Spy1 and other proteins in multiple myeloma

Madhavan, K.

University of Windsor, Windsor, ON.

Multiple Myeloma (MM) is a hematopoietic cancer caused by the overaccumulation of malignant plasma cells in the bone marrow. Improper function of crucial proteins such as polo-like kinases (PLK), Spy1, and cyclin D-E significantly impacts cell cycle progression during interphase and mitosis. Our objective is to establish the methodology for methylation-specific PCR (MSP) for PLK 1- 4, Spy1, and Cyclin D-E proteins in U2-OS and Saos-2 cells grown in vitro. Upon establishing optimal protocol, we will characterize the methylation profile of these proteins in Multiple Myeloma (MM) and normal bone marrow samples of patients. The PLK family has shown aberrant promoter methylation levels in ovarian cancer and glioblastoma. Similarly, Spy1 can suppress predominant stress responses in cells, including apoptosis, senescence, and DNA damage response pathways. Therefore, altering the methylation status of these crucial proteins allows us to examine their role in the cell cycle.

Exploring the role of Spy1 in the development of Non-Alcoholic Fatty Liver Disease and progression to Non-Cirrhotic Hepatocellular Carcinoma

Oschanney, L.S., Baker, A., Fifield, B.A., Porter, L.A

Department of Biomedical Sciences, University of Windsor, Windsor, ON.

90% of liver cancer cases are Hepatocellular Carcinoma (HCC). HCC can occur from Non-Alcoholic Fatty Liver Disease (NAFLD). Most cases are cirrhotic and start from chronic fat triggering inflammatory responses, which leads to the liver initiating a proliferative response. Over time, the liver becomes fibrotic with low proliferation to maintain structural integrity. As fibrosis increases, the liver becomes cirrhotic, and the environment increases HCC risk; however, 20% of HCC cases are non-cirrhotic arising directly from NAFLD. The atypical cyclin-like protein Spy1 can bind to CDKs, increasing cell division and overriding checkpoints. Research has shown that mice with overexpressed Spy1 develop NAFLD and HCC with decreased fibrosis, suggesting that elevated Spy1 drives proliferation in the presence of cell damage. To better understand this response and the role of Spy1, this project examines NAFLD development in a murine model driving Spy1 overexpression in the liver.

Spy1-Mediated Cell Cycle Effects Enhance Oncogenic Transformation by Selected Drivers in Human Glioblastoma

Boujeke, E., Lubanska, D., Porter, L.

University of Windsor, Windsor, ON.

Development of the central nervous system is an intricate process requiring cellular events to coordinate with one another. A small population of adult neural stem cells (NSCs) resides in the mammalian brain and aids neurogenesis throughout life. Cell cycle regulation plays a vital role in determining the fate of NSCs. Using a transgenic mouse model, our group has demonstrated that driving the expression of the cyclin-like protein Spy1 in NSCs inhibits differentiation and promotes self-renewal. The current study investigates the role of Spy1 in tumorigenesis in the face of aberration in selected tumour suppressors and oncogenes known to drive glioblastoma. Using the transgenic mouse model, we analyze the cooperation between Spy1 and the drivers p53, PTEN, c-Myc, and EZH2. This study will elucidate whether Spy1-mediated cell cycle regulation can enhance potential aberrant regulation in NSCs. The results will contribute to the development of new therapeutics to target and treat GBM.

Role of Biological Sex on Non-Alcoholic Fatty Liver Disease Progression to Hepatocellular Carcinoma

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Hepatocellular carcinoma (HCC) is the most prevalent liver cancer and a leading cause of cancer-related deaths worldwide. Men have an increased risk of HCC, but the exact mechanism for this remains unclear. Non-alcoholic fatty liver disease (NAFLD) is a major risk factor for HCC. Hepatocytes typically remain quiescent; however, chronic injury can trigger cell-cycle re-entry to restore liver function. Spy1, an atypical cyclin-like protein, can bind and activate CDKs to override cell-cycle checkpoints & quiescent barriers, and has been linked to HCC. To better understand hepatic regenerative processes, the methionine choline-deficient diet, an excellent NAFLD inducer, will be administered to male & female mice. Morphological and cell-cycle profile differences will be investigated to quantify the liver's regenerative state in wildtype mice. This project will uncover Spy1's role in sex-specific hepatic regeneration, help identify diagnostic markers & important therapeutic pathways in HCC.

Investigating candidate La protein-protein complexes and their function in pre-tRNA 3'-end protection in *Tetrahymena thermophila*

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Nascent pre-tRNAs are transcribed with 5'-leader and 3'-trailer sequences that must be processed for maturation. La-dependent processing is highly conserved in eukaryotes: the La motif (LAM) works with the RNA recognition motif-1 (RRM) to bind and protect 3'-uridylylate trailers. Recent work has demonstrated that the La protein Mlp1 in *Tetrahymena thermophila* lacks the conserved RRM and binds pre-tRNAs with lower affinity and specificity, hinting at an alternative end protection mechanism. IP-LC-MS/MS identified Mlp1-associated proteins that we hypothesize may enhance Mlp1-dependent 3' end protection. Candidate protein interactions with Mlp1 were confirmed via in vitro GST-pulldown assays and have been cloned for expression in fission yeast to utilize an established pre-tRNA processing testing system. We have also developed an in vitro pre-tRNA protection assay in which Mlp1 and candidate interaction partners are tested for an ability to protect pre-tRNA substrates from 3' exonucleases.

Session 3

Room: TH244

Exploring Principles of the Interplay Between Tumour-Initiating Cells and the Endothelial Component in Glioblastoma.

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Glioblastoma (GBM) is the most aggressive type of brain cancer. Current treatment options are suboptimal with an extremely poor median survival of approximately 15 months. GBM Tumour-Initiating Cells (TICs) are at the source of therapy resistance and unpredictable, rapid progression of the disease. GBM TICs are divided into diverse groups with different characteristics, and they present different molecules on their surface by which they can be

identified. GBM TICs thrive on the presence of endothelial cells (ECs), which are recruited by the tumour to form new blood vessels and sustain its growth and expansion. This novel project aims to explore in detail the interaction between TICs and ECs in GBM and how this relationship controls GBM aggressiveness and will aid in the implementation of patient-tailored approaches for the treatment of patients with GBM.

Anti-Cancer Activity of Piper longum and Camellia sinensis Extracts Against Human Glioblastoma in, in-vitro three-dimensional models; Cancer stem cell sensitivity to extracts with and without chemotherapeutic interactions.

Konior, K.

University of Windsor, Windsor, ON.

Glioblastoma (GBM) is the most aggressive form of brain cancer, where standard chemotherapies have limited effectiveness. In addition, GBM has cancer stem cells referred to as glioma stem cells (GSCs) responsible for drug resistance, malignancy, and relapse. Natural health products *Piper longum* (LPE) and *Camellia sinensis* (STE) have shown selective induction of apoptosis in U-87 Mg GBM cancer cells, alone and in combination with chemotherapies. The efficacy of these extracts and their interaction on a 3-dimensional glioblastoma model was investigated in this study. Our results demonstrated a decrease in spheroid microtumor growth in STE and LPE-treated cells. Furthermore, when sensitivity to STE and LPE was tested against GSCs in U-87 Mg using stem cell biomarkers CD44 and ALDH, a majority of stem cells senesced within 48 hrs and complete eradication occurred at 96 hrs. These results indicate STE's and LPE's potential as a novel, non-toxic therapeutic treatment against cancer relapse.

Apoptotic effects of Long Pepper, Synthite Tea, and Rosemary extracts on colorectal cancer and their interaction with FOLFOX chemotherapy

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Chemotherapy is the primary treatment for colon cancer, but it can cause adverse effects in patients and can compromise their quality of life. Natural extracts have shown promising results in selectively targeting cancer cells, but their efficacy in combination with chemotherapy remains unknown. The purpose of this study is to evaluate the potential of combining Rosemary, Long Pepper, and Synthite Tea extracts with chemotherapy to selectively target cancer cells in the HCT-116 colon cancer cell lines. Various concentrations of these extracts were tested, and the induction of selective apoptosis was assessed using AVPI, TRM, and H2DCFDA assays. Further experiments will be conducted to demonstrate that these extracts are selective towards cancer cells and do not cause toxicity to noncancerous cells when combined with chemotherapy. The results suggest that these extracts could offer a healthier and more effective approach in treating colon cancer.

The Tumour Suppressor Tuberin and DNA Damage Response

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The cell cycle is regulated by checkpoints that delay mitotic progression. DNA damage can be caused by an array of processes, like radiation and chemotherapy agents, leading to cellular mutations and carcinogenesis. Tuberin (TSC2), another tumour suppressor protein, regulates the G2/M transition in the cell cycle and negatively

regulates protein synthesis and cell growth. Previously, our lab has shown that Tuberin regulates mitotic onset through cellular localization of the G2/M Cyclin, Cyclin B1. My project focuses on the Tuberin/Cyclin B1 complex and its role in G2/M arrest and DNA damage repair. In this study, two Tuberin null NIH-3T3 (mouse) cell lines will be created through CRISPR-Cas9 editing to define the role of Tuberin during DNA repair. Etoposide, a topoisomerase II drug, will be used to induce DNA damage. Cells will then be analyzed by flow cytometry and western blotting to assess their cell cycle profile, apoptotic levels, and TSC2 protein expression.

Session 4

Room: TH245

Characterization of the Interaction of PLK4 and JAK2 Proteins

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Polo-like Kinase 4 (PLK4) is a key regulator of centrosomes in animal cells. Janus Kinase 2 (JAK2) also localizes to the centrosome. Research shows that consensus sequences for JAK2 and PLK4 exist and that the proteins can be co-immunoprecipitated. It is hypothesized that JAK2's regulatory effect on centrosomes is mediated by interaction with PLK4. To investigate this, bacterial cells are transformed to grow plasmids containing mutated forms of JAK2 and PLK4. Animal cells are cultured and transfected with these plasmids for expression of the modified proteins. Subsequently, JAK2 is purified before performing a kinase assay with PLK4 to confirm a possible interaction. Identifying this interaction can help characterize the relatively unexplored role of JAK2 in cell duplication. Further determination of the function of this interaction is relevant to the area of oncology. Inhibiting these proteins can potentially act as a treatment in cancer, where overexpression of PLK4 is apparent.

The Function of NKR-P1B and Clr-b receptor:ligand interactions in Kupffer Cells

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Kupffer cells (KC) are liver-resident macrophages involved in phagocytotic and scavenging functions to eliminate microbes and endotoxins from the blood. NKR-P1B is an inhibitory receptor in immune cells that recognize Clr-b ligand. Work from our lab has shown that Clr-b is expressed in KCs. The function of NKR-P1B:Clr-b interactions in KCs is not known. We hypothesize that the Clr-b protein plays a role in the development and function of KCs in the mouse liver. We will perform flow cytometry analysis of KCs from the livers of WT, NKR-P1B-KO, and Clr-b-KO mice to assess changes in their phenotypes, frequencies, and functions. The results so far show a trend towards increased frequency of KCs and a decreased frequency of macrophages in Clr-b-KO livers. Future experiments will assess the function of KCs in these mice. These findings will advance our understanding of the biology of KC, which are important for liver immunity.

Characterising the Expression and Function of Nicotinic Acetylcholine Receptors in B-Cells

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2. Medical Sciences Division, NOSM University, Sudbury, ON

This study aims to validate nicotinic acetylcholine receptor (nAChR) presence in the Raji B-Cell line and explore effects of lipopolysaccharide (LPS) stimulation on receptor gene expression. By culturing cells and determining their basal expression using qPCR techniques, it was determined that this cell line expresses multiple nAChR receptor genes. Following this, cells were stimulated with LPS to determine differences in expression between stimulated and control groups using qPCR and gel electrophoresis. No significant differences between treated and untreated groups were found. Reference gene differences may account for these results so LPS effects on nAChRs requires further analysis. Proliferation and viability measures were taken and no significant differences were found. nAChRs are currently being explored as possible treatment targets for multiple sclerosis. Examining the effects of stimulation on nAChR expression in immune cells, may contribute to furthering this research.

Exploring the role of Cyclin B1 in Tuberin Stabilization

Sharma, D., Fidalgo Da Silva, E., Porter, L.A

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Tuberous Sclerosis is an autosomal dominant disorder affecting approximately 1:6,000 childbirths. This disorder results from mutations in either the Tuberous Sclerosis Complex 1 or 2 (TSC1/TSC2) genes and usually results in benign tumours in various areas of the body such as the brain, kidney, skin and lungs. Hamartin, encoded by TSC1, can reveal a ubiquitin-binding site when absent, ultimately leading to Tuberin's degradation through ubiquitin-mediated proteasomal degradation. Moreover, cyclins are a vital aspect of the cell cycle and are regulatory subunits that complex with cyclin-dependent kinases (CDKs), which are serine/threonine kinases. Cyclin B1's function isn't entirely understood; however, it is known that it is essential for mitotic entry. The following study examines if the exogenous expression of a cell cycle protein, Cyclin B1, can recover Tuberin levels in the absence of Hamartin.

Room: TH246

The natural response of gut enteroendocrine cells to whole body ionizing radiation in mice

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Abdominal radiotherapy is used in the treatment of a variety of cancers but can cause complications due to gastrointestinal cell death. The intestinal endocrine L-cell secretes a protective hormone that can prevent cell death, however its role in radiation-induced damage is not known. In this study, mouse intestinal endocrine L-cells were examined after receiving varying doses of whole body ionizing radiation. 48h after, ileal tissue was collected and L cells were visualized using fluorescent immunohistochemistry targeting an L-cell marker. The number of L-cells were blindly counted and compared across the different radiation doses. No significant differences in the number of L-cells at varying radiation dosages was found; however, some

morphological differences in intestinal structure were observed. The results suggest that acute radiation exposure does not impact the amount of intestinal endocrine L-cells. Future work will explore the resilience of the L-cell to radiation exposure.

Effects of High-Dose Ionizing Radiation Exposure During Late Gestation on Mouse Placenta

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2. Northern Ontario School of Medicine University, Sudbury, ON
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This study aims to determine the effects of exposure to high-dose x-ray irradiation during late gestation on the fetus and placenta. Pregnant BALB/cAnNCrl mice were given different levels of radiation (0.1-Gy to 2-Gy) during late gestation (GD14-18). At gestational day (GD) 21, fetal and placental measurements were taken and results showed that 2-Gy of irradiation on GD14 decreased fetal weight. In addition, whole-sample transcriptomic profiling by RNA-Seq of male and female placentae for both the sham and 2-Gy (GD14) treatment groups showed the largest change in Gypa and Cd163 expression. Seven genes were randomly selected for RNA-seq validation via RT-qPCR, which saw a similar direction of expression, but not to the same extent as the transcriptomic. Although the placental weight was unchanged by radiation exposure, the observed changes in gene expression may play a role in altered function, which may impact fetal growth and programming of the fetus.

Catecholamine Biosynthesis and Regulation: The Influence of Progesterone

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Catecholamines are neurotransmitters/hormones that are involved in numerous physiological systems, including blood pressure regulation and stress response. Elevated levels of catecholamines have been linked to hypertension, and sex differences in hypertension rates are thought to be attributed in part to sex hormones. Currently, the mechanism by which progesterone (P) regulates catecholamine biosynthesis is poorly understood. The present study utilized PC12 cells to investigate the effects of P on the gene expression of catecholamine biosynthetic enzymes. PC12 cells were treated with various concentrations of P alone or in combination with dexamethasone (DEX). P alone had no effect on tyrosine hydroxylase (TH) or dopamine beta-hydroxylase (DBH). DEX significantly increased TH and DBH mRNA expression. P potentiated the effects of DEX for TH, but it attenuated the effects of DEX for DBH. These results show that progesterone may influence catecholamine biosynthesis and regulation.

A Local Ca²⁺ and RhoA Signaling Crosstalk Facilitates Cell Migration by Reinforcing Actin Network in the Lamellipodia.

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Cell migration underlies many physiological processes, from embryonic development to tissue regeneration. In order to migrate, cells extend membrane protrusions known as lamellipodia, which are driven by actin polymerization. These lamellipodia are tightly regulated by a variety of

signaling pathways, including Rho GTPases and Ca²⁺-dependent signaling. While the key role of Ca²⁺ signaling in lamellipodia protrusions has been demonstrated, the molecular mechanisms by which Ca²⁺ facilitates lamellipodia assembly is largely unknown.

Session 5

Room: TH253

Investigating TPP-linoleic acid (TPP-LA) as a treatment for Barth Syndrome using a mouse myoblast model

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Barth syndrome is a genetic disease characterized by a loss-of-function mutation in the tafazzin (TAZ) gene. TAZ is responsible for the remodeling of the cardiolipin (CL) species tetralinoleoyl cardiolipin. We evaluated the application of triphenylphosphonium-linoleic acid (TPP-LA) as a potential therapy to improve mitochondrial function. Treatment of TAZ knockout (TAZKO) mouse myoblasts (C2C12) with 1000 nM TPP-LA reversed the loss of CL that typifies the disease. Lipidomic analysis showed a partial normalization of the CL fatty acid profile, including reduced content of the monolysocardiolipin intermediate that accumulates in TAZKO cells. However, TPP-LA treatment did not rescue other aspects of the TAZKO phenotype. TAZKO myoblasts are unable to differentiate into myotubes and this phenotype was not reversed by TPP-LA treatment. We conclude that while TPP-LA induced significant changes in CL composition, it did not otherwise appear to affect TAZKO myoblasts or myotubes.

The Unique Role of DnaJC7 in Cellular Protein Quality Control

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DnaJC7 is a member of the Hsp40 family of molecular chaperones, which are key players in cellular protein quality control or proteostasis. Mutations in DNAJC7 cause familial forms of the neurodegenerative disease ALS (amyotrophic lateral sclerosis). In our study, we sought to understand the role of DNAJC7 in proteostasis under stress conditions. Using *S. cerevisiae* as our model organism, we performed a structure-function analysis to determine how the J domain and two TPR domains of DNAJC7 regulate its function. To this end, we engineered missense and truncated DnaJC7 variants and expressed them in yeast to elucidate the function of each domain and to determine which structural component regulates proteostasis. Ultimately, this project will give us a deeper understanding of the function of DnaJC7, which might also shed light on its role in ALS pathogenesis.

