# FACULTY OF SCIENCE

MEMORIAL UNIVERSITY

# SEA

## Scientific Endeavours in Academia

Interdisciplinary Conference 2024

**APRIL 5-6, 2024**

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# SCHEDULE

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|---|---|
| **FRIDAY**<br>8:30 A.M.-5:30 P.M. | **Registration**<br>*Whale Atrium, Core Science Facility* |
| 9 A.M.-12:05 P.M.* | **Oral Presentations**<br>Session 1A - Climate Change & the Environment<br>*CSF-1301, Core Science Facility*<br><br>Session 1B - Technology, Innovation & Exploration<br>*UC-3015, University Centre*<br><br>*coffee break 10:30 A.M. - 10:50 A.M. |
| 10 A.M.-12 P.M. | ***CBITN Symposium***<br>*EN 2007, Engineering Building* |
| 12:15-2:15 P.M. | **Lunch**<br>*Whale Atrium, Core Science Facility* |
| 12:15-1:15 P.M. | **Poster Session 1**<br>*Whale Atrium, Core Science Facility* |
| 1:15-2:15 P.M. | **Poster Session 2**<br>*Whale Atrium, Core Science Facility* |
| 2:15-5:20 P.M. | **Oral Presentations**<br>Session 2A -Climate Change & the Environment<br>*CSF-1301, Core Science Facility*<br><br>Session 2B - Health & Wellness<br>*UC-3015, University Centre* |

# SCHEDULE

| | |
|---|---|
| 3:45-4:05 P.M. | **Coffee Break**<br>*CSF-1301, Core Science Facility and UC-3015, University Centre* |
| 5:45-7:30 P.M. | **Gong Show**<br>*CSF-1302, Core Science Facility* |
| 7:30-9 P.M. | **Reception**<br>*Whale Atrium, Core Science Facility* |

**SATURDAY**

| | |
|---|---|
| 9 A.M.-2 P.M. | **Registration**<br>*Whale Atrium, Core Science Facility* |
| 9:30 A.M.-12:50 P.M. | **Oral Presentations**<br>Session 3A - Technology, Innovation & Exploration<br>*CSF-1301, Core Science Facility*<br><br>Session 3B - Health & Wellness<br>*UC-3015, University Centre* |
| 11 A.M.-11:20 A.M. | **Coffee Break**<br>*CSF-1301, Core Science Facility and UC-3015, University Centre* |
| 1-3 P.M. | **Lunch**<br>*Whale Atrium, Core Science Facility* |
| 1-2 P.M. | **Poster Session 3**<br>*Whale Atrium, Core Science Facility* |
| 2-3 P.M. | **Poster Session 4**<br>*Whale Atrium, Core Science Facility* |

# WELCOME

On behalf of the Faculty of Science, I am pleased to welcome you to the third annual Scientific Endeavours in Academia (SEA) interdisciplinary research conference.

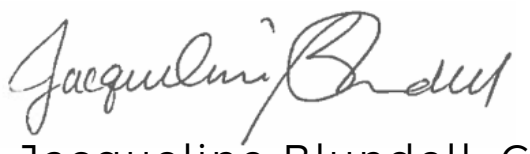
This year's conference builds on the success of our previous conferences – I am proud to report that this year we more than 350 registrants with 160 oral and poster presentations! In addition to honing presentation skills, the SEA conference provides opportunities for networking, developing new collaborations, student recruitment, career development and more!

I am particularly excited to announce we are hosting our second 'Gong Show' which will provide a fun and welcoming atmosphere for the public to interact with researchers. A special thank-you to our judges for the event including Jeremy Eaton, CBC; Heidi Kavanaugh, Holy Trinity High School, and Amanda Mews, NTV.

I would also like to thank everyone who helped to make SEA a success, including members of the organizing committee, sponsors and presenters, judges, volunteers, and attendees.

I am thrilled to be a part of this exciting endeavour. I hope you enjoy hearing about the outstanding research underway in the Faculty of Science.

Sincerely,



Jacqueline Blundell, Committee Chair
Associate Dean of Science, (Research & Graduate)

# MEET THE COMMITTEE

**Dr. Jacqueline Blundell** (Chair) is the Associate Dean of Science (Research and Graduate). She is also a professor of Behavioural Neuroscience in the Department of Psychology. She holds a B.Sc. from Dalhousie and Memorial University, M.Sc. and PhD from Memorial University and completed a Postdoctoral Fellowship at the University of Texas, Southwestern Medical Center.

**Dr. Lynn Frizzell** has been a grants facilitation officer in the Faculty of Science since 2018. Before that, she worked in child health research with partners throughout the community. She holds M.Sc. (Behavioural Neuroscience), and PhD (Developmental Psychology) degrees from Memorial University.

**Sofiia Garasym** is the front desk secretary for the Dean of Science Office. She holds Bachelor of International Relations from Ivan Franko National University of Lviv (Ukraine).

**Tama Ghosh** is a graduate student at Memorial University. She is completing a MSc in Biochemistry focusing on Computational Biochemistry. She has completed a B.Sc. in Chemistry from University of Barishal, Bangladesh.

**Yvonne He** is a graduate student at Memorial University. She is completing a PhD in Biology with a concentration in Microbiology and holds a B.Sc. in Biomedical Science from Toronto Metropolitan University.

# MEET THE COMMITTEE

**Kavi Heerah** is a graduate student at Memorial university. He is completing a PhD in Environmental Science focusing on environmental chemistry. He has a B.Sc. in Environmental Science from the University of Guelph.

**William Kellough** is a master's student in the mathematics and statistics department at Memorial University. His research focus is on pursuit-evasion models in discrete networks. He received a joint honours B.Sc. in mathematics and statistics at the University of Manitoba.

**Phillip MacCallum** is a grants facilitation officer in the Faculty of Science. He holds a BA from the University of Prince Edward Island and a M.Sc. from Memorial. He is currently completing his PhD part-time in Experimental Psychology.

**Dr. Jennifer Major** is a grants facilitation officer in the Faculty of Science. She holds a PhD in Cellular and Molecular Medicine from the University of Ottawa and completed a Postdoctoral Fellowship at the University of Colorado Anschutz Medical Campus.

# GONG SHOW JUDGES

**Jeremy Eaton, CBC**

Jeremy is an award winning video-journalist, reporter and host for the CBC in his hometown of St. John's. The closest he gets to science is when he brutalizes the weather reports or when he finished watching all the episodes of Breaking Bad. His high school teachers will be shocked he has been selected as a judge but it is a role he takes seriously.

**Heidi Kavanagh, Holy Trinity High**

Heidi is the department head of Science at Holy Trinity High in Torbay, NL where she teaches Chemistry, Earth Science, and Environmental Science to students Grades 10-12. She is an alumna of the Faculty of Science at Memorial University, completing her Bachelor of Science (Honours) in 2012 and Masters of Environmental Science in 2014 under the supervision of Dr. Penny Morrill, Department of Earth Sciences. She completed her Bachelor of Education (Intermediate/Secondary) in 2015 and started her teaching career in Happy Valley-Goose Bay, Labrador in 2015. Heidi is the co-chair for the Newfoundland and Labrador Science Fair Council, a regional leader with Let's Talk Science and a wetland excellence leader with Ducks Unlimited. Heidi loves everything science!

# GONG SHOW JUDGES

**Amanda Mews, NTV**

Amanda  is a news anchor, entertainment reporter and a segment host/producer with NTV News in St. John's, NL. Her passion for promoting this province. has taken her on assignments to New York City and Hollywood. She has a passion for the arts, and holds a degree in English/Psychology, as well as a diploma in Performance and Communications Media, from Memorial University. Amanda grew up in Postville, on the north coast of Labrador, and in the central Newfoundland town of Birchy Bay.