H2S protects rat cardiac cells from rotenone-induced mitochondrial damage and labile iron accumulation

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Ischemic heart damage is a leading cause of death. Hydrogen sulfide (H₂S) is a well-studied gasotransmitter with cardioprotection. This study explored the regulatory role of H₂S on mitochondrial functions and iron metabolism in cultured rat cardiac cells. Rotenone, a mitochondrial complex I inhibitor, was used for establishing an in vitro model of ischemic cell damage. It was found that rotenone dose-dependently inhibited cell viability and induced apoptosis, which could be significantly reversed by NaHS (H₂S donor) at physiologically relevant concentrations. H₂S protected rotenone-induced mitochondrial damage, mitochondrial iron transporter ABCB8 expression, and intracellular labile iron accumulation. Unexpectedly, rotenone promoted H₂S generation possibly by inducing the activity of cystathionine gamma-lyase (H₂S-generating enzyme). These results indicate that H₂S would protect heart cells from ischemic damage by preserving mitochondrial functions and intracellular iron homeostasis.

The impact of cystathionine-gamma-lyase knock out and H2S reduction on the physiology of intestinal cells

Pelen-Tobar, K., Gagnon, J.

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In the gastrointestinal tract the primary enzyme pathway for the production of H₂S is the Cystathionine γ -lyase (CSE). People with inflammatory bowel syndrome (IBS), such as Crohn's disease have been linked with high concentration of H₂S in the gut. Patients with IBS are characterized by a reduction of tight junction proteins in the gut epithelium. It is plausible that H₂S can modulate the expression and activity of tight junction proteins, leading to changes in gut barrier function. Tight junctions are essential for the function of a healthy gastrointestinal barrier. To understand the role of H₂S in tight junction protein expression, we set out to analyze the expression of occludin and claudin, which are essential for barrier function in intestinal ileum tissues from CSE-KO and wild-type mice using western Blot technique. Due to issues with protein separation and blotting, we conducted a series of troubleshooting experiments to establish a Western Blot protocol.

Poster Session A

Can Macrophages Differentiated from Conditionally Immortalized Myeloid Progenitors be Used to Study Lysosome Remodeling?

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Macrophages are immune cells that play key roles in innate immunity, tissue regeneration, and development. They have the ability to engulf particles through phagocytosis. Macrophages' importance makes them potential therapeutic targets for multiple diseases. Lysosomes, membrane-bound organelles, aid in phagocytosis and antigen presentation. Recently, lysosomes have been understood to be dynamic and change in response to cellular needs, which aids cellular homeostasis and efficient lysosomal function. Lysosomal dysfunction has

been linked to various pathological conditions. A novel macrophage model has been developed using engineered myeloid stem cells that can be conditionally immortalized. This model may overcome the limitations of current experimental macrophages derived from tumor or primary cell lines. To study lysosomal remodeling and determine whether this model is pioneering, the engineered myeloid stem cells will be activated with lipopolysaccharides.

Deciphering The Role of MBOAT7 in Modulating PI3K/AKT Signalling Pathway

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The regulation and function of phosphoinositides, particularly phosphatidylinositol-4,5-bisphosphate (PtdInsP2) and phosphatidylinositol-3,4,5-trisphosphate (PtdInsP3) are critical for various cellular processes. This has led to extensive research on the interconversion between the various phosphorylated inositol headgroups through the actions of lipid kinases and phosphatases. However, the impact of varying acyl chain profiles on PIP biology through regulating different acyltransferases has been overlooked. MBOAT7, an acyltransferase, controls the activation and signalling of the PI3K/Akt pathway by selectively modifying the acylation of arachidonic acid (C20:4) at the sn-2 position of PtdInsPs, resulting in the formation of the PtdInsP consisting of 1-stearoyl-2-arachidonoyl (18:0/20:4). This discovery represents a new approach to understanding phosphoinositide regulation and function. Thus, we hypothesize that the acyl profile remodelling through the MBOAT7 acyltransferase is required

Design and creation of a whole cell biosensor for γ -hydroxybutyrate (GHB) in *Saccharomyces cerevisiae*

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The illegal substance γ -hydroxybutyrate (GHB) is often used nefariously and lacks efficient testing methods. To this end, we designed a whole-cell yeast biosensor for GHB that produces a visual readout. The BlcR repressor from *Agrobacterium tumefaciens* is known to bind both GHB and γ -butyrolactone (GBL), its precursor. Without GHB/GBL, the BlcR repressor binds an operator sequence (i.e. blcR), preventing downstream transcription. We designed a construct with the blcR operator upstream of three genes (i.e. crtI, crtB, crtE) coding for lycopene, yielding a red colour. All synthetic parts were cloned and assembled according to the widely-used yeast modular cloning method. In this way, we produced a functioning GHB biosensor that can be validated with the addition of exogenous GBL. To optimize biosensor sensitivity, three constructs were assembled with additional copies of the blcR operator. We aim to compare readouts between these engineered strains and the control biosensor strain.

Characterizing plant immunity and physiological phenotypes in temperature-sensitive and -resilient accessions of *Arabidopsis thaliana*

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High temperatures suppress salicylic acid (SA), a key plant hormone mediating immune responses to pathogens and pests. The widely studied *Arabidopsis* accession Col-0 has provided much of our understanding of temperature-regulated immunity. However, the

mechanisms underlying variation in *Arabidopsis* immunity and physiological responses to high temperatures remain unclear. We previously found accessions (Se-0, Sf-2, NFA-8) with temperature-resilient disease resistance. Here we show that Se-0 exhibited thermo-sensitive expression of the immune genes CBP60g and SARD1 like Col-0. In contrast, Sf-2 had constitutively expressed CBP60g/SARD1 while NFA-8 had diverging trends in expression. For SA, we observed heat suppression in Col-0 and Se-0 but not Sf-2. Finally, there was no variation in non-photochemical quenching among the accessions. Overall, our findings reveal potential mechanisms underlying temperature-modulated plant immunity, in hopes of enhancing plant resilience.

The Effects of PIKfyve Inhibition on ER Hitchhiking

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Phosphoinositide 5-kinase (PIKfyve) is a lipid kinase that mediates the phosphorylation of PI(3)P to PI(3,5)P₂ found in lysosomes. Inhibition of PIKfyve causes lysosome coalescence, reducing their number while swelling lysosomes. Interestingly, lysosomes form membrane contact sites with the endoplasmic reticulum (ER), which helps sculpt the fine, tubular, and reticulate ER network. In fact, when we inhibit PIKfyve, we now know that the ER network becomes less dynamic and collapses. To understand how PIKfyve inhibition disrupts the ER network, we hypothesized that PIKfyve inhibition disrupts ER hitchhiking, a process that helps form ER membrane tubules by pulling the ER membrane on motile lysosomes. To test this, we are labelling the lysosomes and ER in Cos7 cells treated with PIKfyve inhibitors. We then measure ER hitchhiking events by super-resolution live-cell imaging. Once this is completed, we will have a deeper understanding of how the ER dynamics are affected.

Pharmacological activators of TFEB in macrophages to stimulate immune function

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Transcription factor EB (TFEB) is a transcription factor that stimulates expression of genes encoding lysosomal proteins and autophagy. It is stimulated by stresses like infection. We hypothesize that pharmacological activation of TFEB has the potential to stimulate microbial clearance. To test this hypothesis, we used in vitro assays using primary macrophages to test and optimize the concentration and time of the curcumin analog C1 and acacetin to stimulate TFEB nuclear activation. Results indicated that both drugs led to TFEB nuclear translocation within two hours and potentially these drugs are more potent than torin1, a mTOR inhibitor used as a positive control for TFEB activation. We are now testing changes in gene expression using qRT-PCR driven by TFEB using wild-type and knockout cells. Once these results are completed, we will have defined parameters to assess the impact of curcumin analog C1 and acacetin on microbe clearance in wild-type and *tfeb*^{-/-} mice.

Oncological and morphological implications of SARS-CoV-2 in the onset of lung adenocarcinoma

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Since 2019, the world has faced a life-altering global pandemic affecting approximately 623 million individuals (Hopkins, 2023). The emergence of SARS-CoV-2, responsible for the respiratory disease COVID-19, has sparked many concerns and questions in the scientific community, and many remain unanswered. What are the long-term effects of COVID-19 and what do they entail for those who survived the disease? In this paper, we determine if COVID-19 induce morphological changes in epithelial human lung cells and if it has some oncological properties contributing to the development of adenocarcinoma, the most frequent type of lung cancer. The virus is thought to have cytopathic effects on cells by altering their morphology, leading to increased cancer risk. We will examine human lung epithelial cells for irregularities in shape and organization. Qualitative and quantitative analyses will be conducted, with statistics to summarize results. The results could open new avenues for research, particularly in oncology while informing the scientific community, health care professionals and the populations around the world on the general long-term effects of COVID-19. More studies should be performed to evaluate the cytopathic implications of SARS-COV-2 on human cells and the impact it has on cell growth phases.

Poster Session B

Dose-dependant inhibition of morphology differs between brown (*H. vulgaris*) and green (*H. viridissima*) Hydra exposed to selective HDAC8 inhibitor PCI-34051

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Hydra is a freshwater polyp that has been extensively studied for its regeneration capabilities. However, there is a gap in the research of homeostatic processes and potential differences between *Hydra vulgaris* (brown) and *Hydra viridissima* (green), a species with a symbiont, Chlorella. PCI is an epigenetic modulator that has been shown to stall regeneration in green *Hydra*, but the previous study did not include an uncut control group, making it difficult to determine whether PCI affects regeneration, rather than viability. Here, green and brown uncut polyps were exposed to PCI for 96 hours. Brown *Hydra* showed a notable decline in morphology after 24 hours of exposure to 2uM of PCI, while green *Hydra* exhibited a similar effect at 6uM after 72 hours, indicating a degree of tolerance to the drug. These results highlight the potential differences in sensitivity to PCI between the species and suggest the need for further research to fully understand their homeostatic processes.

Exploring Loop Properties of the Transcription Factor USF1

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Transcription factor USF1 targets the E-box DNA site, 5'-CACGTG. Additionally, USF1 uses a 12 amino-acid loop to distinguish sequences flanking the E-box: this disordered loop allows USF1 more versatility toward fine-tuning its target E-box DNA sites. We examined the

properties of this loop and its effect on distinguishing sequences. We replaced the shorter, 7 amino-acid loops of various proteins with USF1's loop. We tested the new proteins' ability to distinguish the target sites. As a control, we used protein derivatives with a loop similar in length to USF1's but of a different amino acid sequence. We concluded that the loop length alone does not account for USF1's ability to distinguish DNA sequences that flank the core E-box target. Understanding the loop's interactions can be useful for tailoring protein therapeutics that target transcription sites by binding to specific DNA sequences, resulting in fewer side effects.

Metabolic Stress and AMPK Activation Regulate Cell Surface Membrane Traffic and Cell Migration

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Regulation of cell surface proteome is important for control of cell metabolism and migration. One mechanism of cell proteome regulation is clathrin-mediated endocytosis (CME), a process that selectively internalizes cell surface proteins. We aim to understand how metabolic cues impact the CME of a key protein involved in cell migration, β 1-integrin. We found that activation of AMPK, a metabolic energy sensor activated during metabolic stress, promotes β 1-integrin internalization, leading to decreased cell surface levels. We also found that AMPK causes relocalization of early endosomes by regulating an enzyme, GAPEX5, suggesting that AMPK may further regulate the intracellular traffic of β 1-integrin. We extend these observations of regulation of membrane traffic by investigating how AMPK signalling influences cell migration during metabolic stress using an automated analysis tool to examine the migration distance, and speed. We reveal new regulation of cell physiology by cell metabolism

Optimising A Directed Evolution System To Develop Protein Drugs

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Phage-Assisted Non-Continuous Evolution (PANCE) is a bacterial system useful for mutating a gene expressing a target protein. PANCE uses natural selection through phage survival to select desired mutations. Mutations in a protein's sequence may lead to structural and even functional changes. We used the optimised eMutaT7 mutagenesis plasmid to enhance our PANCE system's ability to target its mutational activity to a specific region of the genome. We are improving our PANCE system by introducing an orthogonal T7 system to direct eMutaT7 activity to the protein gene. This limits mutations to other genes regulating host and phage activity. We are investigating various arabinose concentrations regulating the arabinose-inducible promoter for eMutaT7 activity, and adapting the plasmid to our system to further optimise the mutation rate. We hypothesise that an optimised PANCE system in joint use with the optimised eMutaT7 mutagenesis plasmid may be obtained and used to mutate proteins of know.

Tissue-specific expression of HCN and its metabolic precursors in *Trifolium repens*

Bhachu, K., Emad, H., Johnson, M.T.J.

University of Toronto-Mississauga, ON

Cyanogenesis involves the release of hydrogen cyanide (HCN) from a plant following tissue damage. *Trifolium repens* performs cyanogenesis through the coexistence of two

alleles Ac and Li. This study investigates what similarities exist in the tissue-specific expression of HCN, Ac, and Li in *T. repens*. Feigl-Anger assays were performed to test for Ac and Li in the leaf, floral, and root tissues of 49 experimental plants. Field sampling for floral HCN was expanded to 441 plants across the GTA. There was a perfect correlation in the presence/absence of leaf and floral linamarase. 31 plants expressed root-Li independent of leaf phenotype, suggesting a paralogous Li-related gene in the roots. 8 field sampled leaf-AcLi plants expressed HCN in the flowers. qRT-PCR will be used to quantify the gene identity and expression level of the genes responsible for linamarase expression in the flowers and roots, and HCN expression in the flowers.



Ecology & Environment Abstracts

Session 1

Room 244

Monitoring the environmental abundances of multiple algal viruses using multiplex quantitative PCR

Arguelles, D.A., Inamoto, I., Short, S.M.

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Lake Ontario contains many viruses, including the virophages CpVV-Larry, Curly, and Moe which presumably parasitize the viruses CpV-BQ1, and BQ2 of the freshwater phytoplankton *Chrysochromulina parva*. To determine if these viruses' abundances varied over time and between two distinct environments, water samples were collected weekly from two sites, Lake Ontario at the mouth of the Port Credit River (LO-PC), and a stormwater pond at the University of Toronto Mississauga. Samples were filtered and concentrated, and multiplex quantitative PCR was used to track virus abundances. In the UTM pond, BQ2 and Moe were present at low abundances, yet BQ1, Larry, and Curly were not detectable. In comparison, in LO-PC, Moe was abundant in all samples, Larry was never detected, and the others' abundances were highly variable. This study demonstrated the highly dynamic nature of these viruses infecting a single host highlighting the distinct microbial ecology of nearby freshwater environments.

Establishing baselines for water quality and rotifer communities in frame lake, Yellowknife.

Patenall, M.E., Andreola, N., Gray, D.

Wilfrid Laurier University, Waterloo, ON.

Urbanization has altered aquatic habitats across Canada. Frame Lake in Yellowknife is a prime example of a northern lake affected by urbanization resulting in eutrophication and anoxia. Hypolimnetic aeration has been proposed as a rehabilitation method. However, baseline data on water quality and lower trophic organisms must be collected prior to aerator installation to determine its effectiveness. Objectives include 1) Examining how rotifer community metrics relate to water quality and 2) Examining seasonal patterns in the rotifer community. Monthly, water quality metrics were measured, and replicate zooplankton tows collected rotifer samples. Results indicate that rotifer community metrics have correlations to dissolved organic carbon and pH. Community metrics exhibited seasonality, reaching maximums in summer or late fall and minimums under ice cover. My study has produced novel multi-season data advantageous to future studies assessing the effectiveness of aeration.

Assessing Toxicity of Lead from Recreational Fishing Gear

St-Hilaire, S., Tetreault, G., Franka, R., Gilroy, E., Campbell, S., Miller, J., Sett, A., Leonard, E. Wilfrid Laurier University, Waterloo, ON. Environment and Climate Change Canada.

Lead (Pb) is a highly toxic element with no known biological function. The loss of Pb sinkers and jigs due to recreational fishing poses a health risk to aquatic ecosystems. Although the toxicity of Pb salts is well studied, the toxicity of Pb from fishing gear remains unknown. Water and fish samples were collected from highly fished sites in Ontario along the Bay of Quinte and Hamilton Harbour, where water Pb concentrations exceeded Canadian Water Quality Guidelines (WQG). Lab tests examined effects of solutions made by spinning Pb sinkers in water at different temperatures. Surface area-to-volume ratio positively correlated with the amount of Pb leaching from fishing gear, and the values exceeded WQG. Preliminary data suggests that temperature has no effect on Pb leaching from sinkers. Pb from sinkers was not acutely toxic to *D. magna*, and results align with literature LC50 values. Understanding the toxicity of Pb from fishing gear is crucial for the protection of aquatic biota.

The influence of invasive smallmouth bass (*Micropterus dolomieu*) on native lake trout (*Salvelinus namaycush*) diets in the Sudbury Basin

Dawe, A.M. (1), Therrien, C.A. (2), Neff, B.D. (1)

1. University of Western Ontario, London, ON.
2. University of Waterloo, Waterloo, ON.

Lake trout (*Salvelinus namaycush*) have experienced significant population declines in recent decades across their range. Despite the implementation of intensive stocking efforts, ongoing restoration efforts in the Sudbury Basin have had minimal success. The invasion of smallmouth bass (*Micropterus dolomieu*) into Northern Ontario has been hypothesized as a contributing factor. Smallmouth bass are voracious predators and can shift the dietary niche of lake trout from piscivorous to planktivorous, resulting in reduced growth and reproductive rates. In this study, I used a stomach content analysis to determine the degree of dietary overlap between lake trout and smallmouth bass in the Sudbury Basin. Preliminary results show higher invertebrate prey frequency in lake trout from lakes with smallmouth bass compared to lakes with a pelagic prey base or without bass. These findings further support the hypothesis that smallmouth bass are outcompeting lake trout for nutritionally favourable prey.

Session 3

Room TH253

Effect of a mixed feeding regime on the growth and boldness of guppy fry (*Poecilia reticulata*)

Muraca, T., Wu, A., Gotanda, K.

Department of Biological Sciences, Brock University, St. Catharines, ON.

Diet is an integral component in the welfare of captive animals. Previous studies have shown that diet can influence species growth and behaviour. However, whether a mixed diet provides enhanced benefits for captive animals, like the Trinidadian guppy, is a subject of ongoing debate. We fed guppy fry three different diets over four weeks and assessed growth rate and changes in behaviour. Overall, diet type did not have a statistically significant effect on growth rate or boldness. However, visual inspection of the data suggests a variation in growth rate and boldness. The guppies grew fastest on the mixed diet and slowest on the invariant commercial

flakes diet. Guppies fed mixed diets exhibited greater boldness relative to both invariant diet cohorts, which both remained relatively unchanged throughout the study. Here we show that a high-quality mixed diet instead of an invariant diet of commercial flakes or formulated paste could be beneficial to guppies.

Anogenital Distance: Not a Predictor of Female Rodent Behaviour

Goss, J., Schulte-Hostedde, A.

Laurentian University School of Natural Sciences, Sudbury, ON.

In many species, anogenital distance (AGD) has been shown to correlate with testosterone production. Therefore, AGD may be used as a proxy for masculinization. In mammals, males tend to be less docile and more explorative than females. I hypothesized that female rodents with a larger AGD will present more masculinized behaviours than females with a shorter AGD. Deer mice, Red-backed voles and Woodland Jumping mice were live-trapped in Algonquin Provincial Park and underwent a handling bag test, and an open field arena test to measure docility and exploration. We did not detect any significant differences in exploration and docility between males and females, or any significant relationship between anogenital distance and behaviour in females. The lack of variation in behaviour could be due to stronger environmental factors including resource availability, influencing the expected behaviour syndrome in females.

Through the camera lens: How are grey squirrels (*Sciurus carolinensis*) influencing red squirrels (*Tamiasciurus hudsonicus*) on Manitoulin Island?

Barnes, C.T., Schulte-Hostedde, A.

Laurentian University School of Natural Sciences, Sudbury, ON.

Recent environmental challenges resulting from climate change have encouraged grey squirrel encroachment into Manitoulin Island, a large island in Lake Huron. The Island is previously inhabited by only one species of diurnal tree squirrel, the red squirrel. I aim to understand how the red and grey squirrels are coexisting on the Island using camera traps measuring temperature and time over 365 days, indicating the activity patterns for each species. I hypothesised differences in temperature tolerances between the two species due to their different native ranges, and a change in activity patterns of red squirrels in sites where red and grey squirrels overlap, as detected by the camera traps. My results suggest a difference in the temperature tolerance between the two squirrel species, as well as an increase in active hours in red squirrels where both species co-occur when compared with active hours in red squirrels not competing with grey squirrels.

Thinking inside the box: a study of the sensory innervations in raccoon forepaws and the role of water as a mechanoreceptor catalyst

Séquin, J., Stone, J.

McMaster University, Hamilton, ON.

The raccoon (*Procyon lotor*) is a prominent and controversial species inhabiting many urban environments. Nevertheless, there are large gaps in knowledge and a lack of reliable research regarding their physiological mechanisms and problem-solving abilities. Findings in this study will fill these gaps by investigating the effects of moisture on raccoon paw sensitivity. A tactile puzzle-solving experiment is being conducted with four treatments, comprising blinded and sighted conditions and wet and dry paws. It is hypothesized that raccoons will perform better at object assessments with wet paws due to increased sensitivity of SA receptors. Preliminary data suggests raccoons perform better when their paws are wet, and that vision plays a subordinate

role in object assessment. By better understanding the behaviors that have allowed raccoons to persist in urban environments, we could inform the public on how to better coexist with raccoons and humanely manage their presence.

Room TH255

The relationship between neural gene transcription and the gut microbiome in Chinook salmon

Lanoue, N., Heath, D.

University of Windsor, Windsor, ON.

It is well established that a link exists between the gut microbiome and the brain; the gut-brain axis. This study seeks to examine the relationship between neural gene transcription and the gut microbiome in Chinook salmon. I characterized the gut-brain axis in Chinook salmon by manipulating the gut microbiome using antibiotics and probiotics and measured neural gene transcription profile changes (N = 216). The mRNA was extracted from whole brain tissue in Chinook salmon treated with probiotics, antibiotics, and untreated feed (control). Next, I created gene transcriptional profiles of the brain tissue using an OpenArray nanofluidic qPCR platform (Brain Chip V.2). I tested for probiotic, antibiotic, and gut microbiome composition effects on brain gene transcription. This study may refine our knowledge of the gut-brain axis in Chinook salmon, a common species used in research, and may yield future benefits in understanding the effects of diet on associated neural gene functions.

Species diversity and abundance of beetles in various cover crops in organic vineyards

Cook, P.E.

Brock University, St. Catharines, ON.

Organic vineyards use biological control agents such as beetles and sow their lands with cover crops to promote the presence of predators of pests. This paper will measure the diversity and abundance of beetles among different cover crop treatments and compare the proportion of beneficial versus pest beetles among cover crop treatments in two organic Niagara vineyards. Pitfall traps were laid out at each vineyard in the center of each treatment and cover sweeps were performed at the height of the interrow vegetation. There was no significant difference between the varying cover crop treatments and species diversity for pitfall traps ($p=0.1011$) and cover sweeps ($p=0.929$). The percentage of beneficial beetles was 15.4% compared to the percentage of pest beetles which was 82.1%. Vineyards should implement different kinds of cover crops to deter pest beetles such as leaf beetles (*Chrysomelidae*) due to their high abundance.

The Impact of Urbanization on the Spatiotemporal Distribution of Black-capped Chickadee

Vlahiotis, K. E., Gotanda, K.M.

Brock University, St. Catharines, ON.

Over the past 30 years, Southern Ontario has undergone rapid population growth. Urban sprawl has led to the rapid expansion of cities and increased habitat fragmentation, resulting in an urban gradient made up of heavily urbanized areas with semi-urban and natural spaces scattered between. The black-capped chickadee (*Poecile atricapillus*) is an urbanized avian species known to thrive throughout the urban gradient. Habitat fragmentation has shifted their

native range and changed population distribution and composition throughout Ontario. The extent of this change has yet to be quantified. Relative species abundance distribution trends from the last 30 years were quantified using data extracted from eBird, a community science project. Preliminary results show a decrease in black-capped chickadee populations in heavily urbanized areas. Understanding range shifts and population distribution patterns near urban areas is essential for monitoring impacts of urbanization on bird species.

Recovery of fish populations in a highly degraded stream in response to improving water quality, in Sudbury Ontario.

O'Meara, A.

Laurentian University, Sudbury, ON.

Junction Creek flows through Sudbury's urban and industrial sectors which has resulted in significant damage from atmospheric and effluent inputs from local mining related facilities. Since the early 1970's, efforts to protect and restore the local watershed have resulted in > 95% reduction in local emissions. My research aims to assess the ecological impacts of these efforts on the ecosystem of Nolin Creek, versus a tributary less impacted by mining activities, Maley Creek. Our study found that the aquatic biota has re-established itself in Nolin. We were able to correlate the findings from the survey to water chemistry data recorded over 20 years. Correlation between general habitability, measured by the species abundance in each tributary, could be attributed to the copper levels in the system. Cu is toxic to certain species, resulting in damage to various internal systems and is highly toxic to organisms that the fish feed on. Additionally, Ni and Sulfates have also had an impact on the fish. The findings from this study demonstrate the importance of regulated emission reductions and remedial measures on highly degraded watersheds.

Session 4

Room: TH244

Temporal analysis of genetic diversity in an isolated population of Bog Copper butterflies, *Tharsalea epixanthe*

Contursi, M.M., Keyghobadi, N.

Western University, London, ON.

Restricted to Nearctic peatlands, Bog Coppers (*Tharsalea epixanthe*) naturally live in fragmented bog ecosystems. The Bog Copper may be experiencing genetic diversity changes due to genetic drift. Using wing clip samples, I investigated the genetic status of an urban Bog Copper population located in Sifton Bog, London, Ontario, Canada, through estimates of genetic drift and effective population size (N_e). 10 microsatellite loci were genotyped and amplified through PCR assay from samples taken in 2022. This, alongside historic data from the same population collected in 2009 and 2014, was used to reveal allelic frequency and genetic diversity changes over time. Overall heterozygosity and N_e were low, indicating high rates of genetic diversity loss due to genetic drift. This study highlights the vulnerability of this urban population, informing potential need for translocation, genetic rescue, and regular monitoring efforts for this population, and others of similar nature, in the future.

How do mowing regimes affect tree cricket hatching success?

Sehgal, J., Murray, R.L.*, Gwynne, D.T.*

Department of Biology, University of Toronto Mississauga, Mississauga, ON.

Raspberry canes serve as a valuable egg-laying substrate for some tree crickets (*Oecanthus*, family *Gryllidae*). Female black-horned tree crickets (*O. nigricornis*) drill a series of holes with their ovipositor into the pith of the cane and insert an egg into each hole, leaving a zipper-like scar on the cane. I examined the effects of different mowing regimes on egg hatching success using 3 treatments: canes rooted in soil (the natural state); unrooted canes remaining upright against a fence simulated cut (mowed) stems but with natural orientation; and canes lying on the ground simulated mowing where cut canes become covered with soil, leaves, and debris. I expect egg hatching success to be lowest in the mowed treatment as the dampness of the canes covered in debris may promote bacterial/fungal growth and prevent the eggs from surviving.

The ecological influence of dietary choice on the development and fitness of *Drosophila melanogaster* populations

Akinbi, I.O., Long, A.F.

Wilfrid Laurier University, Waterloo, ON.

Sexual dimorphism is frequently thought to arise because of sexual selection - with different phenotypes being favoured in males and females as they increase their reproductive success. However, if there are different nutritional requirements between the sexes, divergent ecological selection could lead to dimorphic niche partitioning. Sexual dimorphism and increased fitness can develop due to niche differences. Here, we conducted an experimental evolution assay, using fruit flies, *Drosophila melanogaster*, where experimental populations had the opportunity to express dietary choice, while in control populations all food was homogenous. We measured female fecundity and egg-to-adult survival across multiple generations. While survivorships did not show any notable differences between treatments, population in which flies which experienced dietary choice showed evidence of greater offspring production, consistent with the predictions of increased sexual dimorphism via ecological selection.

Hunting-induced selection on thinhorn sheep (*Ovis dalli*) horn morphology

Sherbourne, A.M.G., Balsara, M.J., Coltman, D.W.

Western University, London, ON.

In Yukon thinhorn sheep (*Ovis dalli*), natural selection favors large horns which improve social dominance and reproductive success. However, trophy hunting regulations are based on minimum requirements of horn size and shape. Traits influencing age at harvestability, including horn growth rate and coil, may therefore be under hunting-induced selection. Here, I assessed horn morphology in Yukon thinhorn sheep harvested from 2005-2021 through analysis of harvest photos in ImageJ. I found horn growth rate to be under strong hunting pressure as fast-growing horns led to the earliest harvest. However, growth rate increased over time, likely due to unaccounted-for environmental factors. Horn coil also appeared to be under selection; tightly coiled horns led to the youngest harvest age and loosely coiled horns became more common over time. Therefore, hunting-induced selection is likely driving changes in sheep horn morphology, raising concerns about the impacts of morphology-based harvest.

Session 5

Room: TH244

Using passive acoustic monitoring for individual identification in a vulnerable and non-oscine species, the Great Curassow (*Crax rubra*)

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University of Windsor, Windsor, ON.

Neotropical birds are a highly vulnerable group, with many species at risk of extinction, yet they remain one of the most understudied groups. The Great Curassow (*Crax rubra*) is a prime example of this and its elusive nature makes it difficult to study. In this study, we aimed to investigate whether male Curassows exhibit individual variation in their most common call, the boom call, by analyzing archive recordings from stationary audio recorders in Guanacaste, Costa Rica, originally intended to record wrens. We used AviSoft Bioacoustics to analyze each call, and subjected specific parameters to a discriminate function analysis to identify individuality within calls. Our findings provide insight into the potential use of this approach for species conservation, as comparisons of recordings from previous years may enable the identification of the same individuals. Moreover, our results demonstrate that archived acoustical data can still have valuable applications.

Characteristics of recent field-based conservation translocation programs.

Mohamad, J. (1), Ibrahim, S. (1), Maclsaac, H.J. (2)

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Conservation translocations have recently exploded in popularity. We conducted a WoS review of introductions in 142 translocations (43 papers; 59 species) published since 2014. Translocations for species conservation dominated over those for rewilding (89% vs 11%), and involved mainly angiosperms (44), arthropods (18), and mammals (18). Israel, Sweden and the USA led in total translocations, whereas Brazil and Australia dominated total number of species introduced. Translocations for assisted colonization and rewilding succeeded best (73% each), followed by reinforcement (69%) and reintroduction (58%). Successful translocations dominated over failed ones (64% vs 36%), with success higher in animals (80%) than plants (55%). Translocation failures were attributed mainly to unsuitable environment and low inoculum. Two surprises from our study were the lack of support for the propagule size hypothesis, and the much shorter duration of studies for successful translocations than failed ones.

Examining Benthic Macroinvertebrate Communities as Indicators of Stream Ecosystem Health in the Sydenham River Watershed, Ontario, Canada.

Lachance, N.J., Febria, C
University of Windsor, Windsor, ON.

Agricultural intensification has affected water quality in stream environments ensuing in biodiversity losses and habitat degradation at large scales resulting in the loss of many integral

species, such as Unionid freshwater mussels. Unionids are part of a larger benthic community which serves as indicators of stream health. My research aims to answer how stream habitat traits affect benthic macroinvertebrate communities in the Sydenham River watershed, an agriculturally impacted landscape supporting the highest number of freshwater mussel species at risk in Canada. Seven sites were sampled for benthic macroinvertebrates, water quality and riparian vegetation. I applied multivariate statistics to identify trends between small streams and large river reaches. This research will help inform habitat restoration and mussel conservation by expanding local biodiversity information for conservation authorities and federal government agencies undertaking stewardship and conservation work.

Marine biodiversity assessment around the Maiden Islands using Baited Remote Underwater Video (BRUVs)

Vos, A.J., Mensink P.J., Collins, P., Garbett, A., Houghton J.
Western University, London, ON.

Biodiversity surveys are conducted to assess the well-being of ecosystems, and ocean assessments are becoming increasingly important due to declines in marine species. Baited Remote Underwater Video (BRUVs) is a non-destructive method used to measure baseline biodiversity data and monitor the success of marine protected areas (MPAs). In this study, I used BRUVs to measure the biodiversity around the Maiden Islands, Northern Ireland, an area of biological importance and a voluntary MPA under OSPAR. I analyzed over 100 hours of footage from 44 sampling sites around the Maidens in July/August 2022. 46 species were identified, including sharks, octopus, jellyfish, seals, birds and at least four threatened or endangered species. The species community varied with environmental variables such as depth and substrate. This information can be used to assess the current management strategy of the Maidens and help ensure the conservation of biodiversity in this ecologically significant area.

Room: TH246

Investigating trophic ecologies and mercury bioaccumulation in the apex predators walleye (*Sander vitreus*) and northern pike (*Esox lucius*) in northern lakes

Bateman, D. S., Johnston, T. A.
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The objective of this research was to compare and contrast the trophic ecologies and mercury bioaccumulation of two common piscivorous fishes, walleye (*Sander vitreus*) and northern pike (*Esox lucius*), in northern Ontario lakes with co-habiting populations of both species. Trophic ecologies were inferred from muscle carbon and nitrogen stable isotope ratios, $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$, respectively. I found that $\delta^{13}\text{C}$, $\delta^{15}\text{N}$ and total mercury concentrations [THg] tended to increase with body size in both species. At a common body size, walleye was found to feed on more pelagic food sources (lower $\delta^{13}\text{C}$) and at a higher trophic elevation ($\delta^{15}\text{N}$) than northern pike, and to have higher mercury concentrations than northern pike. Walleye also had a smaller isotopic niche than northern pike though this difference was not significant. Both their food web separation and relative differences in isotopic niche size varied with physical characteristics of the lakes.

Microplastics as an Emerging Risk to the Health of Amphibians

Loiselle, N., Martinez, M., Lesbarrères, D.

School of Natural Sciences, Laurentian University, Sudbury, ON.

Plastic pollution is continually increasing and microplastics have the potential to negatively affect the health of many animal species. My study aims to determine whether microplastic levels in *Lithobates pipiens* varied between five regions with low or high plastic pollution. Individuals were weighted, and the snout-vent length (SVL) was measured. The gastrointestinal content was digested with a 10% KOH solution and then filtered with a 100µm filter. All the suspected plastic particles were analyzed using FTIR. While the number of particles seemed to vary between sites, the FTIR analysis did not confirm whether the isolated particles were microplastics. Furthermore, the morphological analyses of the frogs did not show a significant relationship with the suspected microplastic particle abundance. While my study suggests a difference in the number of particles present in individuals of high and low-plastic environments, further work is needed to determine the nature of these particles.

The Brimstone Factor; Muscle Sulphur Compositions and Mercury Concentrations in Freshwater Fishes

Miller, S.J., Johnston, T.A.

Living With Lakes Centre, Laurentian University, Sudbury, ON.