# JUDGES

**Faculty**

Dr. Rob Bertolo, Biochemistry
Dr. Dawn Bignell, Biology
Dr. Alex Bihlo, Mathematics and Statistics
Dr. Jacqueline Blundell, Psychology
Dr. Janet Brunton, Biochemistry
Dr. Elsa Cardoso-Bihlo, Mathematics and Statistics
Dr. Sukhinder Cheema, Biochemistry
Dr. Sherri Christian, Biochemistry
Dr. Cyr Couturier, Ocean Sciences
Dr. Emily Fawcett, Psychology
Dr. Jon Fawcett, Psychology
Dr. Adrian Fiech, Computer Science
Dr. Cheryll Fitzpatrick, Psychology
Dr. Ian Fleming, Ocean Sciences
Dr. Travis Fridgen, Chemistry
Dr. Patrick Gagnon, Ocean Sciences
Dr. Matthew Hamilton, Computer Science
Dr. Kathryn Hargan, Biology
Dr. Kathleen Hourihan, Psychology
Dr. Chris Kozak, Chemistry
Dr. Andrew Lang, Biology
Dr. Annie Mercier, Ocean Sciences
Dr. Oscar Meruvia-Pastor
Dr. Asokan Mulayath Variyath, Mathematics and Statistics
Dr. Sunil Pansare, Chemistry
Dr. Uta Passow, Ocean Sciences
Dr. Lourdes Peña-Castillo, Computer Science
Dr. Javier Santander, Ocean Sciences
Dr. Tarun Sheel, Mathematics and Statistics

# JUDGES

**Faculty**

Dr. Vinicius Prado da Fonseca, Computer Science
Dr. Ashlyn Swift-Gallant, Psychology
Dr. Kapil Tahlan, Biology
Dr. Heloise Therien-Aubin, Chemistry
Dr. Amy Todd, Biochemistry
Dr. Helene Volkoff, Biology
Dr. Yolanda Wiersma, Biology
Dr. Katie Wilson, Biochemistry
Dr. Zahra Farahnak, Biochemistry

**Post Doctoral Fellows**

Dr. Tiffany Fillier, Biochemistry
Dr. Valentin Kokarev, Biology
Dr. Kevin Ma, Ocean Sciences
Dr. Mackenzie Patrick, Earth Sciences
Dr. Jaime Soto Neira, Ocean Sciences

**Staff**

Dr. Lynn Frizzell, Dean of Science Office
Dr. Jenn Major, Dean of Science Office

# MODERATORS

**Oral Session 1A - Climate Change and the Environment**
Dr. Kevin Ma
Adam Meyer

**Oral Session 1B - Technology, Innovation and Exploration**
Tama Ghosh
Deepal Deshpande

**Oral Session 2A - Climate Change and the Environment**
Nova Hanson
Victoria Heath

**Oral Session 2B - Health and Wellness**
Madelyn Swackhamer
Kajal Gupta

**Oral Session 3A - Technology, Innovation and Exploration**
Matt Drodge
Kavi Heerah

**Oral Session 3B - Health and Wellness**
Azmat Ullah
Naomi Akanmori

# VOLUNTEERS

Adila Irwan
Alex Day
Antonia Peil
Ayesha Quadri
Ayesha Rathnayake
Cathy Hyde
Cyler Vos
Deepal Deshpande
Ellen Bangu
Fadzai Muzhuzha
Golbarg Gazerani
Grigory Arutyunyan
Helia Kamel
Holly Butt
Ian Tompkins
Inemesit Nyong
Jenna Hanrahan
Julia Silverman
Kajal Gupta
Kavi Heerah
Khandoker Munira Mehjabin
Kyle Warren
Marcela Castaño
Matt Drodge
Md Nafiul Alam
Mehzabin Chowdhury
Merreil Asibal
Mikhailey Wheeler
Morgan LeDrew
Narges Ghorbani Bavani
Neilla Martine Gateka
Oforbuike Egbe
Olivia Wyper
Sachel Christian-Robinson
Sadia Afrin
Sarah Boudreau
Shrabontee Deepanwita
Syeda Fateha Akter
Tashuia Baker

# GONG SHOW

## Gong Show Presentations

**Hallie Arno, Ocean Sciences**
*In hot water: does aquaculture make wild Atlantic Salmon less resilient to climate change?*

**Arezou Arvand, Biochemistry**
*The Gene Silencing Game: Discovering the roles of a Special Protein called GRP75*

**Matthew Caines, Psychology**
*Increasing Information Provision: How might three different interviewing strategies help us get more information from eyewitnesses in police interviews?*

**Sachel Christian-Robinson, Chemistry**
*Mussels: More than just meat*

**Julia Craig, Human Kinetics and Recreation**
*Infertility Injustice? We're Not Going to Take It!*

**Katrina Cruickshanks, Biology**
*A glimpse into the tree tops of Nova Scotia's forests*

**Asha De Silva, Biochemistry**
*Methionine requirement of TPN-fed newborn babies*

**Matt Drodge, Biology**
*Exploring the use of marine yeasts from coastal Newfoundland for beer fermentation*

# GONG SHOW

**Narges Ghorbani Bavani & Antonia Peil, Biochemistry**
*The effect of omega-3 and vitamin D on vitamin D level in obese rats*

**Sogand Sasanmoghadam, Biochemistry**
*Exploring the role of teichoic acid in bacillus subtilis sensitivity to AMP-induced damage*

**Jaime Soto Neira, Ocean Sciences**
*Sensors development: overcoming barriers to curiosity*

**Saad Equbal Syed, Computer Science**
*Holographic Displays and Light Field Image*

# CBITN SYMPOSIUM

CBITN

Canadian Behavioural Interventions and Trials Network

## FEATURED SYMPOSIUM

In conjunction with the MUN SEA Conference

***"Enhancing impact: Supporting health and well-being through the development of behavioural interventions and their application in real-world contexts"***

## Join us!

for a morning of presentations and discussion with professionals and trainees

| DATE | TIME | WHERE |
|---|---|---|
| **APR 5, 2024** | **10AM-12PM** | **EN - 2007** |

CBITN sponsored lunch to follow

# ORAL PRESENTATIONS

**Session 1A - Climate Change & the Environment**
Moderators: Kevin Ma, Adam Meyer

Sydney Collins, Cognitive and Behavioural Ecology
*Leach's Storm-Petrel parental behaviour is consistent and predicts reproductive success*

Oforbuike Egbe, Chemisry
*Selective Tuning of Polycrystalline Copper Substrate with Nanoparticle - Ionic Liquid Hybrid Catalyst for CO2 Reduction*

Chantelle Clermont, Ocean Sciences
*Spatial and temporal variability in green sea urchin (Strongylocentrotus droebachiensis) covering behaviour*

Mikhailey Wheeler, Chemistry
*Using Green Chemistry and carbon dioxide to make plastics*

Jeremy Hussey, Biology
*Investigating Disturbance Mediated Alterations of Macrolichen and Bryophyte Stoichiometric Ratios and Biodiversity Patterns Following Intense Moose Herbivory in the Eastern Boreal Forest*

Mojtaba Maleki Rad, Earth Sciences
*Biodegradation of thermo-oxidative pretreated low-density polyethylene (LDPE) and polyvinyl chloride (PVC) microplastics by Achromobacter denitrificans Ebl13*

Katrina Cruickshanks, Biology
*Old growth aspirations: the effects of survey height and age on lichen communities in hardwood forests of Nova Scotia*

# ORAL PRESENTATIONS

Megan Fitzgerald, Chemistry
*Marine Materials: Using Seafood Waste to Create Hydrogel Materials with Broad Applications*

Cyler Vos, Chemistry
*Sustainable Production of Polymers Through Renewable Resources and Chromium Catalysts*