Sulphur is an essential element in living organisms and is closely associated with the element mercury in the environment. I examined variation in sulphur to nitrogen ratios (S:N) and sulphur stable isotope ratios ($\delta^{34}\text{S}$) of muscle from 12 fish species from river and lake ecosystems of northern Ontario to learn more about their usefulness as indices of fish ecology and mercury bioaccumulation. For the majority of species, S:N did not vary significantly between rivers and lakes and the mercury content was not significantly correlated with S:N in any species. However, S:N was noticeably greater in walleye. $\delta^{34}\text{S}$ differed greatly between populations and was much greater in northern rivers than in lakes. There was a strong association between mercury concentrations and $\delta^{34}\text{S}$ in Brook Trout and Longnose suckers, but not in any other species. $\delta^{34}\text{S}$ displayed a significant link between $\delta^{34}\text{S}$ and the species effect.

The effects of temperature and time on soil enzymatic activities in the City of Greater Sudbury

Lougheed, A. & Nkongolo K.

Laurentian University, Sudbury, ON.

Soil enzyme activities are good indicators of soil health. It has been hypothesized that soil storage before analysis might affect microbial function. The objective of the present study was to determine if soil storage at -20°C and -80°C impacts soil enzymatic activities. Soils samples were collected and stored for 4 weeks at -20°C and -80°C . Activities of 9 enzymes were measured in fresh samples and every two weeks during storage. Overall, 9 enzymes were targeted including β -glucosidase (BG), cellobiohydrolase (CBH), β -N-acetylglucosaminidase (NAGase), aryl sulfatase (AS), acid phosphatase (AP), alkaline phosphatase (AIP), glycine aminopeptidase (GAP), leucine aminopeptidase (LAP), and peroxidase (PER). With the exception of PER, storage at -20°C and -80°C decreases the activities of all enzymes tested. These changes varied with specific enzyme targeted. Further studies should be conducted to determine how these low storage temperatures affect the whole microbial transcriptome.

Room: TH248

Evaluating the consequences of urbanization on the dental health of the North American Raccoon (*Procyon lotor*)

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1. Laurentian University, Sudbury, ON.
2. Center for Evolutionary Ecology and Ethical Conservation.

The raccoon, *Procyon lotor*, is an opportunistic frager whose species has thrived in proximity to humans due to the ability to consume anthropogenic food waste. Previous studies show increased dependence on anthropogenic food contributes to a decline in oral health and secondary health conditions in mammals, due to low nutritional value and increased bacteria presence. We hypothesized that urban raccoon populations that rely on anthropogenic foods have worse dental health than their rural counterparts. We evaluated the dental health of 48 adult Ontario raccoons from urban counties near major cities and rural counties near farmlands. Dental health was assessed by counting missing and broken teeth, using tooth wear and calculi indices and measuring attachment loss and dental caries. No significant differences were found between the two sites. The limitations of our study and future opportunities for examining the effects of urbanization on dental health will be discussed.

The Effect of Distance to Anthropogenic Structures on Rodent Pace of Life and Behaviour

Duval, K.F., Schulte-Hostedde, A.I.

Laurentian University, Sudbury, ON.

Anthropogenic structures cause novel stressors for inhabitants of terrestrial ecosystems. The pace-of-life syndrome (POLS) suggests that life history and physiological traits coevolve alongside ecological trade-offs, and favour either slow- or fast-paced traits. Small mammals who live closer to anthropogenic structures and have constant exposure to novel stimuli should express faster-paced life strategies to cope with the higher stress environment. Live-trapping was done over four months in Algonquin Park, gathering data on aggressive and docile behaviour of Deer Mice, Southern Red-Backed Voles, and Woodland Jumping Mice. We found no effect of anthropogenic structures on behaviour of the three species. We will review why our hypothesis was not supported and discuss POLS in rodents.

Is maternal body condition correlated with clutch variables in Blanding's (*Emydoidea blandingii*) and Snapping (*Chelydra serpentina*) turtles?

Campbell, K., Moxley, K., Litzgus, J.

School of Natural sciences, Laurentian University., Sudbury ON.

Scales Nature Park, Oro-Medonte, ON.

With all 8 turtle species in Ontario listed as at risk of extinction, a better understanding of reproductive success is important for improving conservation efforts. We tested the hypothesis that mothers in better body condition will have larger clutch sizes and higher hatching success because of greater energy stores available to invest in reproduction. Clutches of eggs were collected from nesting mothers of two species (30 Blanding's turtles, 22 snapping turtles), transported to the lab, and incubated in a controlled setting. Maternal body condition was estimated using scaled mass index (SMI). We did not detect a positive relationship between SMI and clutch size or hatching success for either species; however we found a positive relationship between carapace length and clutch size. Our findings suggest that short-term

energy reserves may not influence contemporary reproductive investment, as turtles may be capital breeders, in line with their slow life histories.

Hatchling Turtle Behavioural Responses to Rip-rap used on Road Embankments to Prevent Turtles from Nesting

Drektraan, L., Kentel, J., Burke, T., Litzgus, J.
School of Natural Sciences at Laurentian University.
School of Natural Sciences at Laurentian University.
Georgian Bay Biosphere.
School of Natural Sciences at Laurentian University.

Vehicle strikes are a significant threat to turtles, and there are several mitigation strategies used to prevent turtles from accessing roads, but the consequences for hatchlings are rarely considered. We analyzed the behaviour of Painted Turtle (*Chrysemys picta*, n=18) and Snapping Turtle (*Chelydra serpentina*, n=27) hatchlings in response to rip-rap (a common construction material used on road embankments) deployed to deter female turtles from nesting on our study road. Hatchling behaviours were scored using ethograms during 50-minute trials in two arenas, rip-rap and gravel. Our results suggest that implementing this strategy created barriers to turtle recruitment. Both species were unsuccessful at navigating the rip-rap arena (0% completion rate), experienced more negative behaviours (e.g., became stuck), and achieved a less favourable score than in the gravel arena. Our study emphasizes the importance of developing mitigation techniques that consider all life stages of target species.

Poster Session A

Changes in herbivory and evolution of antiherbivore defenses in *Trifolium repens* along an urban-rural gradient in Toronto

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University of Toronto Mississauga, Mississauga, ON.

Urbanization has led natural selection to influence rapid adaptation in populations. The GLUE project is a global collaborative effort assessing whether white clover (*Trifolium repens*) is adapting to urban habitats. The evolution of an antiherbivore defence trait, the production of hydrogen cyanide (HCN) was examined to answer: (1) Is parallel evolution caused globally by urbanization? (2) What is the role of herbivores in driving plants' adaptation to urban environments? *Trifolium repens* leaves from 121 populations along three 50 km urban-rural transects in Toronto, Canada, were collected, and measurements of urbanization and herbivory were recorded. Each leaf was screened for the HCN-genotype using Feigl–Anger colorimetric assays. A higher frequency of cyanogenic plants in rural populations indicated that herbivores are imposing selection pressure favouring HCN production. This defence mechanism builds a greater global understanding of humans' influence on the evolution of life.

Bryophyte and lichen cover and diversity in relation to recovery of roads in the Nipissing Forest

Bottoms-Cau, T.M., Dech, J.
Nipissing University, North Bay, ON.

Road ecology is a relatively new field, and bryophytes and lichens are understudied groups that are important in succession. The purpose of this research is to determine how bryophyte/lichen cover and diversity are influenced by the stage of recovery and level of activity on forest roads in the Nipissing Forest. During the summer of 2022, bryophyte and lichen samples were

collected from subplots on forest roads and then identified to genus. Results show 27 genera of bryophytes and lichens were collected, and ordinations were conducted to compare species abundance with environmental variables. The results will provide an index of bryophyte/lichen richness and abundance, and information on the relationship between bryophyte/lichen taxa and environmental variables.

Coordination of Sentinel and Foraging Roles in American Crows, *Corvus brachyrhynchos*

Kerr, T. H. (1), Clark, B. A. (2), Popescu, A. G. (1), & Gotanda, K. M. (1)
Brock University, St. Catharines, ON.
Binghamton University, NY, USA.

The use of a sentinel, a designated individual who adopts an elevated, prominent position and maintains constant vigilance, is a complex social anti-predator behaviour. Research on sentinel behaviour largely focuses on how they communicate the presence of threats or predators to foragers. How sentinel positions are delegated, initiated, and terminated is not well understood. American crows were observed over a 4-month period to determine how sentinels notify their group when they are terminating their position. We found sentinel crows appear to notify their group with wing tail flicks, calls, and plumage raising up to 30 seconds before they departed. Furthermore, we found that calls before departure differed in their spectrograms, durations, and syllables when compared to normal flee or mob calls. Our results demonstrate that sentinel crows may use specific behaviours to signal their departure, enhancing our understanding of how social anti-predator behaviour is coordinated.

Relationship of zooplankton community structure with dissolved ions in Saskatchewan lakes

Khan, L., Binning, A., Gray, D.
Wilfrid Laurier University, Waterloo, ON.

Salinity levels in lakes on the Great Plains naturally shift as the region goes through periods of drought and high precipitation. In the coming century, lake salinities are expected to rise as the region experiences prolonged drought. One group of organisms sensitive to changes in salinity are the zooplankton. The objective of my study is to examine differences in zooplankton communities in relation to dissolved ion concentrations. Zooplankton were sampled from eleven lakes surrounding Saskatoon, SK with salinities ranging from 0 ‰ to 20 ‰. Zooplankton were identified to the genus and common measures of community structure were calculated (richness, diversity, evenness). None of the measures of community structure were correlated with concentrations of dissolved ions. However, lakes with higher salinities had fewer cladocerans and more copepods. My results are surprising given the patterns described in previous studies and may reflect the small number of lakes included in my study.

Poster Session B

Should I water my garden?

White, J., Grogan, P.
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Southeastern Ontario summer soil moisture will decrease by 2100. The current relationship between soil moisture and ecosystem productivity is poorly defined so we can't predict how decreased soil moisture will impact productivity. At an old-field meadow in the region researchers have been manipulating soil moisture through water addition and limitation since

2010. They observed reduced growth with limitation but no ample increase with addition. For the 2019-2022 growing seasons I mapped high-resolution temporal soil moisture. In 2022 I calculated field capacity (FC) and measured plant height as a productivity indicator. In each growing season soil moisture started at FC and water addition didn't increase soil moisture until ambient moisture fell below FC. This happened at different times each year. In 2022 it occurred in July and addition did not boost plant height. Soil moisture levels don't always limit productivity but interannual variability suggests that in some years it will.

Investigating mosquito abundance and species richness in the Georgian Bay Islands

Tremblay, M. (1), Chaudhry, F. (1), Du, S. (1,2), Hall, A. (2), Murray, R (1,2), McCauley, S. (1,2), and Fortin, M. (2)

Department of Biology, University of Toronto Mississauga, Mississauga, ON

Department of Ecology & Evolutionary Biology, University of Toronto, Toronto, ON.

Mosquitoes are pests that can be vectors for many tropical diseases but also carry these pathogens to temperate latitudes. With climate change, mosquito species are expanding their ranges further north. Understanding where and how mosquitoes colonize new habitats will be important for predicting future disease outbreaks in temperate regions. To measure mosquito abundance and diversity, we examined 140 samples of aquatic invertebrates collected from the Georgian Bay Islands. From these samples, we identified mosquito larvae and measured abundance and species richness across 28 islands. Our preliminary analyses reveal an uneven distribution of mosquito larvae; most islands had few (less than 10) and only 6 islands had a high abundance of 42-126. We also identified 5 morphotypes and relate our findings of species richness and abundance to water quality, distance from the mainland, and predator presence to understand mosquito distribution across the temperate landscape.

Plant Biology Abstracts

Session 1

Room: TH245

Characterizing legume-secreted flavonoid profiles in response to inoculation with a model nitrogen-fixing symbiont

Peragerasingam, M. (1), Sidhu, H. (2), Slater, G. (2), Batstone, R.T. (1)

1. Department of Biology, McMaster University, Hamilton, ON.

2. School of Earth, Environment, and Society, McMaster University, Hamilton, ON.

Given the ecological importance of symbiosis between legumes and nitrogen (N) fixing bacteria called rhizobia, understanding the mechanisms underlying symbiosis establishment is critical. It remains unclear whether plants plastically respond to rhizobia strains present in the rhizosphere by modulating the identities and/or relative abundance of flavonoids (i.e., flavonoid profiles). Here, I characterize these profiles using GC-MS and tested whether they differed depending on the presence or absence of rhizobia. If flavonoid secretions differ based on the root environment, this suggests hosts may sense rhizobia in the rhizosphere and regulate flavonoid synthesis. This work will lead to insights on flavonoid secretion underlying host-microbe specificity in coevolved species and can be used to increase the N legumes receive from their N-fixing rhizobia partners, providing a more sustainable method of N supplementation in agriculture.

The effects of warming temperature on tomato plant defence pathways in response to diverse bacterial lifestyles

Liu, K., Marchetta, E., Snider, S., Weadge, D., Slawson, R., Yoshioka, K., and Castroverde, C.D.M.

Department of Biology, Wilfrid Laurier University, Waterloo, ON.

Previous studies have examined how temperature affects plant defences against canonical plant pathogens. Less is known about plant interactions with other microbial lifestyles under changing temperatures. Here we inoculated tomatoes with the plant pathogen *Pseudomonas syringae* pv. tomato (Pst), human pathogen *Salmonella*, or beneficial rhizobacteria (*Bacillus velezensis* and *Pseudomonas fluorescens*). Gene expression analyses revealed thermosensitive expression of marker genes for plant defense hormones salicylic acid, jasmonic acid, and abscisic acid, but not ethylene in Pst-infiltrated plants. Thermoregulation of defense genes in *Salmonella*-inoculated tomatoes was influenced by bacterial strain and plant age. In contrast, defense gene expression in *B. velezensis* or *P. fluorescens*-inoculated tomatoes were not induced at different temperatures. This study highlights the importance of considering diverse bacterial lifestyles when studying plant immunity in a changing environment.

Chemical screams: understanding indirect effects of nematode-infected plants on their uninfected neighbours.

Cristante, Z., Koprivnikar, J., Campbell, L.

Department of Chemistry and Biology, Toronto Metropolitan University, Toronto, ON.

Root-knot nematodes (genus *Meloidogyne*) cause billions of dollars in annual crop yield losses worldwide by reducing growth and fruiting. While direct effects of RKN are understood, it is completely unknown whether they can have indirect effects on neighboring uninfected plants. Plants under herbivore attack release various chemicals that can cause trait changes in neighbouring plants to prepare them for defence. Our research explores if RKNs have similar indirect effects, by considering whether infected plants can communicate enemy threats to conspecifics. We hypothesize that RKN-infected bean plants will transmit cues to their neighbours about infection risk, causing trait changes. Our experiment pairs uninfected bean plants with either uninfected or RKN-infected bean plants to determine if they can send trait-altering chemical cues through the soil only, or both soil and air. The study is ongoing but will measure various traits in both RKN-infected and uninfected plants.

Session 2

Room 255

The influence of buildings on invasive common dandelion performance in its northern range limit

Wong, B. Y. S., Kotanen, P. M.

Department of Biology, University of Toronto Mississauga, Mississauga, ON.

The establishment of invasive plant species is rare at high latitudes. One exception, the common dandelion (*Taraxacum officinale*), is established in the subarctic region of the Town of Churchill in Manitoba. Abiotic influence from buildings on *T. officinale* performance have not been previously studied, leaving a gap in our understanding of the species' success. Therefore, it was tested whether shelter provided by buildings may enhance its persistence in the harsh subarctic conditions. A systematic field survey using transects and quadrats was carried out measuring flowering proportion, longest leaf length, and number of leaves per plant to determine *T. officinale* performance around buildings at different exposures and distances. Determining the effect of buildings on *T. officinale* can be the first step in predicting the consequences of human settlement that could threaten native plant populations.

The influence that wetland plant's family, clade, and occurrence in conjunction with presence in stormwater management ponds have on Arbuscular Mycorrhizae structures and colonization

Plant, R., Stevens, K.

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Arbuscular mycorrhizal (AM) fungi colonize both land and aquatic plants by infiltrating their roots, forming a mutualistic relationship. A type of constructed wetland home to aquatic plants are stormwater management ponds (SWMP), which act as biofilters for nearby urban runoff. There is little research regarding AM in these wetlands, how they may benefit the plants present undergoing stress, and their influence on wetland's productivity. Aquatic plants previously confirmed to develop AM relationships were examined to determine the effect that wetland type, and plant species, family, clade, and occurrence have on the fungus. All plants observed

experienced AM colonization, proving that SWMP, although stressful environments, can support AM. AM colonization was highest among monocots, facultative wetland plants, and plants from the *Asteraceae* family. This information can be used to enhance SWMP by including plants that will improve its productivity and health.

Testing Germination Conditions of Common Milkweed (*Asclepias syriaca*) from different locations

Abass, M., Vasseur, L.

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The monarch butterfly (*Danaus plexippus*) is threatened, largely due to the decline of the milkweed species (*Asclepias sp.*). Manual propagation techniques may assist in increasing milkweed populations. However, there is a lack of consistent applicable propagation protocols. The objectives of my thesis were to 1) test the efficacy of different germination protocols including: cold stratification, mechanical scarification, and ascorbic acid 2) observe if maternal environment may lead to different rates of germination and plant morphological characteristics. Results showed that mechanical scarification led to highest germination followed by cold stratification, while chemically treated seeds did not germinate. Results also depended on location of seed origin. Variations were likely the result of the different maternal environments that seeds originated from, which contributed to differences in height, leaf number, and germination rate. Results provide insight on effective propagation pro

Validating and Calibrating Indices of Canopy Gap Age

Shafiquzzaman, S., Rubin, B.

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Canopy gaps are openings in the forest canopy that occur after the death of one or more trees, called gap makers. They are ecologically important areas for tree regeneration, understory vegetation, and wildlife habitat. As canopy gaps age, tree canopies expand inwards, and saplings grow toward the canopy. Therefore, gap maker decay, gap size, and sapling size are potential gap age indices, but their accuracy have never been tested. I sought to validate and calibrate these indices based on field measurements of the indices from 25 gaps and yearly aerial photographs for determining true gap age. There was not a statistically significant correlation between the indices and gap age, indicating that previous studies that used these indices should be interpreted carefully.

Plasticity, protandry, and pollination: the interplay between sex phase transition & flower colour change in an invasive weed.

Lewis, I., Friedman, J.

Queen's University, Kingston, ON.

For animal-pollinated plants, reproductive success depends on pollinator attraction. Cues that indicate flower condition may direct pollinators to flowers with high reproductive potential. In *Saponaria officinalis*, a protandrous weed, transition from male to female phase is associated with a change in flower colour from white to pink. Pollinators prefer white, male-phase flowers, where reproductive success is limited by fertilization success. However, pollinator variability may shift the benefits of investing in either sex function. Plasticity in flower sex and colour changes may allow *S. officinalis* to adjust to such variability. Here, I manipulated pollen removal from flowers to measure responses in flower colour change and sex phase transition. As predicted, I found that flowers with no pollen removed delayed colour and sex phase transition,

whereas those with all pollen removed accelerated it. These findings give insight into plant-pollinator interactions in dynamic environments.

Frost tolerance in *Carex lasiocarpa* and *Dulichium arundinaceum*

Loane, E.A., Ryser, P.

Laurentian University, Sudbury, ON.

In climates with cold winters, tolerance to frosts can extend the growing season. Development of frost tolerance in autumn has rarely been studied in herbaceous wetland plants. I studied cold-weather acclimation in Northern Ontario wetlands, using two native sedge species, *Carex lasiocarpa* and *Dulichium arundinaceum*, adapting and applying an injury quantification system previously used in an agricultural context. In September and October, we tested for leaf and root tolerance to sub-zero temperatures by measuring the electrical conductivity of cytosol leachate to determine the extent of injury due to frost. The studied plants presented clear decreases in index of injury over the course of the fall season. Both species were more tolerant to the -10°C treatment than the -20°C, and *C. lasiocarpa* was hardier overall. These results contribute data for predictive modeling to improve wetland conservation efforts.

Session 3

Room 246

Characterizing the membrane remodeling Glycerophosphodiester Phosphodiesterase (GDPD) family in *Eutrema salsugineum*

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Department of Biology, McMaster University, Hamilton, ON.

Under inorganic phosphate (Pi) deficits, plants can replace phospholipids in membranes with galactolipids and repurpose released Pi. A Yukon ecotype of *Eutrema salsugineum*, an extremophile crucifer, displays an exceptional capacity to withstand low Pi conditions relative to an ecotype found in Shandong, China. To assess membrane-remodeling capacities for this species, we focused on glycerophosphodiester phosphodiesterase domain containing (GDPD) proteins in a pathway that produces Pi and glycerol. GDPD proteins were aligned with Clustal Omega and RAxML generated a phylogenetic tree. The *E. salsugineum* genome encodes 6 GDPD and 5 GPDL-Like (GPDL) genes. Compared to its close relative, *Arabidopsis*, the *E. salsugineum* genome lacks three GPDL genes (1, 2 and 6), has two GPDL3 genes and encodes two GDPD4 isoforms. GDPD1 expression is only responsive to low-Pi in Shandong plants, suggesting elevated GDPD expression is not sufficient for low Pi tolerance in this species.

Soybean response to copper and microplastic in soil

Javier, L.J., Macfie, S.M.

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Microplastics, such as those produced from polyethylene terephthalate (PET), are pervasive environmental pollutants. They are products of plastic degradation and indirectly affect plant growth by affecting physicochemical properties of soil, including the availability of copper to plants. To determine the effect of microplastics on copper bioavailability, soybeans (*Glycine max*) were grown in topsoil that was spiked with 250 mg/kg copper and/or 10 g/kg PET microplastics. Neither photochemical efficiency nor plant dry biomass were affected by copper and/or PET treatment, indicating that neither contaminant caused toxicity to soybean. The

bioavailable copper in soil and the total copper in roots and leaves will be measured using inductively coupled plasma mass spectrometry (ICPMS) to assess the effect of PET on copper uptake. The results will help clarify the interactive effect of copper and PET microplastics and help predict future consequences of continued soil pollution on plants.

Fatal Fungicides: Examining the effects of applied copper on hydroponically grown *Brassica napus*

Clarizio, G., Macfie, S.

University of Western Ontario, London, ON.

Copper is a nutrient essential for plant growth and functioning, but it can be harmful at high doses as it leads to the production of reactive oxygen species (ROS). This stress is mitigated by cysteine-rich metallothionein (MT) proteins that bind and detoxify metal cations. To explore the relationship between MT abundance and ROS levels in canola (*Brassica napus*), they were grown hydroponically and treated with 10 or 20 μ M copper. Dry plant biomass and photochemical efficiency were affected by each treatment which indicates copper toxicity to canola. A thiobarbituric acid reactive substance (TBARS) assay and reverse-transcriptase quantitative polymerase chain reaction will be used to explore ROS levels and MT transcript abundance across each copper concentration, respectively. These results will help clarify the relationship between ROS and MT abundance, and lead to further research on the acclimation mechanisms of globally important crops.

Optimizing the Expression of TOC Complex Proteins

Hume, J., Smith, M.

Department of Biology, Wilfrid Laurier University, Waterloo, ON.

Chloroplast pre-protein import relies on the translocon at the outer membrane of chloroplasts complex, which consists mainly of the TOC159 and TOC 33 GTPase receptors, and the TOC75 translocation channel. The acidic domains of TOC159 receptors are thought to drive preferential interactions between specific TOC protein domains when forming distinct complexes, however the general interactions between complex components are largely unknown. Here we have successfully optimized the expression in *Escherichia coli* and purification using a combination of affinity tags for each of the TOC protein components involved in complex formation. Future studies will use these components to uncover the specific domain interactions between receptors that lead to the assembly of functionally distinct complexes. Characterizing these interactions is essential to our understanding of how plant cells use these complexes to import different subsets of plastid pre-proteins when differentiating plastid types.

Session 4

The Changes in Gene Expression Induced by Nickel Toxicity

Mutambara, PK., Nkongolo, K

Laurentian University, Sudbury, ON.

This study aimed to investigate the impact of short and long-term exposure to nickel contamination on the expression of four genes (AT2G16800, GR, ZAT11, and IREG1) in white birch plants grown in a controlled growth chamber. The objective was to determine if time influenced gene expression when exposed to nickel. The plants were treated with nickel and monitored for changes in gene expression on day 1, 3, and 5, with RT-qPCR utilized to measure the gene expression levels. The findings suggest that nickel levels commonly found in metal-contaminated soils in mining areas have some significant impact on plant genetic response.

This study highlights white birch plants' resistance to nickel contamination and sheds light on the genetic mechanisms underlying plant adaptation to environmental stressors. Overall, the study advances our understanding of the effects of nickel contamination on plant gene expression and may aid in the development of metal-contaminated soil management strategies.

Root growth in the wetland sedge, *Carex lasiocarpa*, in the late growing season

Misic, K.P., Ryser P.

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Recent data indicates that root growth may occur late in the growing season. In this project, late-season root production of the wetland sedge, *Carex lasiocarpa*, was studied in northern Ontario. Plants were harvested in 2-3 week intervals in the late growing season for the purpose of determining the rate and time frame of adventitious and lateral root growth. This is of importance for nutrient uptake in the following spring. Both length and dry mass of the roots significantly increased during the measuring period from August to November. Root growth was highest in October. Data shows that *Carex lasiocarpa* root production continues even after the production of new shoots has stopped. This was the case for both adventitious and lateral roots. We cannot rely on above-ground data only to evaluate carbon sequestration in wetlands due to climate change; we also need below-ground data.

Within-branch order of leaf senescence in four North American tree species

McCaffrey, S., Ryser, P.

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Leaf senescence is a widely observed phenomenon, colouring of North American deciduous trees in the fall being an especially attractive case. Both extrinsic and intrinsic factors shape this process of nutrient remobilization. The question remains, in which order do leaves with a given branch senesce? Using four Northern Ontario tree species – *Acer rubrum*, *Populus tremuloides*, *Betula papyrifera*, and *Prunus pensylvanica* – this process was observed. Colouration changes and abscission were noted weekly in September and October. It was predicted that either the leaves on the tip of the branch or at the base of the branches would fall off first, Pearson regressions and paired t-tests showed that all species except *A. rubrum* had a consistent and significant order of senescence, distal leaves being the last to senesce. This being especially pronounced for early-successional trees implicates that the order of senescence may be related to the species' ecological strategy.

Senescence Affected by Nutrient Availability in Monocot Wetland Species

Muller, M., Ryser, P.

Laurentian University, Sudbury, ON.

Mineral nutrients namely nitrogen and phosphorus are often growth limiting in wetlands. Remobilization of such nutrients during autumnal senescence is important for a plant's nutrient balance. The research goal was to understand if nutrient availability affects timing of senescence, and consequently, late-season plant productivity. I hypothesize that higher nutrient availability will delay senescence. My experiment used species of wetland monocotyledons, common in the Sudbury region, using nutrient additions in spring and fall. Six species were investigated: *Sagittaria latifolia*, *Sparganium emersum*, *Dulichium arundinaceum*, *Carex lasiocarpa*, *Scirpus cyperinus*, and *Alisma triviale*. Senescence was recorded on a 1-5 greenness scale. Statistical analysis using ANOVA

indicated no significance in the spring addition, rejecting the hypothesis ($p=0.399$).
Nutrient addition in autumn had significant effects, supporting the hypothesis ($p<0.001$).
Overall, fall nutrient addition delays senescence.



Physiology Abstracts

Session 1

Room 246

Exercise recovery in native high and low altitude deer mice: the role of liver metabolites

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Exercise is crucial for an animal's survival, allowing them to escape predators, forage, and compete for resources. During exercise, the muscles rapidly consume glucose, and the liver mobilizes glucose to fuel this accelerated metabolic demand. Exercise recovery is equally important but has been studied much less. We used the North American deer mouse, found at both low and high altitude (LA; ~450m, HA; ~4350m) with HA populations exhibiting numerous adaptations for survival in their cold, low-oxygen environment. We investigated liver metabolites in fasted hypoxia-acclimated HA and LA deer mice throughout recovery from submaximal exercise. We hypothesized that HA mice would deplete liver glycogen stores at a greater rate during exercise and recovery and that both groups would demonstrate glycogen repletion despite being fasted. This research progresses our understanding of exercise recovery, providing insight into vital mechanisms used for the survival of these small mammals.

Regulation of skeletal muscle carnitine palmitoyl-transferase I in high and low altitude deer mice (*Peromyscus maniculatus*)

Steele, D., Baragar, C., McClelland, G.

McMaster University, Hamilton, ON.

Deer mice living at high altitude (HA) experience decreased oxygen availability and increased thermogenic demand compared to their low altitude (LA) counterparts. Despite this, HA deer mice are still able to oxidize lipids at a greater rate; currently, the mechanism by which this occurs is unknown. I hypothesized that HA deer mice are able to maintain higher rates of lipid oxidation due to increased activity of CPTI, a key mitochondrial enzyme involved in lipid oxidation. To test this hypothesis, I examined various aspects of CPTI, including maximal activity, activity in the presence of an allosteric inhibitor, and affinity for carnitine. This study was conducted on HA and LA deer mice acclimated to three unique environments to search for any potential population or acclimation effects. With this research, we will further our understanding of the mechanisms by which high altitude is able to alter mammalian physiology.

Flight Muscle Fiber Type Composition in Various Songbird Species

Chang, R.M., Ivy, C.M., Guglielmo, C.G.

University of Western Ontario, London, ON.

The pectoralis major is the muscle required for migratory flight in songbirds. Modifications in muscle fiber composition between seasons may be linked to the migration distance of songbird species to be optimized for the functional demands during powered flight. Songbird pectoralis muscles have been previously believed to be exclusively composed of fast oxidative glycolytic (FOG) fibers; although recently, smaller birds under 20 g were observed to have both FOG and fast glycolytic (FG) fibres. This project will investigate the effect of season, migratory distance, and songbird family on pectoralis muscle fiber composition. Using myosin-ATPase staining combined with light microscopy, I identified FOG and FG fiber types to calculate fiber densities. These findings provide some of the first information on how the flight muscle fiber types change seasonally in North American songbirds and between songbird families.

Consumption of an invasive high-thiaminase prey fish may be causing thiamine deficiency and morphological changes in the hearts of lake trout (*Salvelinus namaycush*) in the Sudbury Basin

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In the Sudbury Basin, non-native rainbow smelt (*Osmerus mordax*) have invaded many lakes with native lake trout (*Salvelinus namaycush*). Rainbow smelt contain high levels of thiaminase, an enzyme whose ingestion has been shown to cause thiamine deficiency and morphological changes in the hearts (i.e., larger ventricles) of laboratory-reared lake trout. These changes were associated with decreases in swim performance and thermal tolerance. My study assessed the effects of rainbow smelt ingestion on the heart morphology of wild lake trout by measuring ventricular mass and roundness, as these metrics influence the ability of lake trout to cope with thermal and metabolic stress. I found that lake trout exposed to rainbow smelt had a greater ventricular mass and lower roundness than those in lakes without rainbow smelt, indicating that rainbow smelt ingestion may negatively impact the fitness and thermal tolerance of this socioeconomically important species.

Session 4

Assessing the Safety and Tolerability of a Multi-Target Dietary Supplement (MTDS) in an Aging Population: A Clinical Trial

Levert, K.J. (1), Lemon, J.A. (2), Boreham, D.R. (2), Rollo, C.D. (1, 3)

1. Laurentian University, Sudbury, ON.
2. NOSM University
3. McMaster University, Hamilton, ON.

A Multi-Target Dietary Supplement (MTDS) was designed to simultaneously target and support interdependent cellular processes associated in the progression of age-associated deterioration. These key mechanisms include oxidative stress, inflammatory processes, insulin resistance, and membrane and mitochondrial deterioration. In more than 20 years of pre-clinical research, the supplement has proven significant beneficial effects in animal models of age-associated disease. This first-in-human clinical trial aims to determine if the MTDS is safe and tolerable for healthy older adults. Participants took one of three different doses of the MTDS for 90 consecutive days while completing blood work, wellness surveys and a daily log. Results

indicate that MTDS is safe in humans at all tested doses, with several participants reporting increased energy levels and mental acuity. Future clinical trials will assess efficacy in ameliorating age-associated disorders and neurodegenerative disease.

Multiple exercise bouts increase GLUT4 expression in cardiac tissue following doxorubicin treatment

Thompson, T.* (1), McCue, M. (1), & MacLean, D. (2)

1. Laurentian University, Sudbury, ON
2. NOSM University

Doxorubicin (DOX) is a cardiotoxic chemotherapeutic agent used in cancer treatment that impacts energy utilization and metabolism. The literature is divided on whether DOX disrupts glucose transporters (GLUTs). Exercise is linked to better outcomes in DOX-treated patients and is known to upregulate GLUTs in cardiac tissue. This study explores the effect of DOX on GLUT1, GLUT4 and GLUT8 abundance at a transcriptional level using qPCR. We also investigate exercise to mitigate DOX-induced changes to GLUT expression in cardiac tissue. Rats treated with DOX were randomly divided into 6 experimental groups (n = 6 per group) and swam for one hour once, twice or not at all, over 48 hours. GLUT abundance did not change after the DOX administration. GLUT4 increased by 142% following two exercise bouts ($p < 0.05$). The acute effect of exercise may have implications in incorporating exercise into cancer treatment regimens without delaying chemotherapy.

Optimization of a dye-based feeding assay to quantify changes in food intake using *Drosophila melanogaster*

Taylor, C., Merritt, T.J.S.

Laurentian University, Sudbury, ON

Metal contamination is a concern for our health, but our understanding of the biology of metal contamination is limited. *Drosophila melanogaster*, the common fruit fly, is a powerful model for understanding the biology of metal contamination due to conserved metal regulation pathways. Metal contamination can be studied using flies by feeding them contaminated food. However, the flies may avoid toxic food, complicating the interpretation of the results. The research goal was to optimize a dye-based feeding assay protocol to quantify changes in feeding due to Nickel, using *D. melanogaster* as a model. To explore the biology of the system, my protocol accounted for the biological sex of the organism, genetic diversity, and regular feeding behavior. The results suggest that biological sexes feed at different rates therefore, separate assays have to be optimized for each. Future research will explore the effects Nickel and other stressors have on food intake.

The ventilatory responses to hypoxia in migratory and non-migratory sparrows

Mohns, M., Ivy, C., Guglielmo, C.

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Recent research has shown that songbirds that reside at low altitude will ascend to ~6,000m above sea level during migratory flight. Since migratory flight is aerobically demanding, whether migratory birds exhibit plasticity in breathing to maintain oxygen uptake in low oxygen environments is unknown. This study investigated whether the hypoxic ventilatory response of sparrows was altered between resident and migratory species and seasonally (during migration versus winter) within a species. Breathing responses were tested using a stepwise reduction in inspired O₂ tension (PO₂), 21, 16, 12, 9, 7, and 5 kPa in fall migration and winter conditions.

Similar ventilatory responses to hypoxia were observed between resident and migratory species, although resident sparrows did not increase breathing as much in severe hypoxia. All species became more sensitive to hypoxia during the winter (increased breathing frequency and total ventilation), with reduced pulmonary oxygen extraction. These findings support hypoxia tolerance changing seasonally.

Poster Session A

The Effect of Temperature on the Cardiovascular Development of Yellow Perch (*Perca flavescens*)

Easwaramoorthy, M., Thompson, W.A., Wilson, J.Y.
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Global water temperatures are anticipated to rise due to anthropogenic activity, affecting aquatic species' ability to regulate body temperature. The yellow perch (*Perca flavescens*) is economically and culturally important to Ontario. However, it is unclear how altered rearing temperatures will affect cardiovascular development in this species. This study hypothesizes that increased temperature during embryonic development will promote extensive blood vasculature in the yellow perch. To test this, we collected fish samples at early-life stages while rearing at varying temperatures. Heart rate was recorded to track cardiac development and wholemount alkaline phosphatase staining allowed for visualization of vasculature. Additionally, quantitative PCR identified differences in the expression of genes critical for heart, vasculature, and muscle development. These results demonstrate the impacts of elevated temperature on cardiovascular development in a species facing population decline.