Dr. Jahrul Alam, Mathematics and Statistics
*The implications of extreme weather events in wind energy projects*

**Session 1B - Technology, Innovation & Exploration**
Moderators: Tama Ghosh, Deepal Deshpande

William Kellough, Mathematics & Statistics
*How to Play With Fire: \\ An Adversarial Graph Burning Model*

Ugonna Ani, Biochemistry
*Examining The Challenges And Benefits Of Flexible Experiential Learning Opportunities In Undergraduate Life Science Courses*

Chengjun Yue, Mathematics & Statistics
*A trace principle for fractional Laplacian with an application to image process*

Weiyang Li, Mathematics & Statistics
*Liouville-Type Laws Quasilinear Equations with Absorption*

# ORAL PRESENTATIONS

Shramana Sarkar, Earth Sciences
*Can ultra-trace element aqueous geochemistry aid critical mineral exploration for Li-Cs-Ta pegmatite deposits?*

Dr. Len Zedel, Physics and Physical Oceanography
*Doppler sonar records of fish movement through a strong tidal stream: 3-months of observations from Grand Passage Nova Scotia*

Fathima Manooja, Computer Science
*Task-based Parallelism in SPH*

Cody King-Poole, Chemistry
*High Performance Marine Coatings from Sulfur Nanoparticles*

Sathees Duglas, Sustainable Aquaculture
*Comparative Immune Response of Atlantic Salmon Head Kidney Cell Line to Vibrio anguillarum serovars O1 and O2.*

Debasmita Behera, Civil Engineering
*Application of ZnO and Fe2O3 nanoparticle for enhanced lipid production in microalga Scenedesmus obliquus: A Sustainable approach for biofuel production.*

Haoming Luo, Computer Science
*AI in breast cancer detection*

# ORAL PRESENTATIONS

**Session 2A - Climate Change & the Environment**
Moderators: Nova Hanson, Victoria Heath

Joseph Baafi, Biology
*Modeling the Impact of Seasonality on Mosquito Population Dynamics: Insights for Vector Control Strategies*

Tori Burt, Cognitive and Behavioural Ecology
*Exploring multi-modal behavioural attraction in Leach's Storm-Petrels*

Tshering Dendup, Earth Sciences
*Geophysical Study of the Historical Landfill at Wishingwell Park*

Sachel Christian- Robinson, Chemistry
*Seeing value in seafood waste*

Nurul Bin Ibrahim, Physics and Physical Oceanography
*Deep Learning Investigation of Turbulent Jets*

Victoria Heath, Ocean Sciences
*Characterizing mechanisms of variation in thermal tolerance in Atlantic salmon* (Salmo salar)

Alex Day, Biology
*Spring 2022 Northwest Atlantic Thick-billed Murre Mortality*

Sarah Boudreau, Chemistry
*Isolating Hydroxyapatite from Atlantic Salmon Processing Waste – Transforming Trash to Treasure!*

# ORAL PRESENTATIONS

Rajesh Barua, Biology
*Efficient in vitro propagation of Vaccinium membranaceum in liquid culture using bioreactors and antioxidant enzyme profiling in micropropagules*

Emmerson Wilson, Biology
*Predicting carbon in the maritime boreal forest under sequential disturbances*

Nova Hanson, Ocean Sciences
*Investigating the "hairy snail" holobiont of Alviniconcha from hydrothermal vents in the western Pacific*

**Session 2B - Health & Wellness**
Moderators: Madelyn Swackhamer, Kajal Gupta

Rashid jafardoustBostani, Biochemistry
*Identifying the bone marrow cells affected by extracellular vesicles released from CD24-stimulated B cells*

Justine Yick, Psychology
*Examining How Need for Cognition, Drawing, and Writing Interact with Memory Performance*

Aaron Pye, Biochemistry
*A Computational Analysis of Glycosylated tRNA Structure*

Claire Hynes, Biochemistry
*Characterization of CSDE1 missense variants in autism spectrum disorders*

# ORAL PRESENTATIONS

Quinn Morris, Psychology
*Prevalence and predictors of harm OCD: A meta-analytic review*

Syndney Knapman, Psychology
*Validation does not end at creation: Validation of the Profile of Female Sexual Functioning*

Tama Ghosh, Biochemistry
*Examining the structure and function of FUT8 enzyme: A Computational Modeling Approach*

Noah Pevie, Psychology
*Meaningful Measurement of Body Image in Transgender Populations*

Adar Buxton, Biochemistry
*Characterizing the effects of creatine precursors, guanidinoacetic acid and methionine on gut creatine transport using a Caco-2 model*

Yuguan Jiang, Biochemistry
*Exploring novel PIWI-interacting proteins and their function in the piRNA pathway and cell differentiation*

Kelsey Downer, Psychology
*No Place to Call Home: Housing Stigma Against Previous Offenders*

# ORAL PRESENTATIONS

**Session 3A - Technology, Innovation & Exploration**
Moderators: Matt Drodge, Kavi Heerah

Yvonne He, Biology
*Packaging patterns in Rhodobacter capsulatus*

Saad Equbal Syed, Computer Science
*Light Field Images*

Jesna Fathima, Civil Engineering
*Removal of antibiotic Azithromycin from synthetic wastewater and simultaneous bioelectricity generation using microalgae-Microbial Fuel Cell (m-MFC)*

Mohammad Mousavi, Physics and Physical Oceanography
*Ocean Sound Speed Profile measurement using time-delay profile*

Zhen Shuang, Mathematics and Statistics
*PDE methods in signal processing*

Dr. Jaime Soto Neira, Ocean Sciences
*Novel hydrocarbon sensing technologies for environmental studies*

Chandrika Dissanayaka, Biochemistry
*Bioactivity enhancement of camelina* (Camelina sativa L. Crantz) *seed meal peptides*

Ayon Debnath, Computer Science
*Light Field Image Compression*

# ORAL PRESENTATIONS

Narges Vadood, Scientific Computing
*Turbulent dusty Molecular Clouds with SPH-1-fluid vs 2-fluid methods*

Dr. Kim Welford, Earth Sciences
*The magic of geophysics to solve our modern challenges*

Maddie Borland, Biochemistry
*Unlocking the Potential of Harnessing Pigments from Green Sea Urchin Shells and Spines*

Shemonto Das, Computer Science
*Unbalanced Fault Classification Using Active Learning in Synthetic Fiber Manufacturing Process*

**Session 3B - Health & Wellness**
Moderators: Azmat Ullah, Naomi Akanmori

Lily Bertolo, Biology
*Fine structure histological anatomy of posterior ocular vasculature in early juvenile lumpfish*

Kaitlyn Mayne, Biochemistry
*Exploring CD22 and Siglec-G as functional co-receptors of CD24 on developing B cells from murine bone marrow*

Morgan LeDrew, Biochemistry
*Vitamin D and Muscle Health in Adults in Newfoundland*

Robyn Cumben, Psychology
*Exploring Readiness for Love: Attitudes Toward Repartnership Following the Death of a Partner*

# ORAL PRESENTATIONS

Ishraq Rahman, Biology
*Avian influenza virus infection of seabirds in Newfoundland and Labrador*

Asha De Silva, Biochemistry
*Dietary methionine requirements for metabolites in TPN-fed neonatal piglets*

Caitlan Meaney, Biochemistry
*The Impact of Diet Quality on Student Success in Higher Education STEM*

Narges Ghorbani Bavani, Biochemistry
*The effects of dietary docosahexaenoic acid (DHA) and vitamin D supplementation on vitamin D metabolism in diet-induced obesity (DIO) animal model*

Naomi Akanmori, Biochemistry
*Human Ribokinase activity: Regulation by monovalent cations*

Sarusha Santhiravel, Biochemistry
*Steam Explosion Enhances the Inhibitory Activities of Soluble Phenolics from Dun Pea* (Pisum sativum sativum var. avense) *on Free Radicals and Reactive Oxygen Species*

Golbarg Gazerani, Biochemistry
*Therapeutic Potential of Nicotinamide Riboside and a-Cyano-4-HydroxyCinnamic Acid on Myelin Phagocytosis by Pro-inflammatory Macrophages*

Farzad Mostafavi, Biochemistry
*Molecular Structural Similarity of Protein-Carbohydrate Complexes, A Computational Study*

# POSTERS

**Poster Session 1**

Haley Adams, Chemistry
*Impact of exposure to environmental pollutants on placental metabolism*

Arezou Arvand, Biochemistry
*Unraveling the role of GRP75 in siRNA mediated gene silencing*

Sepideh Azari, Biology
*Exploring Guppy Fish: Gene Expression Dynamics, Reproductive Strategies, and Environmental Adaptations*

Artho Baroi, Biology
*Isolation and characterization of the plant-pathogenic Streptomyces spp. in Newfoundland*

Bahareh Bastan, Chemistry
*Electrochemically controlled facilitated Fe2+ transfer investigations using trioctylphosphine oxide ligand at an immiscible micro water/1,2-dichloroethane interface*

Justine Bissonnette, Chemistry
*Characterization and Quantitation of Microplastics in the Blood of Canadian Mothers by Pyrolysis Gas Chromatography-Ion mobility mass spectrometry*

Nicole Careen, Psychology
*Abstract for Evaluating Undergraduate Students' Opinions On a Pilot Informational Program: The Psychology Pathways Program.*

# POSTERS

Marcela Castaño Rodriguez, Biology
*Small-scale biophysical interactions between marine pathogens and larval bivalve hosts*

Kailee Clark, Chemistry
*Multi-year monitoring of organic carbon dynamics: using fluorescent dissolved organic matter to track high export fluxes in the North Pacific*

Heather Coleman, Psychology
*Intergenerational effects of preconception stress: predator exposure and ranked breeding on mice offspring behaviour*

Julia Craig, Human Kinetics and Recreation
*Exploring Patients' Experiences Accessing Fertility Information and Services: A Journey of Advocacy and Empowerment*

Kayla Crichton, Biochemistry
*Evaluation of Canada's first tax on sugar-sweetened beverages: pretax analysis of sugar-sweetened beverage consumption and overall diet quality of adults in Newfoundland and Labrador using the Healthy Eating Food Index (HEFI)-2019*

Shrabontee Deepanwita, Psychology
*Identifying the Significance of Sex Hormones, Sex Chromosomes and Maternal Immune Activation in a Preclinical Murine Model of Autism Spectrum Disorder*

Deepal Deshpande, Biology
*Cause of DNA packaging variation in Gene Transfer Agents*

# POSTERS

Isabella Doody, Psychology
*Evaluation of Predator Stress on Anxious Behaviours Across Generations*

Rahana Ebrahim, Ocean Sciences
*The single chambered decapod crustacean heart may function as a “multi-chambered” organ*

Abi Fleming, Psychology
*Consequences of Wildtype Huntingtin Reduction on H3K9me3 Alterations in Huntington's Disease*

Lucas Fowler, Cognitive and Behavioural Ecology
*Differential Epigenetic Biomarkers in the DNA of Heterosexual and Homosexual Men*

Kailey Genge, Biochemistry
*The effects of fructose consumption and exercise on metabolic risk factors*

Camilla Hollett, Biochemistry
*Beyond the surface: Computational Study of Bacterial Inner Membrane and Implications for Antibiotic Development*

Khandoker Munira Mehjabin, Biology
*Exploring the genetic landscape of Rhodobacter capsulatus using comparative genomics of 12 strains*

Lily Perchard, Biochemistry
*Binding Specificity Analysis of the FUT8 Active Site, A Computational Study*

# POSTERS

Shannon Waye, Psychology
*Non-Invasive Electrical Stimulation of Cells Chemically Predisposed for Excitability as a Cell Type-Specific Treatment for Depression*

**Poster Session 2**

Kiana Alfaro, Biology
*Visualization of interactions between chemoautotrophic symbionts and gill epithelial cells of marine molluscs using confocal microscopy*

Emma Burnett, Biochemistry
*Smart Fats: Investigating Phospholipid Influence on Omega-3 Bioavailability*

Gordon de Jong, Marine Institute
*Applying environmental DNA metabarcoding in Canadian marine conservation areas*

Méliane Deshaies, Ocean Sciences
*Ecosystem services performed by the sea cucumber Cucumaria frondosa: a look at carbon storage in Atlantic and Arctic populations*

Matt Drodge, Biology
*Exploring the use of marine yeasts from coastal Newfoundland for beer fermentation*

Abigail Earle, Biology
*Assessing the Relationship Between Climate Change and Body Size of Small Mammals in Canada's Boreal Forest*

# POSTERS

Rachel Forbes, Ocean Sciences
*Greenland shark (*Somniosus microcephalus*) local abundance estimates in the Eastern Canadian Arctic*

Lauren Gover, Biology
*Population structure of the northern sea cucumber around a nursery ground in the Canadian Arctic*

Kenzie Grace, Psychology
*Legacies of Stress: The Impact of Anxiety-Like Behaviour on Offspring*

Laura Grasmeyer, Biochemistry
*The Effects of Fructose Consumption and Sex on Erythritol Synthesis*

Kajal Gupta, Biology
*Multiomics analysis to discover novel antibiotics in Streptomyces*

Jenna Hanrahan, Chemistry
*Magnetic resonance imaging to detect structural brain changes in Huntington's disease: a review from mouse models*

Zoey Healey, Psychology
*The Impact of Marital Breadwinning Roles on The Likelihood of Being Hired*

Mikayla Hickey, Biochemistry
*Forget the Fructose? Investigating Sex, Diet, and Exercise-Related Differences in Glycemic Regulation in Mice*

# POSTERS

Alyssa Janes, Biochemistry
*The effect of probiotics on Blood-Brain Barrier integrity and the blood lipidome in a pre-tangle rat model of Alzheimer's Disease*

Madison Lasaga, Psychology
*I See Dead People: Measuring the Severity of Horror Media-induced Intrusive Memories*

Drew Locke, Biochemistry
*Metabolic biomarkers of neurodegeneration in a novel mouse model*

Courtney Loveless, Psychology
*What's the model got to do with it? A comparison of inferences from the Common Fate and Actor-Partner Interdependence Dyadic modeling approaches for relationships research*

Elizabeth Mack, Biology
*Reconstructing Historical Seabird Populations and Viral Exploration Using Sediment Analysis*

Sashwat Prasadh, Physics and Physical Oceanography
*Resolving Age Discrepancy: Stellar Merger and Evolution of Three Galactic Cepheid Binaries*

Emma Rodgers, Psychology
*The Effect of Gut Probiotic Supplementation on Microglial Activation and Peripheral Blood Inflammation in a Pretangle Animal Model*

# POSTERS

Seyed Mohammad Taheri Ghahfarokhi, Computer Science
*BacTermFinder: Bacteria-agnostic Comprehensive Terminator Finder using a CNN Ensemble*

Corrie Vincent, Biology
*Function of the concanamycin phytotoxins in the potato common scab pathogen* Streptomyces scabiei

Nana Zoghbi, Ocean Sciences
*Organic matter relative composition control oil-spill response efficacy*

**Poster Session 3**

Hallie Arno, Ocean Sciences
*Consequences of interbreeding between farmed and wild salmon under climate change: effects on thermal tolerance*

Catherine Barrett, Kinesiology
*Brain Plasticity, Maternal Physiology, and Exercise Science: A Scoping Review*