The phenotypic plasticity of non-shivering thermogenesis and brown adipose tissue to photoperiod and temperature in low-altitude deer mice

Chau, V.W., Wong, E.W., McClelland, G.B.
Department of Biology, McMaster University, Hamilton, ON.

Organisms must anticipate seasonal changes in environmental conditions to best survive in their natural habitat. Physiological changes resulting from acclimatization can occur in response to seasonal changes in photoperiod and ambient temperatures. It has been observed that thermogenic capacity increases through physiological changes in brown adipose tissue (BAT) to elevate non-shivering thermogenesis (NST) when exposed to fall conditions. This study focuses on determining the alterations in NST and BAT in lowland deer mice (*Peromyscus maniculatus*) in response to a decrease in photoperiod and temperature. Lowland deer mice were subjected to a gradual decrease in photoperiod from 12 hours to 8 hours of light and temperature from 23°C to 5°C. I hypothesized that photoperiod and temperature significantly influence the capacity of NST in *P. maniculatus*. I predicted that an increase in BAT mass, mitochondrial density, and uncoupling protein 1 (UCP1) expression would be observed.

Poster Session B

The Effects of Increased Embryonic Incubation Temperature on the Development of the Thyroid in Yellow Perch (*Perca flavescens*)

Sen, A. S., Thompson, W. A. and Wilson, J. Y.
Department of Biology, McMaster University, Hamilton, ON.

Global warming and anthropogenic activity have led to increasing aquatic temperatures. This is a threat to many fish species, especially during their vulnerable early developmental stages,

impacting growth and development. The yellow perch (*Perca flavescens*), a commercially important native fish species, has experienced population declines. Our previous work in this species has demonstrated that altered rearing temperatures can lead to substantial changes in morphology, but the mechanisms behind this were unclear. This study tests the hypothesis that high rearing temperatures disrupt the development of the thyroid gland, a key hormonal regulator during development. We tested and validated a whole-mount intrafollicular staining technique, to localize the thyroid. qPCR will be used to measure the expression of genes involved in thyroid hormone production. This will improve our understanding on how temperature influences the development of this critical endocrine system in yellow perch.

Examining the Association Between TNF- α Levels and Physical Activity in Children with Inflammatory Bowel Disease

Kandappa, S., Morin, S., Byra, M., Issenman, R., Zachos, M., Sherlock, M., Pai, N., Brackenridge, E., Timmons, B.W., Obeid, J.
Department of Pediatrics, McMaster University, Hamilton, ON.

Introduction: Inflammatory Bowel Disease (IBD) is a chronic inflammatory disease with no known cure. Elevated Tumor Necrosis Factor-alpha (TNF- α) levels in IBD drive chronic inflammation. Physical activity may regulate TNF- α levels, but this has not been examined in IBD. The aim of this study is to assess the relationship between physical activity and TNF- α in children with IBD. Methods: Youth (7-17 years) with IBD wore an ActiGraph accelerometer for 7 days to monitor habitual physical activity. TNF- α concentrations were measured from fasted blood samples, using high-sensitivity enzyme-linked immunosorbent assays. Multiple regression analyses were performed to determine the relationship between physical activity intensity and TNF- α . Results: Analyses are in progress and will be presented at the Ontario Biology Day Conference. Implications: Examining the link between physical activity and TNF- α levels can guide the development of future evidence-based physical activity interventions to

TFM exposure leads to Increased Oxygen Consumption in Larval Sea Lamprey

D Souza, L., Flávio, H., Wilkie, M.
Wilfrid Laurier University, Waterloo, ON.

Sea Lamprey (*Petromyzon marinus*) are an invasive species in the Laurentian Great Lakes, where their parasitism of native fishes drastically reduced their numbers in the early-mid 1900s. To control sea lamprey populations, the lampricide 3-trifluoromethyl-4-nitrophenol (TFM) is added to streams infested with larval sea lamprey. TFM is a chemical pesticide that decreases ATP production by disrupting oxidative phosphorylation in the mitochondria. However, there is still much to learn about how TFM affects energy metabolism in sea lamprey and other fishes. To learn more about this, intermittent flow respirometry was used to measure oxygen consumption ($\dot{M}O_2$) in larval sea lamprey during TFM exposure. Increasing concentrations of TFM led to stepwise increases in $\dot{M}O_2$, resulting in death when $\dot{M}O_2$ reached levels equivalent to their known maximum metabolic rates. These $\dot{M}O_2$ responses to TFM could reveal the sensitivity of other aquatic animals to TFM and reduce the need for lethal experimentation.

Microbiology Abstracts

Session 1

Room: TH245

Novel lycopene-based in vivo biosensor for γ -hydroxybutyric acid detection in *Saccharomyces cerevisiae*.

Breckenridge, S., Tanner, N., Xiao, M., Chan, A., Chen, J., Heathcoate, A., Kaneshan, A., Ruml, A., Pyne, M.

Department of Biology, University of Western Ontario, London, ON.

γ -Hydroxybutyric acid (GHB) is a central nervous system depressant used in drug-facilitated sexual assault cases. Commercial GHB detection methods are beverage-sensitive and unreliable, thus highlighting the need for an effective and portable solution. Here, we design a whole-cell yeast biosensor to detect GHB and its precursor, γ -butyrolactone (GBL). Our biosensor encodes BlcR, which is inactive in the presence of GHB and GBL and controls the expression of downstream carotenoid genes for lycopene biosynthesis. This produces a visual red phenotype. We optimize the sensitivity of the repressor system through four constructs containing different copy numbers of the BlcR operator sequence (blcO). We confirmed the correct assembly of our construct through DNA sequencing and restriction enzyme digests. We anticipate that our biosensor will report the presence of endogenous GHB and exogenous GBL in yeast through the red pigment formed by lycopene production.

Session 2

Room: TH246

Isolation and characterization of microbes from Canadian soil and lake samples capable of naphthalene biodegradation

Seneviratne, S., Batra, H., Paschos, A.

Mohawk College of Applied Arts and Technology

Selectively isolating and using microorganisms that biodegrade harmful contaminants can remedy man-made chemical pollution spills. We established screening assays and enriched in progressive enrichment cultures with naphthalene as sole carbon source potent autochthonous naphthalene utilizing bacteria. After DNA sequencing we identified the microorganism up to the genus level. Our collection of naphthalene-degrading bacteria is a valuable resource for future catabolic examination studies and identification of functional genes associated with the naphthalene degradation pathways. In parallel, we explore the application and utility of our

isolates in moving bed biofilm reactor technology by characterizing their naphthalene degradation and biofilm forming capability.

Room: TH245

Investigating *Salmonella* biofilms under stress and exploring the synergistic relationship between bacterial enzymes and antibiotics in biofilm treatment

Turner, AAB, Weadge, JT, Slawson, RM
Wilfrid Laurier University, Waterloo, ON.

Salmonella is a major foodborne pathogen causing salmonellosis, resulting in healthcare and economic burdens. In agriculture, it infects livestock, crops, and soil. The pathogen forms biofilms enabling adherence, persistence and adaptation to stress. Biofilms are made of two critical components: curli fimbriae and cellulose. Curli provides adherence, cellulose contributing to the structure. This study aims to understand the adaptability and composition of environmentally isolated *Salmonella* strains in response to stress. We are investigating the synergistic relationship between enzymes and antibiotics in biofilm eradication and inhibition. An effective biofilm eradication therapy could revolutionize agricultural practices in preventing potential outbreaks and have applications in preventing healthcare-associated infections. The study found that these isolates can upregulate biofilm production in response to environmental stressors, as well as in the presence of antimicrobial compounds

Elucidating the structure of the CesT-EspJ complex and its implications in type III secretion system effector hierarchy.

Mahendradeva, S., Birstonas, S., Pandya, M., Little, D.J.
Toronto Metropolitan University, Toronto, ON.

Enterohemorrhagic *Escherichia coli* (EHEC) and enteropathogenic *E. coli* (EPEC) require the action of a type III secretion system (T3SS) during infection. The T3SS is a needle-like protein injectisome delivering effector proteins into host cells that manipulate various host signalling pathways to promote infection. The T3SS chaperone CesT mediates the release of many T3SS effectors into the host cell, yet the underlying hierarchical mechanism behind this remains unclear. In this study, we investigated the functional and structural basis of CesT binding to EspJ, one of the T3SS effectors released by CesT. By utilizing affinity-pulldown chromatography and crystallographic methods, we delineated the minimum CesT binding region on EspJ to residues 19-82 and determined a partial CesT-EspJ crystal structure to ~3 Å. Our findings shed new light on the regulation of EspJ secretion by CesT, which may pave the way for developing antimicrobial drugs to treat T3SS-dependent EPEC/EHEC infections.

The effects of climate and geographic barriers on *Aspergillus fumigatus* isolates and population structure from British Columbia, Canada.

Trajkovski, M.
McMaster University, Hamilton, ON.

Aspergillus fumigatus is a ubiquitous fungus, known to cause a series of infections called aspergillosis. Although triazole antifungal drugs are available, the emergence of azole resistant strains can render them useless. Despite its medical relevance, little research has been done on the effects of climate on *A. fumigatus*. This study aims to gather information about *A. fumigatus* strains in Canada and how external conditions affect them. Samples from British Columbia were

utilized due to its biogeoclimatic zones and history for creating optimal conditions for fungal pathogens. *A. fumigatus* strains were isolated from soil and their genotypic profiles, thermoprofiles, mating types and azole resistance were determined. It was hypothesized that isolates from different localized climates would be unique from each other. This study will provide an understanding of how climate affects *A. fumigatus* and could be connected to pathogenicity and the effects of climate change on fungal pathogens.

The effects of sub-natural background radiation exposure on yeast *Saccharomyces cerevisiae*

Couture, L.E., Lapointe, M.R., Thome, C.P.

Laurentian University, Sudbury, ON; NOSM University, Sudbury, ON.

Natural background ionizing radiation is ubiquitous. Nevertheless, much is yet to be understood regarding its role on normal cellular function. An increasing number of researchers are investigating this topic, including the REPAIR project at SNOLAB, a deep underground facility shielded from cosmic radiation. The aim of this project was to determine the effects of ultra-low background radiation on desiccated yeast (*Saccharomyces cerevisiae*). Samples were stored in SNOLAB and in our surface control laboratory. To further reduce background radiation, yeast were cultured in specialized media with reduced levels of radioactive K-40. Dosimetric calculations confirmed that our experimental dose rate was 0.14% of normal background. After various incubation periods (every 4 weeks), yeast were analyzed for growth, survival, metabolism, and mitochondrial degradation. Initial findings revealed that survival was reduced and mitochondrial degradation was increased in the sub-background environment.

Deletion of FFH gene in *Escherichia coli* and its impacts on protein production and secretion

Hilal, G. J.

Laurentian University, Sudbury, ON.

Escherichia coli (*E. coli*) are bacteria that may be found in foods, untreated water, the environment, as well as the intestines of both animals and humans. This study was conducted to see how the deletion of Forty-Fifth Homologue (FFH) gene in *E. coli* affects protein production, and the methods that were used for this were culturing, Tricine-SDS-PAGE Gel Electrophoresis, Bradford Protein Assay (Sigma), and Mass Spectrometry. We found that YtfQ and TolA proteins were missing from the FFH knockout strain in comparison to the parent strain. Protein YtfQ is a periplasmic protein that is outer membrane bound and is galactofuranose binding. Protein TolA is a part of a system called Tol-Pal, which aides in the invagination of the outer membrane of the cell when it comes to cell division, meaning it is vital for cell membrane integrity.

Identifying SecB-dependent periplasmic proteins in *Escherichia coli*

Pham, K., Saleh, M.

Laurentian University, Sudbury, ON.

Bacterial cells have evolved by using protein chaperones to maintain protein functionality by preventing deleterious effects of protein misfolding and aggregation, which can otherwise lead to cell death and other misfolding diseases. In my study, we knocked out the gene for the chaperone, SecB, in *E. coli* to determine which periplasmic proteins may be affected. The SecB chaperone transports secretory and periplasmic proteins by preventing protein aggregation, thus allowing post-translational translocation across the cytosolic membrane. Periplasmic

proteins of the knockout mutant were fractionated using SDS-PAGE and compared to those of the parent strain, BL21(DE3). Differentially expressed proteins were digested with trypsin, and identified as PliG, CreA, TolA, and MdoG using PMF from MALDI-TOF MS data. The discovery of SecB-dependent periplasmic proteins may be utilized in understanding SecB-like chaperones in other systems and developing treatments against MDR Gram-negative bacteria.

Poster Session A

How macrophages control the growth of *Aspergillus fumigatus* hyphae: the role of reactive oxygen species

Khaitin, A., Moussaoui, S., Terebiznik, M.

Department of Cell and Systems Biology, University of Toronto Scarborough, University of Toronto, Toronto, ON.

Aspergillus fumigatus is an opportunistic fungal pathogen which causes aspergillosis in immunocompromised individuals when growth of inhaled conidia is not prevented by the immune system and hyphae overgrow in the lungs. Phagocyte interaction with *A. fumigatus* conidia is well-studied, but little is known about how phagocytes such as lung-resident macrophages affect growing hyphae. Macrophages readily internalize conidia but can only form open phagocytic compartments, which cannot retain hydrolases or acidify, when interacting with hyphae. Phagocytic reactive oxygen species (ROS) production is thus implicated in the control of growing hyphae. By utilizing nitroblue tetrazolium as a ROS detector, we confirmed that ROS are produced by murine macrophages interacting with *A. fumigatus* hyphae. Through live-cell microscopy, we also confirmed that interaction with these macrophages slows the growth of hyphal germlings. These results model macrophage control of filamentous fungal pathogens.

Enzymatic analysis comparing BcsZ, an endo- β -1,4-glucanase from *Pseudomonas fluorescens* and Bacteriophage-derived cellulase as biofilm control agents

Peralta, A., Weadge JT.

Wilfrid Laurier University, Waterloo, ON.

Biofilms are communities of surface-associated microbial cells held together by self-produced extracellular polymeric substances. Bacterial cellulose (BC) serves a structural role by providing a scaffold that supports and protects biofilm growth, allowing for increased resilience to antimicrobials; thereby making BC synthesis a subject of research interest. BC synthesis is accomplished by the widely conserved bacterial cellulose synthase (Bcs) operon. However, the BcsZ enzyme has yet to be sufficiently characterized in *Pseudomonas fluorescens* (annotated as PfBcsZ). Here we show that PfBcsZ has endocellulase activity with a pH optimum of 4. Our results are in accordance with the literature that have shown BcsZ to possess endo- β -1,4-glucanase activity, which is characteristic of glycoside hydrolase family 8. Our results will be a starting point to demonstrate the degradation efficiency of PfBcsZ and its impact as a regulator of cellulose biosynthesis.

Development of a Genetic Toolbox for *Haemophilus Influenzae*

Shedeed, A., Hamadache, S., Karas, B.

Western University, London, ON.

Haemophilus influenzae, a gram-negative bacterium with a small genome and efficient homologous recombination abilities, has great potential for use as a model system for synthetic biology applications. We have previously shown *H. influenzae*'s promise for whole genome

transfer and becoming a model for the development of synthetic organelles by transiently transferring the bacterium to *Saccharomyces cerevisiae*. However, in order to fully utilize its capabilities, reliable genetic tools must be developed. In this study, we report the development of two novel transformation methods for *H. influenzae*, as well as the construction of plasmids that streamline the process of engineering *H. influenzae* in any lab. Additionally, we are currently working on an *H. influenzae*-specific genome editing system to further expand the genetic toolbox for engineering this microbe. With these advancements, *H. influenzae* has the potential to become a powerful tool for synthetic biology research.

Hypergravity Signaling Effects in the Freshwater Eutradigrade Species *Graveenius annulatus*

Whalen, C., Stone, J.R.

Department of Biology, McMaster University, Hamilton, ON.

Tardigrades are model organisms for biological mechanisms of extreme tolerance. Tardigrades are known to survive under hypergravity. Though considerable research on tardigrades' tolerance to direct exposure to stressors exists, little is known about their tolerance to bystander effects. Bystander effects occur when cells or organisms not exposed to stressors are negatively affected by nearby cells or organisms that were exposed. Only one study has investigated radiation bystander effects in tardigrades. I will investigate whether hypergravity bystander effects exist in tardigrades, and how they may influence survival in the species *Hypsibius exemplaris*. I will expose bystander tardigrades to tardigrades that had previously been exposed to hypergravity. If hypergravity bystander effects exist, then I should observe decreased survivorship in bystander tardigrades. Such a finding would support the existence of hypergravity bystander effects in tardigrades. Data collection in progress.

Using phenotypic growth characteristics to determine loci contributions in growth of *A. fumigatus* at varying temperatures and under oxidative and nitrosative stress

Andre, E., Korfanty, G, Xu, J. P.

Xu Lab, McMaster University, Hamilton, ON.

Aspergillus fumigatus is an opportunistic fungal pathogen that invades the body through inhalation and germination in the alveoli. When inhaled by an immunocompromised individual, *A. fumigatus* can cause sporulate. infection or life-threatening disease generally termed Aspergillosis. This elicits the proposed research question if there is a correlation between growth phenotypes among different stressor conditions, and how parental phenotypes influence progeny. It is expected that strains that elicit high growth phenotypes in one stress condition, will have similar growth patterns in the other conditions. This experiment was done by growing 98 strains of *A. fumigatus*, including parental strains, in liquid media at different temperatures, and separately in liquid media with the presence of H₂O₂ and NaNO₂ representing oxidative and nitrosative stress, respectively. Optical density (OD) measurements were taken every 24 hours, for 72 hours, which is proportional to amount of growth.