Kavi Heerah, Environmental Science
*A call for improved monitoring in small systems across the northern peat and boreal environment*

Nur Adila Puteri Irwan, Biochemistry
*Investigating the potential of Roselle improving the shelf-life of meat*

Wanyue Li, Biology
*Regulation of plant pathogenicity in Streptomyces scabiei*

# POSTERS

Mary Londero, Ocean Sciences
*Integrating scientific and community knowledge for marine conservation through the I-ADApT frame: a Burgeo, NL case study*

Kyla Malayang, Psychology
*Receiving feedback for newly learned material interacts with environmental context to influence judgments of learning (JOL) and recall performance*

Amy Mitchell, Chemistry
*Iron Catalysis for the Conversion of Carbon Dioxide*

Kelsey Molloy, Biochemistry
*The Impact of a High Omega-3 Diet on Kidney Fatty Acid Composition in a Schizophrenia-Induced Maternal Immune Activation Model*

Leila Nazari, Chemistry
*Spontaneous Au Nanoparticle Electrogeneration/Poly(9-vinylcarbazole) Electropolymerization Thin Films at three different Immiscible, Polarizable Liquid/Liquid interfaces*

Mahammed Zaid Patel, Biochemistry
*Unravelling somatic cell piRNA-guided gene regulation: protein-RNA-protein Interactions in piRNA-MIWI and piRNA-MILI silencing complexes*

Chloe Penney, Chemistry
*Non-targeted screening of unknown per- and polyfluoroalkyl substances in cosmetics and human plasma using ion mobility-mass spectrometry*

# POSTERS

Rebecca Ralph, Biology
*Development of machine learning methods to estimate local fluid flow environments surrounding marine pelagic organisms*

Arshad Ali Shaikh, Biology
*Deciphering the role of a pleiotropic regulator in* Streptomyces clavuligerus

Amy Stephenson, Chemistry
*Sex differences in metabolite concentrations in the mouse placenta*

Madelyn Swackhamer, Biology
*Elucidating the Role of cpe and 2-Hydroxymethylclavam in Clavulanic Acid Biosynthesis in Streptomyces Species*

Eshra Tabassum, Biochemistry
*Analyzing amino acid-sugar π-interactions formed by carbohydrate- active enzyme using computational modelling*

Kyle Warren, Biochemistry
*GlycoRNA Energy Landscapes: Implications on Large-Scale GlycoRNA Behaviour*

Kera Whitten, Ocean Sciences
*Spatial Mapping and Reproduction Output of a Large Colony of Deep-Sea Coral*

Cole Winsor, Biochemistry
*Quantifying the effectiveness of dietary precursors on creatine synthesis in Yucatan miniature piglets*

# POSTERS

Olivia Wyper, Chemistry
*Sea-ing Things Differently: Discovering Uses for Seaweed*

Nidhi Yadav, Environmental Science
*Unlocking the mysteries of microbial carbon pump in the Northwest Atlantic Ocean through optical lens of dissolved organic matter*

**Poster Session 4**

Olivia Bishop, Psychology
*The Prevalence of Aggressive Obsessions in Youth with Obsessive-Compulsive Disorder: A Meta-Analysis*

Matthew Caines, Psychology
*Increasing Information Elicitation: An Evaluation of the Model Statement, a Mock Transcript, and Teach to Talk on Information Yield and Recall Accuracy*

Mehzabin Chowdhury, Ocean Sciences
*Effect of Vibrio anguillarum infection on lumpfish (Cyclopterus lumpus) gut microbiome using full-length 16S rRNA amplicon sequencing*

Yuthika Jalim, Ocean Sciences
*Interactions between a passive suspension feeder and an active filter feeder: competitive or complementary?*

Wanglong Lu, Computer Sciences
*Visual Style Prompt Learning Using Diffusion Models for Blind Face Restoration*

# POSTERS

Isobel McMahon, Psychology
*Perceptions of Cannabis Consumption During Pregnancy and Lactation: A Patient Informed Survey*

Thomas O'Brien, Biochemistry
*Is Maternal Exposure to Polyethylene Micro and Nanoplastics Causing Placental Dysfunction?*

Lesley Piercey, Biochemistry
*Computational Insights into Bacteria Membranes for Antibiotic Discovery*

Molly Pomeroy, Biochemistry
*From Tap to Tax: Investigating Beverage Choices, Water Attitudes, and Sociodemographic Impacts of the NL SSB Tax*

Laura Priddle, Psychology
*Understanding the Role of the MECP2 Nuclear Protein and its Implications in Huntington's Disease Treatments*

Sushmitha Ramakrishna, Biochemistry
*CSDE1 as regulator of the miR-20a-5p/TMBIM6 Axis in Melanoma*

Alison Randell, Psychology
*Examining the contributions of sex chromosomes and hormones on the sex bias in the maternal immune activation rodent model of autism spectrum disorder*

Lily Reid, Psychology
*The Effects of Preconception Stress Exposure on Subsequent Generations*

# POSTERS

Lauren Ringer, Chemistry
*Early life exposure to micro- and nanoplastics*

Katelyn Ryan, Psychology
*Behavioral Examination of Healthy Huntingtin gene Knockout in Adult Mice*

Somayeh Saliminasab, Earth Sciences
*Influence of Cations Type on Microplastics Deposition to Quartz Sand*

Sogand Sasanmoghadam, Biochemistry
*Antibiotic Impact on Bacterial Growth*

Oladapo Simeon, Biology
*Microbiology of a serpentinizing environment in the Tablelands, NL, Canada*

Rachael Stephan, Ocean Sciences
*Photosynthetic acclimation to static low irradiance and spectral quality in the kelp* Laminaria digitata

Ian Tompkins, Chemistry
*Characterizing iron binding ligands in the ocean using Immobilized Metal Affinity Chromatography*

Ella Vivian, Ocean Sciences
*Characterization of Microplastics Collected by a Sediment Trap in the Gulf of Mexico*

# POSTERS

Mary Whelan, Earth Sciences
*Signs of Life at Sites of Terrestrial Serpentinization - An Analog Study for Ultramafic Celestial Bodies*

Kati Whelan, Psychology
*Implementing Digitized Measurement-Based Care in NL: Exploring Provider and Patient-Partner Perceptions and Experiences with the Digital Platform*

## Poster Presentation Abstracts

## Session 1

### Haley Adams, Chemistry

*Impact of exposure to environmental pollutants on placental metabolism*

For a healthy pregnancy, the placenta needs to meet the metabolic demands of the fetus and supply it with sufficient oxygen and nutrients. Our group has recently shown using NMR-based metabolomics that genetic deficiency and environmental exposures can perturb the metabolic profile of the placenta, resulting in adverse pregnancy outcomes. This study aims to evaluate the effects of exposure to persistent organic pollutants, legacy and novel per- and polyfluoroalkyl substances (PFAS), on placental metabolism. Placental tissue samples were collected from healthy control pregnant CD-1 mice and mice exposed to perfluorooctanoic acid and fluorotelomer ethoxylates throughout gestation. The tissue was flash frozen in liquid nitrogen and stored at -80°C. Metabolite profiles were determined using $^{1}$H high-resolution magic angle spinning magnetic resonance spectroscopy on a Bruker 600 MHz spectrometer with a 3.2 mm MAS solid-state NMR probe. Data was analyzed using MestReNova and MetaboAnalyst. The relative concentration of several metabolites that are essential nutrients for fetal development were found to be significantly altered in the PFAS-exposed groups. This study adds to the growing literature that has demonstrated the significant impact of environmental pollutants on placental function and emphasizes that efforts should be made to minimize exposure to pollutants during pregnancy.

Arezou Arvand, Biochemistry

*Unraveling the role of GRP75 in siRNA mediated gene silencing*

RNA interference (RNAi) is a pivotal mechanism for cellular homeostasis, utilizing small non-coding RNAs to control gene expression post-transcriptionally. While the role of protein chaperones like HSP90 in siRNA pathway facilitation is established, the specific function of GRP75, a member of the HSP70 family, remains less understood. Building on previous findings that implicate GRP75 in RNA viral replication and dicer complex interactions, our study aims to elucidate the precise role of GRP75 in siRNA-mediated gene silencing, particularly its involvement in mitochondrial siRNA trafficking in mammalian cells. We employed mitochondrial fractionation, siRNA transfection, and immunoprecipitation, followed by western blot analysis, to explore the interactions between GRP75 and siRNA pathway components. Our results indicate that GRP75 knockdown affects the expression of Dicer and AGO2 and reveals a direct interaction between GRP75 and AGO2. Furthermore, the detection of AGO2 in mitochondrial fractions suggests a novel aspect of GRP75's role in the mitochondrial import of siRNA pathway proteins. These insights advance our understanding of the RNAi mechanism and underscore the significance of chaperone proteins in gene regulation.

Sepideh Azari, Biology

*Exploring Guppy Fish: Gene Expression Dynamics, Reproductive Strategies, and Environmental Adaptations*

The guppy (*Poecilia reticulata)*, a small live fish native to Trinidad and Tobago, Venezuela, and Guyana, has become globally widespread due to its use as a mosquito repellent and popularity in the aquarium trade. This species has been used as a model in genetics, invasion biology, ecology, and medicine, owing to its availability, prolific reproduction, viviparity, and sexual dimorphism. Our study explores guppy gene expression differences between genders and reproductive stages, alongside the effects of fasting, food intake, and epigenetic changes on genes involved in both feeding and reproduction. Additionally, we investigate the influence of temperature on food intake and gene expression, genes involved in feeding and reproduction. Our findings shed light on the intricate molecular mechanisms governing guppy embryonic development and unveil relationships between feeding, epigenetics, reproduction, and nutritional status, particularly in females. Despite limitations such as cohort singularity and shared gene expression data usage, our research sets the stage for future investigations into hormonal regulation across vertebrates, aiding our understanding of evolutionary adaptations and ecological dynamics.

Artho Baroi, Biology

## *Isolation and characterization of the plant-pathogenic Streptomyces spp. in Newfoundland*

The genus *Streptomyces* comprises Gram-positive, filamentous, spore-forming Actinobacteria that play a pivotal role in both ecology and medicine by producing bioactive specialized metabolites. Despite their ubiquitous presence in soil and aquatic environments, only a small fraction of Streptomyces species (~1%) are plant pathogens. Common scab (CS) is an economically important disease that is caused by *Streptomyces* species and affects potato and other root crops. The disease is characterized by the presence of necrotic scab-like lesions with a corky texture on potato tubers, and these lesions impair the quality and, consequently, the market value of the affected crop. The economic impact of CS on the potato industry in Canada is estimated to range between $15.3 and $17.3 million dollars annually. The occurrence and severity of the disease can vary between potato fields, within individual fields, and from year to year at the same location, and currently, no potato varieties are commercially available with complete resistance to the disease. Several different species of *Streptomyces* are known to cause the disease, and the thaxtomin A phytotoxin is a key pathogenicity factor that is produced by most CS pathogens. Though potatoes and other root crops are widely grown in Newfoundland, there is currently little known about the CS pathogens that are present and their virulence mechanisms. In this study, Streptomyces species will be isolated from CS lesions on beet, turnip, carrot, and potato tubers grown in different regions of Newfoundland. The strains will be taxonomically characterized, and their ability to produce the known virulence factors associated with CS will be assessed. The results of this work will provide new insights on the types of pathogens that contribute to CS in Newfoundland and will assist in the development of control strategies that reduce the impact of the disease on growers.

Bahareh Bastan, Chemistry

*Electrochemically controlled facilitated $Fe_2^+$ transfer investigations using trioctylphosphine oxide ligand at an immiscible micro water/1,2-dichloroethane interface*

The growth of phytoplankton in the ocean is essential to the global carbon cycle; however, they are often hindered by the scarcity of bioavailable iron. Given iron's limited solubility, phytoplankton have evolved to utilize specialized ligands for iron acquisition, underscoring the significance of understanding ligand-iron interactions. This study introduces a novel approach employing a micro-liquid interface to explore the complexation reactions of iron utilizing trioctylphosphine oxide (TOPO) as a model ligand. The complexation dynamics of TOPO with Fe(II) ions were meticulously examined through an electrochemically driven ion-transfer mechanism. The utilization of differential pulse voltammetry in conjunction with established thermodynamics of facilitated ion transfer provided insight into $Fe_2^+$-TOPO binding interactions. The findings reveal notable differences in the complexation behaviour of TOPO compared to traditional ligands, offering a new perspective on its potential applications in environmental and industrial processes. The complexation dynamics of TOPO with Fe(II) contribute to our understanding of its potential environmental and industrial applications. This study builds upon existing research, emphasizing the novel application of TOPO in facilitated ion transfer investigations towards transition metals like iron.

Justine Bissonnette, Chemistry

*Characterization and Quantitation of Microplastics in the Blood of Canadian Mothers by Pyrolysis Gas Chromatography-Ion mobility mass spectrometry*

Nano- and microplastics (MNPs) are ubiquitous environmental contaminants and there has been a growing concern for how exposure to plastic particles impacts human health. In particular, there is concern regarding the potential impact of plastic particles in maternal blood on fetal growth and development. Although recent studies have detected microplastics in human blood, limited research exists on the quantification of plastics in pregnant women's blood, and there is little information on the plastic additives and other small molecule pollutants transported by MNPs. This study employs a recently developed method to extract microplastics from whole blood and characterize them using pyrolysis gas chromatography-ion mobility mass spectrometry. A pilot study, including a small set (n=5) of maternal blood samples collected at the General Hospital in the Health Sciences Centre at Memorial University of Newfoundland, is used to evaluate the potential of this method for the characterization and quantitation of microplastics and their additives. Five plastic types, including polyethylene (PE), polyethylene terephthalate (PET), poly (methyl methacrylate) (PMMA), polypropylene (PP), and polystyrene (PS), are targeted in this study. The challenges of targeting polyvinyl chloride (PVC) will also be discussed in this contribution.

Nicole Careen, Psychology

*Abstract for Evaluating Undergraduate Students' Opinions On a Pilot Informational Program: The Psychology Pathways Program.*

This study evaluates undergraduate students' opinions on the Psychology Pathways Program (PPP), a pilot informational initiative implemented at Memorial University of Newfoundland and Labrador (MUN) to address the perceived lack of timely access to career guidance and preparedness for post-graduation. Drawing on literature highlighting students' concerns about inadequate career information and the efficacy of individual development plans (IDPs) in fostering goal-setting and self-efficacy, the PPP integrates elements of career seminars and mentorship. I conducted a program evaluation by surveying second-year psychology/behavioral neuroscience majors who participated voluntarily in the PPP, assessing their opinions on program effectiveness and areas for improvement. Students' responses to survey questions about career readiness, accessibility to information, goal setting and monitoring, and overall perceived benefits and barriers. Preliminary findings suggest positive perceptions regarding usefulness of the program and mentorship value. These results will be used to inform best practices for second-year students and may also be extended to other departments within the Faculty of Science.