Poster Session B

Filamentation of K12 *E. coli* With different overexpressed orthologs of QueE

Atakgayeva, G. (1), Porco, N. (1,2), Little, D. (1,2) Botelho, R. (1,2), McPhee, J. B. (1,2).

1. Department of Chemistry and Biology, Toronto Metropolitan University, Toronto, ON.
2. Graduate Program in Molecular, Toronto Metropolitan University, Toronto, ON.

In order to cause infection, bacteria such as uropathogenic *Escherichia coli* (UPEC) protect themselves from the antimicrobial peptides (AMP) produced by host cells. One such mechanism involves the PhoPQ signaling system, which enhances resistance to AMP by regulating genes that alter the charge of the cell surface and reduce interaction with these molecules. Activation of the PhoPQ leads to overexpression of QueE, that when overexpressed, localizes to the divisome of UPEC and blocks septation resulting in filamentation of the bacterial cell.

Filamentation has been observed during infection by a number of bacterial species including *E. coli*, *S. enterica* and *K. pneumoniae*. Here, we sought to determine whether overexpression of other QueE orthologs from other enteric pathogens would cause filamentation in K12 *Escherichia coli*. Through live cell imaging and analysis, we observed that differences in filamentation occurred in these orthologs.

Isolation and Characterization of *Pseudomonas aeruginosa* from the Rhizosphere and Rhizoplane of Food Crops

Lamba-Rautapuro, N.H.M., Slawson, R.M.

Wilfrid Laurier University, Waterloo, ON.

Pseudomonas aeruginosa is a gram-negative, pathogenic bacterium able to cause infections in both healthy and immunocompromised individuals. Armed with a variety of survival and resistance mechanisms, *P. aeruginosa* can persist in a broad range of external environments, such as soil, water, and plants. However, the stress tolerance profile of environmentally-isolated *P. aeruginosa* is less well known. In this study, *P. aeruginosa* was isolated from the rhizosphere and rhizoplane of leafy green crops. Isolates were subjected to several stressors, such as temperature, nutrient availability, antibiotics, and heavy metals. Our results demonstrate that these strains are multi-drug resistant, survive at both high and low temperatures, grow under low nutrient conditions, resist copper and zinc, but are susceptible to silver. We anticipate that this tolerance to environmental stressors will enhance persistence of this organism and potentially impact the occurrence of illness and infection.

Exploring and exploiting Ontario's environmental genetic and chemical resources

Batra, H., Seneviratne, S., Paschos, A.

Mohawk College of Applied Arts and Technology

Having the remarkable metabolic diversity of microorganisms in mind we are exploring new microbial sources of natural products derived from the local freshwater and soil environments and apply biotechnology principles to learn how to extract and utilize them. By culturing aquatic microorganisms and bacteria isolated from fish ponds we developed methods and techniques to extract substances like omega-3-fatty acids and collect biogenic hydrogen respectively, both of which are crucial industrial and pharmaceutical feedstock. By screening autochthonous freshwater actinobacteria we explore the opportunities for the discovery of new chemical entities and drug candidates. Moreover, we explore the cultivability of the isolated actinobacteria in bioreactors. Finally, we explore procedures to evaluate local soil and environmental health as well as food quality control.

Pacifistic elimination of competition: The role type IV secretion system plays on interference competition in *Rhizobium etli* Mim1 during symbiotic interaction with host plant

Ibrahim, A., Finan, T., Kearsley, J., Batstone, R.
Department of Biology McMaster University

The rhizobial 'competition problem' describes a phenomenon where lab engineered 'elite' inoculants fail to compete against native strains in agricultural fields. In this study I investigate the role of a type VI secretion system (T6SS) in interference competition among rhizobia as they establish symbiosis with their host plant. I hypothesize that T6SS increases rhizobia competitive fitness by decreasing likelihood of mixed nodule occupancy. To observe these effects, I inoculated mutated *Rhizobium etli* Mim1 (lacking T6SS) and wildtype (WT) *R. etli* Mim1 against another *Phaseolus vulgaris* nodulator *R. leucaena*. After a growth period of ~21 days, I investigated differences in mixed nodule occupancy frequency. I predict that WT *R. etli* Mim1 will occupy less mixed nodules, while the mutant will be more likely to co-occupy nodules with the competitor. I also expect to find no overall difference in plant health or nitrogen production, given that T6SS is unlikely to impact plant performance. These findings would support my hypothesis that the T6SS is a key factor in interference competition as it prevents competitors from forming mixed nodules, and therefore, competitively excluding other strains from co-nodulating.

Characterizing Type VI mediated killing in *R. etli* mim1

MacLean, L.T., Batstone, R.T., Colautti, J., Whitney, J.
Department of Biology, McMaster University, Hamilton, ON.
Department of Biochemistry & Biomedical Sciences, McMaster University, Hamilton, ON.

Competition among nitrogen (N) fixing bacteria known as rhizobia has important outcomes in agriculture. Yet, little is known about why certain rhizobia strains optimized for N fixation fail to compete with other less effective N fixing strains. One hypothesis is that some endogenous microbes are better suited to compete within their own ecological niche. I am exploring a specific strain of rhizobia, *Rhizobium etli* b.v. Mim1 which contains a functional Type VI secretion system (T6SS). In other bacterial species, T6SS is known to act as a microbial killer, inherently giving the microbe a competitive advantage as it kills its competition. Currently, I'm adapting competition assays developed for another species to characterize the function of the T6SS found in *R. etli* Mim1. Understanding the role of T6SS in enhancing a strain's competitive ability could benefit agriculture, as strains that have both a competitive advantage and are effective N fixers could be identified or engineered.

The impact of environmental stressors on biofilm formation potential

Schultink, S.H., Weadge, J.T., Slawson, R.M.
Wilfrid Laurier University, Waterloo, ON.

Biofilms represent a complex bacterial community, which includes extracellular polymeric substances. Due to its protective matrix, biofilms are often considered more resistant to environmental stressors such as antibiotics, heavy metals, and varying temperatures. If bacteria encased within biofilms become more resistant to stressors, it can be problematic to many applications. This project was undertaken to assess the impact of environmental stressors on biofilm formation potential of potential pathogens *E. coli* and *E. faecalis* isolated from crop rhizospheres. The results indicate that these strains show more biofilm growth at 37°C

compared to lower temperatures and that biofilm formation persisted in the presence of antimicrobial substances. Additionally, biofilm formation was stronger when exposed to heavy metals compared to antibiotic exposure. This suggests that environmental bacteria maintain good biofilm formation ability in the presence of stressors.

Antimicrobial Activity of Self-Assembled Sulfonamide Quaternary Ammonium Organophosphonates on Cotton

Ladores, C.M. (1), Brennan, L.P. (1), Caschera, A. (2), & Foucher, D.A. (1)
Toronto Metropolitan University, Toronto, ON.
McMaster University, Hamilton, ON.

Contaminated inanimate surfaces can be a source of transmission for weeks, posing threats of hospital-acquired infections (HAI) and antimicrobial resistance (AMR) to the health of Canadians. This project explores the application of synthesized sulfonamide-based quaternary ammonium organophosphonates that increase in aromatic steric bulk (phenyl, mesityl, naphthyl, and dansyl) bonded to cotton. Surface-treated samples were characterized by UV-VIS using anionic dye, fluorescein sodium salt, which produced a surface charge at approximately $10 \text{ C} \cdot \text{nm}^{-2}$. Microbiological testing was performed on triplicates of treated and control samples using the developed Large Droplet Inoculum Protocol at solid/air interfaces. All treated samples showed partial to total reduction of viable *Glutamicibacter soli* and *Pseudomonas aeruginosa* after 4 hours of contact time. Results introduce rival concepts to known anti-infective surfaces and lead to an optimistic effort to prevent HAI and AMR against biofilms.

Investigating the symbiotic activity between *Medicago sativa* and rhizobia strains under soil and hydroponic conditions with varying nitrogen levels

Saeedi, S. & Batstone, R.
Department of Biology, McMaster University, Hamilton, ON.

Hydroponics are a fast-growing industry with many benefits to plant growth and nutrition. Despite this, there is little research on highly controlled studies comparing hydroponic setups to traditional soil-grown methods. As a pilot study, I evaluated the number of leaves, shoot height, shoot biomass, and root biomass in hydroponic and soil conditions with low free- N (0.625mM) and no added rhizobia. I will further measure leaf N level (through chlorophyll content), nodule number, nodule colour, and nodule size for the final thesis project with added rhizobia. I found a significant difference ($p < 0.05$) between soil and hydroponic conditions with low free N and no rhizobia present, in which hydroponic conditions had a significantly greater number of leaves, shoot height, shoot biomass and root biomass. This study further demonstrates the importance of hydroponics, and acts as a foundation to support the research to transfer agricultural community to hydroponic-based approaches.

Bioinformatics and Computational Biology Abstracts

Session 2

Room: TH246

Expanding the Machine Learning with Digital Signal Processing Pipeline for Classification of Novel Data: A Case Study on Bat Calls

Charette, C.L., Randhawa, G.S., Olteanu, D.G., Hill, K.A.

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Bats, use sound to communicate; uniquely, they use sound for spatial recognition. Also, bats have specialized control over the sounds they emit. Audio data recordings are prime candidates for machine learning (ML) classification to understand signals in calls associated with behaviour. Biological data often has structure with a pervasive signal. ML algorithms can be trained to classify digital signals. audio files of 20 second bat calls were converted into classifiable faux DNA compatible with supervised ML. Two classification tests were done: 1] between bats calling against bats not calling (n = 254, 175 calling, 79 not calling), which achieved 69%-85% accuracy AND 2] between prenatal maternal bats and postnatal maternal bats (n = 120, 57 prenatal, 63 postnatal), which achieved 58%-77% accuracy. Results are consistent a pervasive and class distinct signal which may allow classification of other bat traits. However, refinement and testing are needed to increase classification accuracy.

Computational Studies on Menopause: Aneuploidy and the Historic Changes to Fitness in Humans

Abbas, D., Stone, J.

Department of Biology, McMaster University, Hamilton, ON.

Menopause comprises the period of time, past the age of reproduction until the end of life, in which human females are no longer able to produce offspring. This study assesses whether human menopause evolved as a behavioural strategy to avoid the risk of aneuploidy observed in births that occur later in life. Within the study, a computational model was created to compete two populations, to examine if the risk of aneuploidy can produce a fixed, learned behaviour of reproductive cessation. One population is characterized to have evolved a reproductive behavior to cease reproduction at a certain point in the female lifespan. The second population does not possess the risk of aneuploidy and maintains reproduction from the onset of fertility to the end of a short life. The model demonstrated that the likelihood of the first population outcompeting the second increased when fecundity diminished later in life.

The Analysis of Genetic Diversity Derived from Transposable Elements in Mice Williams, D.

Brock University, St. Catharines, ON.

Mobile elements (MEs) are DNA elements that can mobilize within an organism's genome. Class I MEs (Retrotransposons) use reverse transcription to copy-and-paste themselves, while class II MEs (DNA transposons) move at the DNA level in a cut-and-paste fashion. Retrotransposons are often the focus of ME analysis as DNA transposons are mostly inactive in mammals. This study compares 19 inbred mouse strains with the mouse reference genome (GRCm39) to identify and analyze any ME variations. We found a total of 122,935 polymorphic MEs, 89,388 of which were present only in the reference genome while 33,547 were absent from the reference but present in one or more inbred mouse strains. These MEs were derived from B1, B2, LINE-1, and LTR elements with B1 and B2 showing higher activity. We found many of variants within regions of known function which could impact gene function and phenotypes. We also use the MEs as genetic markers to analyze the evolutionary relationships of the mouse strains.

Machine Learning Gone Viral: New Perspectives on *Astroviridae* Taxonomy with Alignment-Based and Alignment-Free Genome Comparisons

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1. Department of Biology, University of Western Ontario, London, ON.

2. Department of Computer Science, University of Waterloo, Waterloo, ON.

Astroviridae is a virus family which most commonly infects 3–8-month-olds, elderly, and immunocompromised individuals with infections and have become increasingly frequent and severe. The International Committee on the Taxonomy of Viruses (ICTV) historically classified strains into two genera based on mammal and avian isolation upon discovery, and species based on sequence identity. The number of known hosts has more than quadrupled; 598 unclassified sequences and 11 classes of hosts not included in this classification. Frequent recombination and inter-species transmission led experts to call for novel taxonomic classification. Past researchers relied on alignment-based methods. We provide novel classification based on whole genome sequence identity and applied kmer-derived genomic Chaos Game Representations (CGRs), leveraging the alignment-free tool Machine Learning with Digital Signal Processing (ML-DSP) to propose alternative taxonomic classification from viral genomic signatures.

Investigation of the Global Population Genetic Diversity of *Streptococcus pneumoniae* Using Archived Multilocus Sequence Typing Data

Dalmieda, J., D., Hitchcock, M., Xu, J.

Department of Biology, McMaster University, Hamilton, ON.

Streptococcus pneumoniae is a major agent causing invasive pneumococcal disease (IPD). However, relatively few strains cause the majority of all IPDs in the world. In 1998, Enright and Spratt developed a consensus multilocus sequence typing scheme (MLST) for *S. pneumoniae*. Since then, hundreds of studies have used MLST system to characterize their isolates. With over 70 000 isolates collected, a diverse epidemiological pattern for IPD has been identified. However, the global patterns of MLST sequence type (ST) and allele type (AT) distributions remain largely unknown. In this study, we investigated the spatial and temporal patterns of ST

and AT distributions of *S. pneumoniae* using phylogenetic and population genetic tools. We hypothesize that due to spatial heterogeneity and vaccine-related factors, continental and national populations of this species are genetically differentiated. I will discuss the implications of my analyses for global epidemiology and future vaccine developments.

Poster Session A

Foundations for Transcription Factor Inference from Three Dimensional Structures in *Escherichia coli*.

Channe, S.K., Moreno-Hagelsieb, G.
Wilfrid Laurier University, Waterloo, ON.

Proteins that control gene expression through the transcription process are called transcription factors (TF). Inferring whether an uncharacterized protein might be a TF is normally done by sequence comparison. However, somewhat recent advances have allowed for highly accurate prediction of 3-dimensional structures. It is thus possible that such structures could help in inference of TFs by structural comparisons beyond what can be done by sequence comparisons. In order to advance in this direction, it is necessary to understand the accuracy of the predictions. Hence, this study aims at identifying all transcription factors of *Escherichia coli* and comparing their experimentally determined 3D structures against predicted structures found on AlphaFold. Structural alignments were performed with TMalign. So far results for known TFs have been obtained and analysis is in process. Similarities or differences between alignment scores will determine the conclusion of this study.

Poster Session B

Does 'pace of life' have a genomic basis in kittiwakes? A candidate gene approach

Green, A. R., Boccia, C., Friesen, V. L.
Department of Biology, Queen's University, Kingston, ON.

'Pace of life' encompasses variation in lifespan, reproduction, and rate of development. Pace of life differences are common among closely related bird species, but little research has been done to untangle the genomic basis of these differences. This thesis will explore the genomic basis of pace of life in kittiwakes (*Rissa spp.*), which exhibit pace of life differences across and within species. I compare whole genome sequences from kittiwakes sampled throughout the Northern Hemisphere to test the hypothesis that variation in kittiwake genes underlies differences in pace of life. My findings suggest that there is selection on candidate genes related to pace of life in kittiwakes. These findings identify a potential genomic basis for pace of life. Future research could test mechanisms by which genes alter pace of life traits. This will enable a deeper understanding of species' lifespans, reproduction, and rates of development, which are critical for species conservation and management.

Spatial and temporal meta-data analysis of *Vibrio cholerae* around the world

Chen, W., Xu, J.

McMaster University, Hamilton, ON.

Vibrio cholerae, a bacterium that causes cholera, is responsible for infecting 1.3 – 4 million people worldwide. Inside the human host, *V. cholerae* would infect the small intestine and release cholera toxins to cause diarrhea. Changes in the environment due to factors such as climate change and human migration, *V. cholerae* populations have likely changed as well. Studies have looked at both the local genetic changes of *V. cholerae* and how local climate change affects it but there is a lack of research in the relationship of both factors at the global level. This study hypothesizes that changes in the global environment have led to rapid genetic and population changes in *V. cholerae*. Using pubMLST data, this relationship will be analyzed and observed spatially across the world in the past few decades. This research will provide a deeper insight on the impact of the changing environment on this important bacterial pathogen.

Neuroscience and Behaviour

Abstracts

Session 2

Room: 248

Investigating the neuroprotective efficacy of Ashwagandha root extract and Ubisol-q10 as treatment for mechanisms of Alzheimer's disease in double transgenic mouse models

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Alzheimer's Disease (AD) is rapidly increasing in prevalence as a result of the aging population. AD causes deficits in behaviour/cognition, and progressive memory loss. Mechanisms of AD include oxidative stress, mitochondrial dysfunction, inflammation, and autophagy dysregulation. There are no treatments for AD, only symptom-aiding medications accompanied by many adverse side effects. Natural Health Products (NHPs) can be utilized to avoid detrimental effects while halting mechanisms implicated with AD. Both Ashwagandha Root Extract (ASH) and Ubisol-Q10 have demonstrated neuroprotection. The current study utilizes their combination on double transgenic mouse models of AD (PSEN1+APP transgenes), subjected to one of 5 treatment groups. Harvested tissue samples were stained with immunofluorescent antibodies and observed through fluorescent microscope imaging. Results demonstrate that ASH and Ubisol-Q10 possess neuroprotective effects. Future research should create quantitative analyses.