Marcela Castaño Rodriguez, Biology

*Small-scale biophysical interactions between marine pathogens and larval bivalve hosts*

The swimming behavior of planktonic organisms plays a crucial role in their survival and success in the water column, and it is not surprising that it may also influence infectious processes within aquatic environments. From the perspective of pathogenic bacteria, the ability to scavenge for nutrients and find hosts requires a multitude of swimming strategies. Previous studies (Stocker et al., 2008; Garren et al., 2014) have demonstrated how many marine bacteria exhibit chemotaxis, swimming towards chemical cues exuded by potential hosts and nutrient sources. This pathogen-host system is understood for some marine systems, such as tropical corals and common pathogenic *Vibrio* species, but likely occurs in a wide range of marine environments. An additional complexity occurs when the potential host is free-swimming, like the larvae of many marine invertebrates like oysters. Oyster larvae serve as typical hosts for *Vibrio coraliiticus*, resulting in substantial aquaculture losses (Dietrish et al. 2022). Our study aims to elucidate how pathogen-host encounters occur when the host, like the oyster larva, is motile. The local flow created by the host's swimming and feeding may significantly alter bacterial encounters and infection success, by altering both the fluid environment and the chemical cue field around the host. Here, we show how we will quantify the local flow fields around swimming larvae at different life stages and employ state-of-the-art imaging and flow quantification techniques to analyze the dynamic fluid flow created by swimming larvae. We hope that our results bring a novel perspective to infectious processes in aquatic environments.

Kailee Clark, Chemistry

*Multi-year monitoring of organic carbon dynamics: using fluorescent dissolved organic matter to track high export fluxes in the North Pacific*

Previous studies along the Line P transect in the North Pacific have shown sporadic high carbon flux events at depth with high spatial variation. These events have been observed during seasons of high productivity (spring and summer) with the carbon signatures returning to expected by the winter, indicating significantly high rates of removal in this region. Optical analysis of fluorescent dissolved organic matter (FDOM) samples is used to characterize the fractions of carbon that are produced at depth. Assessments of dissolved organic carbon (DOC) to total organic carbon (TOC) ratios are used to determine the relative contribution of microbial transformations and sinking (particulate) biological materials to this carbon pool, allowing further understanding of long-term carbon storage in this region.

Heather Coleman, Psychology

*Intergenerational effects of preconception stress: predator exposure and ranked breeding on mice offspring behaviour*

Recent literature has shown that not only does predator stress impact an individual, but the anxiety levels of the parents can also impact subsequent generations. In this study, F0 mice were exposed to a live rat or an empty chamber (predator stress or control) and assessed for anxiety-like behaviour (ALB) with an Open Field Test (OFT). Parental mice were ranked and bred based on the results of the OF test (high and low ALB). In adulthood, all F1 mice were exposed to a live rat and then underwent a behavioral battery consisting of OFT, Elevated Plus Maze, Social Interaction Test, Light-Dark Box, Forced-Swim Test, and Novelty-Suppressed Feeding Test. Analysis of results is ongoing to assess ALB, depressive-like behaviour, and social behaviour based on parental anxiety and condition.

Julia Craig, Human Kinetics and Recreation

*Exploring Patients' Experiences Accessing Fertility Information and Services: A Journey of Advocacy and Empowerment*

Infertility is a prevalent phenomenon that affects an estimated 8 to 12% of people worldwide. The underlying causes of infertility are complex, with the etiology influenced by non-modifiable and modifiable risk factors. Infertility-related modifiable risk factors, such as sedentary behaviour, eating habits, and drug and alcohol use, have been widely studied. However, it is not well known to what extent individuals are aware of these factors or how they may contribute to their reproductive health during the waiting period to see their fertility physician. Along with a lack of knowledge regarding the awareness of modifiable risk factors among the infertility patient population, there is also an absence of research engaging patients within the study design and creation process. This lack of patient-oriented research is problematic because patients offer lived knowledge, experience, and insight into the condition or phenomenon of interest, which are invaluable in designing and directing research studies and the relevance and dissemination of research findings. This presentation will outline the proposed study and discuss the need for infertility research and patient-oriented research. The author will also discuss the proposed methods and anticipated results and outcomes throughout the presentation.

Kayla Crichton, Biochemistry

*Evaluation of Canada's first tax on sugar-sweetened beverages: pretax analysis of sugar-sweetened beverage consumption and overall diet quality of adults in Newfoundland and Labrador using the Healthy Eating Food Index (HEFI)-2019*

Sugar-sweetened beverages (SSBs) are a significant source of added sugar in Canadian diets, with Newfoundland and Labrador (NL) leading per capita intake. NL introduced Canada's first SSB tax of $0.20 per liter on September 1, 2022, to address associated health risks. This study aimed to assess pre-tax SSB intake, diet quality, and demographics to understand the tax's impact. Participants (n=1223), 19 years and over, living in NL, were recruited through a combination of strategies for this cross-sectional study. An online survey detailing demographics and beverage habits was completed, with a subset (n =173) undergoing a dietary assessment using the Automated Self-Administered 24-hour Dietary Assessment Tool (ASA24). Diet quality was evaluated using the Healthy Eating Food Index 2019 (HEFI-2019). Participants, comprising 26% males and 74% females, resided across urban (62%) and rural (38%) areas. SSB consumers (n = 149) reported an average daily intake of 535 ± 575 mL. Notably, HEFI-2019 scores did not significantly differ between SSB consumers (35.4) and non-consumers (34.7). In summary, NL residents exhibit high SSB consumption, but there were no differences in HEFI-2019 scores between consumers and non-consumers. Future research will explore the interplay between SSB intake, diet quality, and sociodemographic factors.

Shrabontee Deepanwita, Psychology

*Identifying the Significance of Sex Hormones, Sex Chromosomes and Maternal Immune Activation in a Preclinical Murine Model of Autism Spectrum Disorder*

Autism Spectrum Disorder (ASD) is identified by communication difficulties and repetitive behavioral patterns, with a higher prevalence in males. Understanding ASD's etiology necessitates scrutinizing the impact of sex chromosomes and sex hormones in prenatal phases. Rodent models, especially Maternal Immune Activation (MIA), reveal sex- dependent deficits, emphasizing males' vulnerability and shows how neurodevelopmental complications could be linked to a mother's immune system being stimulated by gestational ailments. About 55% of ASD risk is attributed to environmental factors. This study explores the relationship between sex chromosomes, gonadal hormones, and ASD. Four core genotype murine model with sex chromosomes (XX or XY) exposed to a saline versus poly IC treatment is employed to examine the behavioral and neurodevelopmental aspects.

Deepal Deshpande, Biology

*Cause of DNA packaging variation in Gene Transfer Agents*

Gene transfer agents (GTAs) are bacteriophage-like particles present in some bacterial species that package host DNA and transfer it to other cells. GTAs increase gene flow within a population of bacteria, however there are variations among GTAs in different species in terms of the selection of DNA for packaging and transfer. In *Rhodobacter capsulatus*, packaging is random across the entire genome. But in a related bacterium, *Dinoroseobacter shibae*, there are discrete regions that are highly packaged and others that are packaged to a smaller extent. The cause of this bias is unknown, but in bacteriophages, from which GTAs evolved, a protein known as the small terminase (TerS) is responsible for DNA recognition and subsequent packaging. Therefore, it is possible that the TerS in *D. shibae* preferentially binds to certain genomic regions, resulting in increased packaging of these regions and less packaging of other regions. My research is focused on studying DNA binding by the *D. shibae* GTA TerS and its potential recognition of specific DNA sequences. This is a first step towards understanding the cause(s) of the differences in DNA packaging in the different species.