Testing for enduring effects of fear in the brains of free-living meadow voles (*Microtus pennsylvanicus*) using Δ FosB

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Predators affect prey in more wide-reaching ways than direct killing. Predators instill the fear of being killed in prey resulting in antipredator behavioural responses which affect prey at the community, population, and individual levels. Fear has known enduring effects in the brains of captive animals in the lab, but whether similar enduring effects exist in free-living wildlife is completely unknown. We used audio from either predators or non-predators to manipulate fear of predation risk in four populations of free-living meadow voles (*Microtus pennsylvanicus*), then quantified the density of cells expressing Δ FosB, a persistent marker of activation, within regions of the brain associated with the fear network. If fear has enduring effects in the brains of free-living animals, we would expect a greater cell density in those exposed to predator cues due to sustained activation in the fear network.

The Effects of Turbidity on Redside Dace Olfactory Sensory Neurons

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The olfactory sensory system plays an important role in the survival of redbreasted dace (*Clinostomus elongatus*, RD), which is an endangered teleost fish, and their population is declining due to changes, such as deforestation, forest fires, agriculture and urbanization. One of the consequences of these activities is increasing of water's turbidity that can negatively affect the RD's health, behaviour, and social interaction. In this experiment, the effects of turbidity on olfactory sensory neurons, crypt cell olfactory sensory neurons, in the RD was examined using 200 mg/L bentonite, which is an aluminum-based clay commonly used to experimentally induce turbidity changes. These cells were labelled to become visualized by applying immunohistochemistry techniques using antibodies against the calcium-binding protein S100. Investigating the impacts of turbidity on the olfactory sensory morphotypes can provide information regarding the effects of stressor situations on the neurons of fish.

Developing the Parkinson's Physical Literacy Questionnaire (PPLQ)

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Parkinson's Disease (PD) is a neurodegenerative disorder with symptoms such as tremors, stiffness and difficulty with balance and coordination. One recommended intervention for people with PD is physical activity. However, there appears to be a low uptake of physical activity among those with PD. Physical literacy, encompasses motivation, confidence, competence, and knowledge, providing further insight into physical activity engagement. The objective of this study is to develop the Parkinson's Physical Literacy Questionnaire (PPLQ) considering physical literacy parameters. An enhanced understanding of physical literacy will lead to an increase in motivation, confidence, competence and knowledge. Thus, encouraging and promoting the need of physical activity. Utilizing a modified Delphi Technique, an expert panel receives a survey to provide feedback on a draft PPLQ. Revisions of the PPLQ are made accordingly. Future research will involve exploratory and confirmatory analyses of the PPLQ.

The impact of seismic noise on Acadian redbreasted (*Sebastes fasciatus*), Deepwater redbreasted (*Sebastes mentella*) and Atlantic cod (*Gadus morhua*) : A behavioural analysis

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A global rise in anthropogenic noise within aquatic ecosystems poses numerous threats to fish yet remains highly unregulated. By observing the effects of seismic noise on benthic fish abundance, the current study aims to bridge the knowledge gap on four ecologically-relevant species: Acadian redbreasted (*Sebastes fasciatus*), Deepwater redbreasted (*Sebastes mentella*), Atlantic cod (*Gadus morhua*) and Atlantic northern shrimp (*Pandalus borealis*). A total of five fleets of seven baited cameras were placed off the shore of Newfoundland in the Northern Atlantic Ocean and airguns were deployed. Recordings of free-swimming fish were analyzed for species abundance before, during and after noise presentation. Shrimp were unaffected by sound, cod tended to avoid sound for extended periods, and redbreasted only avoided sound near its origin. Understanding how sound influences species abundance and avoidance behaviours can help develop proper management and policies to reduce their impacts.

Effects of Prenatal Exposure to Ionizing Radiation on Gene Expression in the Hippocampus and Cerebral Cortex of the *Mus musculus* Adult Offspring

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Northern Ontario School of Medicine University

Exposure to stressors during fetal development may lead to phenotypical changes, called programming. Prenatal exposure to ionizing radiation at high doses can be harmful to both the mother and the fetus, here we chose to explore the effects of low dose exposures. Research has shown that behavioural changes in the mother and offspring can be linked to modifications of some genes in the brain. The goal of this study was to determine if there were any changes of the level of gene expression in two areas of the brain: the hippocampus and the cerebral cortex of adult *Mus musculus* offspring. This was achieved by exposing pregnant mice to 50mGy or 300mGy doses of ionizing radiation on gestational day 15 and comparing them to sham controls. The brain tissues of the offspring were harvested. Gene expression changes were measured by real-time quantitative polymerase chain reaction tests. The results of the study show significant changes in treatment conditions.

Session 3

Room: 248

Evaluating the Efficacy of Natural Health Products as a Treatment for Mechanisms Implicated in Parkinson's Disease

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Parkinson's disease (PD) is a common neurodegenerative disease. Traditional treatments of PD slow its progression, but their long-term usage can cause adverse effects. Natural health products (NHPs) such as Ubisol-Q10 and Ashwagandha root extract are proposed treatments that may circumvent the adverse effects and prevent the progression of PD. Previous studies demonstrate that these NHPs possess neuroprotective and anti-inflammatory capabilities, which may target mechanisms implicated in PD. It is hypothesized that Ubisol-Q10 and Ashwagandha may prevent PD by stabilizing mitochondrial function, inducing autophagy, and decreasing oxidative stress and inflammation. These mechanisms were examined through immunofluorescent staining and imaging. Results demonstrated that both NHPs exhibited neuroprotective and anti-inflammatory properties through the hypothesized mechanisms. Future studies utilizing stereological analysis may provide greater insight into using NHPs as a potential treatment.

Cortical Gamma Activation and Cognitive Functioning: An EEG Study

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Learning disorders (LD) and Alzheimer's disease (AD) are associated with a significant decrease in Gamma activity in the brain. Recent research has demonstrated that the application of an electromagnetic field (EMF) at 40 Hz significantly reduces Alzheimer's pathologies in mice. Because of this, we hypothesized that the application of a low-frequency EMF patterned

at 40 Hz would facilitate gamma activity in the brain. To test this hypothesis, cerebral dynamics were assessed pre- and post- EMF exposure, where the exposure period is 30 minutes. Following this, psychometric testing from the WAIS-IV was administered to assess participants' short-term and working memory. Participants' brain activity was measured for the entire duration of the experiment through means of an electroencephalogram (EEG), which measures electrical activity through scalp potentials. Initial results demonstrated that the application of an EMF increases gamma activity in the brain in regions exposed to EMFs.

Infographics as knowledge translation tools to promote patient and family education of sex and gender effects in traumatic brain injury

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Traumatic brain injury (TBI) is a common injury that has different presentations and often long-lasting adverse outcomes. Sex and gender greatly affect TBI acquisition, care-seeking behaviours, and recovery; however, this may not be realized by people with TBI and their family members.

The objective was to fill this knowledge gap among patients and family members, while fostering interest and motivating them to practice gender-adaptive behaviours early after injury. To aid in the knowledge translation process, we created five infographics employing principles of graphic design and scientific narration, aiming to be inclusive and relatable to life experiences of men, women, and gender-diverse people.

Visual communication of complex phenomena via infographics can facilitate greater recognition of the important sex and gender effects in TBI and could be applied to other topics in medicine. Next steps include seeking feedback from stakeholders and end-users.

Funding: Cass Family Grants.

All “Wrapped” Up in Reflection: How does supporting students’ self-regulated learning lead to improved academic performance?

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Self-regulated learning (SRL), the process of utilizing effective strategies to acquire knowledge or skills, is influenced by motivation, metacognition, and behavior. We hypothesized that promoting reflection on SRL could promote academic success. In our study, undergraduates in a second-year biology course were provided with survey instruments that encouraged them to create study plans and reflect on the effectiveness of their study strategies. We sought to investigate the role of metacognition, motivation, and study-related behaviors on academic performance by (i) identifying the SRL strategies most.

Session 4

Room: TH255

Patterned electromagnetic field and chemical exposure influences regeneration and aversive behaviours in planaria

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Regeneration plays an important role in planaria freshwater flatworms. Their regenerative process is dependent on activity associated with the extracellular signal-related kinase (ERK) by activation of their stem cells which function to make cell-fate decisions. We examined whether there were effects on planaria regenerative abilities following bisection. Exposure to patterned electromagnetic fields (EMF) resembling electric signature of ERK, chemical exposure from methyl methane sulfonate or hydrogen peroxide, or a variety of conditions were applied. We observed aversive behaviours, locomotion, and the regrowth of eyespots and auricles. We found that exposure to EMF increased the differentiation of eyespots on planaria at day 7 and scrunches on days 4 and 8. A increase in multiple aversive behaviours was observed on day 4 after chemical exposure. The results suggest EMF may enhance regeneration in planaria, and both EMF and chemical exposure may separately induce aversive behaviour.

Effects of Red LED Light on Planarian Regeneration

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The freshwater flatworm known as planaria are widely used for scientific research due to their fascinating ability to regenerate. Light radiation has been shown to impact this regeneration process with varying effects based on the type of light used. This study focuses on the specific effects of red LED light on the regrowth of the planarian head over a period of eight days. The planaria are first exposed to the LED light and then placed under a photomultiplier tube to measure the biophotons that are emitted over the eight-day period. From days five to eight a microscope is used to take pictures of the planarias head regeneration process to observe the rate of regrowth. Initial results demonstrate that the application of red LED light promoted regeneration and altered photon emission measured from the planaria throughout testing.

Effects of cross-fostering on neural development in degu (*Octodon degus*) pups

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2. Department of Biology, Swarthmore College, PA USA.

Mammalian offspring brain and behavioral development can be impacted by parental separation, either directly or through changes in parental care. One form of maternal separation is fostering, where offspring are raised by non-biological parents. Developmental stress may impact the hippocampus, an important brain region, in a sex-specific manner. My research assesses how early-life adversity, through fostering, affects social behaviour and brain development in female and male *Octodon degus*. We found that mothers of fostered pups spent more time off the nest compared to control mothers. When female pups were fostered without siblings, they displayed higher rates of play fighting. There was no significant effect of cross-fostering treatment on dentate gyrus volume in offspring. Analyses are ongoing to examine changes in neurogenesis with cross-fostering. The study will contribute to understanding how early life environment impacts hippocampal development and social behaviour in degu.

The enduring effects of the fear of predation on neurogenesis in free-living meadow voles (*Microtus pennsylvanicus*)

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The fear of predators, or perceived predation risk, is an impact predators have on prey populations beyond direct killing. Fear leaves enduring effects on prey behaviour with subsequent population-level effects. Our research aims to identify long-term effects of predation risk on neurogenesis in free-living wildlife to integrate the effects on the brain seen in laboratory biomedical research with those observed by ecologists in the field. Perceived predation risk was tested by exposing audio playbacks of predators and non-predators to free-living male and female meadow voles (*Microtus pennsylvanicus*). We quantified the enduring effects of these playbacks on neurogenesis using percent cover of doublecortin-positive cells in 3 brain regions associated with fear and memory 7 days after playbacks were stopped. We expect that predation risk will decrease neurogenesis as seen in previous research, which may be linked to retaining memories for avoiding predation and increasing survival rate.

Poster Session A

The creation of an inducible, isoform specific SDK1 viral vector for the study of SDK1 isoforms in neurons

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SDK1 is a cell adhesion and signaling molecule that is highly expressed in the brain and vital for proper development of neuronal circuits. Recent work on SDK1 has demonstrated two unique isoforms, referred to as the short and long forms, but it is unclear which isoform is responsible for the vital roles of SDK1. One of the major limitations for studying SDK1 (either isoform) is its large size, at over 7Kb, precluding the use of AAVs to study its function in neurons. Making use of the large packaging limits of the Herpes simplex virus (HSV), I created a Cre-inducible overexpression system that overexpresses only the long isoform of SDK1 (p1005-DIO-Sdk1LF), or the short form (p1005-DIO-Sdk1SF), allowing for inducible HSV based transductions of either isoform individually. Future experiments will focus on understanding which isoform regulates the known roles of SDK1 in synaptic plasticity and ultimately, learning and memory.

Memory Processing- at a snail's pace

Wimmer, J., Ibrahim, Z., Spencer, G.

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Vitamin A and its metabolite, retinoic acid, are important for brain development and function. Deficient retinoid signaling can reduce the ability of synapses to change and thus interferes with learning and memory. Many effects of retinoids are conserved between species, and using both operant and classical conditioning paradigms, we have shown that retinoic acid plays a key role in long-term memory formation in an invertebrate species. Whether retinoids affect later aspects of memory processing, such as memory reconsolidation and/or extinction, has not been studied. Through classical conditioning, we provide evidence that retinoic acid is required for both memory reconsolidation and extinction. However, the requirement for retinoic acid in this memory processing appears to depend on a number of different factors that influence the strength of the memory. These findings reveal how retinoid signalling may affect distinct facets of memory processing in the adult brain.

Using guided reflections and active learning to reduce the fear of failure in an undergraduate biochemistry course

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Failure plays an important role in the learning process. Previous research shows that students view failure negatively, which can result in feelings of anxiety. Undergraduate biochemistry courses often hold a reputation of being difficult, but where this belief comes from is poorly understood. We investigated this and whether active learning strategies can help maintain student engagement in course material. Case studies were implemented in an undergraduate biochemistry course at Toronto Metropolitan University, which contained examples of real-world application of course material. Students completed surveys to determine whether using case studies improved engagement and understanding as measured by students' perceptions of learning and assessment grades. Students also provided suggestions for biochemistry course changes that would better support their learning. The results of this study can guide the development of evidence-based biochemistry curricula across institutions.

Role and regulation of TrkB isoforms in autism spectrum disorder

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The development and plasticity of synapses in the human brain are regulated by interactions between BDNF and its receptor, TrkB. The TrkB-FL isoform contains an intracellular catalytic tyrosine kinase domain and mediates classic neurotrophic signaling. Conversely, the two truncated TrkB isoforms, TrkB-T1/Shc, lack kinase activity and serve as negative regulators of BDNF/TrkB signaling. Rbfox1, an RNA-binding protein that binds to TrkB mRNA, has been implicated in autism spectrum disorder. Our previous research found that decreased Rbfox1 correlated with decreased TrkB-FL, but not truncated TrkB, suggesting the relationship between Rbfox1 and TrkB in idiopathic autism. The RBFOX1 gene is alternatively spliced to produce two isoforms. While the function of the nuclear isoform has been well-studied, the function of the cytoplasmic form, Rbfox1-iso2, is largely unexplored. This study is to investigate the impact of Rbfox1-iso2 knock-down using siRNA on TrkB-FL protein expression levels.

Poster Session B

Effects of Early life stress on Hippocampal cell death and microglia morphology in degu pups

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Early life stress (ELS) can result in a variety of developmental deficits. In rodents, cross-fostering (CF) is a form of ELS that creates parental-offspring instability. Previous work indicates that CF affects play fighting behaviour in female degu pups. This study examined neural mechanisms of CF. Programmed cell death and microglia activity are crucial in maintaining healthy cell populations. We investigated the effect of CF on cell death and microglia in the offspring hippocampus, a brain region sensitive to stress. At PND8, Degu pups were assigned to either: (1) control (pups remained with biological parents), (2) partial CF (only one pup was cross fostered), or full CF (entire litter was switched) treatment. At weaning, offspring brains were collected for Immunohistochemistry. Preliminary results indicate cell death was lower in

the CF groups compared to controls. Analyses of microglia are ongoing. This work will contribute to understanding how ELS impacts brain development.

The Neurobiological Manifestation of Phenotypic Plasticity in Locusts: Is the Visual Acuity of Solitary Locusts Superior to Their Gregarious Counterparts?

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The exhibition of density dependent polyphenism in locusts is characterized by measurable differences in morphology, physiology, and behaviour. Through aggregation in large groups, gregarious phase locusts may benefit from this inherent safety, rendering them protection against avian and reptile predators. Conversely, solitary locusts remain separate and sparse and presumably rely on less overt behaviour. This study focuses on the visual system of *Locusta migratoria* – the African migratory locust. By employing electroretinograms, we measured the physiological responsiveness of the eye to flashes of light. We predict solitary phase *Locusta* will demonstrate shorter latencies, faster rates of depolarization, and higher measures of flicker fusion frequencies to light flashes compared to their gregarious phase counterparts rendering them the ability to discern rapidly changing patterns of light in the environment which may provide a survival advantage in the face of diurnal predators.

Experiential learning activities at Mohawk College covering environmental and water related topics

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Mohawk College of Applied Arts and Technology

Mohawk College of Applied Arts and Technology is offering Biotechnology, Chemical Engineering and Environmental Technology programs. Instructors at Mohawk College are seeking to provide students with the necessary technical and critical reasoning skills to successfully complete these programs. As part of the curriculum one large portion of the courses is focusing on coping with aquatic pollution and treatment, as well as dealing with water toxicology, analysis and purification. College students explore the microbiology and physico-chemistry of water, inclusive the chemical and physical parameters as well as the microbiological hazards during waste water treatment and water purification. In addition, students explore in seminar series the recent trends and topics in water related management, technology, science and engineering. We here present the experiential learning challenges and opportunities we have encountered specifically in the three years Advanced Biotechnology program.

Impact of Allatostatin-C like neuropeptides nlp-67 on the mevalonate pathway in *Caenorhabditis elegans*

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Neuropeptides are short amino acid chains that play a crucial role in synaptic transmission and regulatory control. There are 113 neuropeptide genes producing 250 distinct neuropeptides in *C. elegans*. Some neuropeptides resembling Allatostatin-C regulate Juvenile Hormone production through interaction with GPCRs, impacting circadian rhythm and olfactory memory consolidation. In *C. elegans*, peptides resembling *Drosophila* AST-C were discovered, named nlp-62, nlp-64, nlp-66, and nlp-67, with no known function or phenotypic data available. The goal of this study was to analyze an available mutant of nlp-67 and create overexpression

strains of all 4 neuropeptide genes as a means of identifying function through alterations in behaviour. In the study, we found that nlp-67 mutant has shorter longevity and did not have significant difference in egg laying, chemotaxis compared to wildtype. We are expecting that nlp-67 mutant has higher expression of key enzymes in mevalonate pathway.