Isabella Doody, Psychology

*Evaluation of Predator Stress on Anxious Behaviours Across Generations*

Traumatic events can have lasting behavioural, molecular, and physiological effects on the individual. Additionally, traumatic experiences of parents can be 'passed on', and thus change the behaviour of subsequent generations. Recently, researchers have shown an interest in preconception stress, and its transgenerational effects on anxiety-like behaviour. The current study examined how parental preconception predator-stress affects the behaviour of both the first filial (F1) and second filial (F2) generations. We exposed male and female mice (F0) to a live rat (predator stress) or control (non-predator) condition for five minutes. Behaviour was measured during the rat exposure test (RET). Two days later, all mice underwent the Open Field Test (OFT), and rearing frequency was measured to quantify anxiety levels. Based on OFT scores, all mice were ranked on a scale ranging from most anxious to least anxious. Within each group (Parental Stress/Control) high-anxiety males were bred with high anxiety females, and low anxiety males were bred with low anxiety females. Behaviour of the offspring (F1) was assessed during adolescence (OFT, Elevated Plus Maze) and again in adulthood (Rat Exposure Test) following a mild stressor. Data analysis is still ongoing. The current research is imperative to the understanding of the etiology of stress-related psychopathologies.

Rahana Ebrahim, Ocean Sciences

*The single chambered decapod crustacean heart may function as a "multi-chambered" organ*

The open circulatory system of decapod crustaceans is described as highly complex; a single chambered ventricle delivers haemolymph into seven arterial systems that further divide into "capillary-like" vessels. Regional haemolymph flow is controlled via cardioarterial valves at the base of each artery. Recently published research using Cancer pagurus shows that the internal structure of the crab heart is not a simple open ventricle, but rather is divided by longitudinal myocardial folds. We used the American lobster, *Homarus americanus*, to investigate the functional morphology of the decapod heart to determine if these myocardial folds may aid in regional haemolymph flow. Lobsters were scanned in situ using Micro Computed Tomography (Micro CT), and Echocardiography (ECG), allowing us to reconstruct the internal structure of the heart in 3D and investigate the effects of hypoxia on regional contraction of the heart. We found that like the crab heart, the internal structure of the lobster heart is divided into a series of "pseudo chambers." A typical bradycardia was observed during hypoxic exposure, our preliminary results showed the "pseudo chambers" may be differentially contracting during a single cardiac event. We are currently analysing the data to determine if this aids in differential/regional haemolymph flow. These findings could not only further our knowledge of the field of crustacean physiology, but drastically change our understanding of the control mechanisms in open circulatory systems.

Abi Fleming, Psychology

*Consequences of Wildtype Huntingtin Reduction on H3K9me3 Alterations in Huntington's Disease*

This research delves into the consequences of reducing wild-type huntingtin (wtHtt) in neuronal and glial cells whilst keeping in mind the transcriptional dysregulation that underlies Huntington's disease (HD) etiology. The histone modification protein H3K9me3 plays a key role in silencing gene expression through maintaining the structural integrity of tightly regulated and transcriptionally inactive heterochromatic regions, central to regulating genome stability. The study employs immunocytochemical techniques to analyze H3K9me3 expression in both neuronal and glial nuclei from rat hippocampal cultured cells subjected to wtHtt knockdown using siRNA[MP1] treatments. Results reveal a significant decrease in H3K9me3 nuclear intensity in both wtHtt-knockdown neurons and glial cells compared to control cells across several days in vitro (DIV). These findings suggest a potential link between wtHtt loss and altered heterochromatin structure, which may contribute to transcriptional dysregulation and neurodegeneration associated with HD. Understanding the molecular underpinnings of wtHtt loss of function will offer insight that could inform targeted therapeutic strategies to selectively preserve neuroprotective wtHtt levels or modulate H3K9me3 levels to restore proper chromatin structure to slow the neurodegenerative processes associated with HD. Overall, this thesis probes the complex relationship between H3K9me3-mediated histone modifications, and wtHtt reduction consequences, paving the way for future investigations and therapeutic interventions.

Lucas Fowler, Cognitive and Behavioural Ecology

*Differential Epigenetic Biomarkers in the DNA of Heterosexual and Homosexual Men*

Our research project will explore the development of sexual orientation in men through biological and environmental factors. Sexual behaviour toward the same sex is present in many animals, including insects, dolphins, and humans. Studies on mice suggest that prenatal sex hormone increases affect sexual orientation development; however, it is ethically challenging to conduct similar experiments in humans. Thus, our project focuses on understanding the interactions between genetics and environmental factors on sexual orientation development. Specifically, we will be looking at epigenetic contributions, in which environmental factors change the structure of cells and contribute to changes in gene activity across the genome of heterosexual and homosexual men. Changes to gene activity may affect sex organ development and hormone signalling previously linked to sexual orientation. To test this, we performed whole-genome DNA methylation, which quantifies the epigenetic modification of cells, on saliva samples collected at pride events. Our project has two objectives: (i) To identify differences in epigenetic patterns between heterosexual and homosexual men and (ii) To evaluate whether these differences are associated with functions that may contribute to sexual orientation development. Through this research, we aim to uncover more about the complex factors that influence sexual orientation in men.

Kailey Genge, Biochemistry

## *The effects of fructose consumption and exercise on metabolic risk factors*

Human average sugar intake has increased drastically since historic times. From consuming sucrose (a molecule of 1 fructose and 1 glucose) solely from naturally, unprocessed foods such as fruits or honey, to refined sugar and in ~1970, the introduction of high fructose corn syrup (HFCS), which corresponds to the global surge in obesity and cardiometabolic risks. While fructose utilizes the glycolytic pathway similar to glucose, it bypasses rate-limiting steps and has no storage confirmation analogous to glycogen resulting in the accumulation of glycolytic and lipidemic metabolites, which is potentially the link between high fructose consumption and metabolic issues such as obesity, insulin resistance, type 2 diabetes and cardiovascular disease. The sedentary habits of today's society also likely contribute to the increased rates of these metabolic issues since any excess energy or metabolites are not being used up by the body and thus linger in the body. Thus, this study aims to determine the differences in factors that may affect the cardiometabolic risk factors such as body weight and liver weight, as well as the blood triglyceride, low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, and total cholesterol levels of a high fructose diet compared to a diet without fructose within each sex and energy expenditure group in mice. To achieve this objective, adult sex-balanced C57Bl/6J mice consumed a high-fat, high-sugar, diet consisting of either 0%, or 20% of total calories from fructose, then these diet groups were then further divided into exercise and non-exercise groups, where the exercise groups had access to a running wheel and the non-exercise group did not. Although the study is still ongoing, so far, no differences and/or interactions have been found in the blood triglyceride levels (total 0% fructose 1.356 +/- 0.150 mmol/L, and total 20% fructose 1.346 +/- 0.159 mmol/L) which signifies that a 20% fructose diet does not alter triglyceride levels concerning metabolic risk. Sex differences (8.879 +/- 2.347 mmol/L

in males vs. 5.197 +/- 1.370 mmol/L in females), diet differences (7.704 +/- 3.133 mmol/L in 0% fructose vs. 6.646 +/- 1.992 mmol/L in 20% fructose) and exercise differences (6.628 +/- 1.972 mmol/L in no exercise vs. 7.561 +/- 3.118 in exercise), as well as interactions in: sex by diet (10.13 +/- 1.94 mmol/L in the male 0% fructose and 7.629 +/- 2.157 mmol/L in the male 20% fructose group vs. 5.106 +/- 1.732 mmol/L in the female 0% fructose and 5.296 +/- 1.370 mmol/L in the female 20% fructose), sex by exercise and diet by exercise have been identified in the total cholesterol content. HDL and LDL levels are currently being analyzed.

Camilla Hollett, Biochemistry

*Beyond the surface: Computational Study of Bacterial Inner Membrane and Implications for Antibiotic Development*

Cell membranes are primarily composed of proteins and lipids, and function to safeguard and organize cells through intricate structures. These structures separate cellular components and include embedded proteins, offering potential insights for developing new methods to treat bacterial infections. The predominant lipids in the bacterial inner membrane are phosphatidylethanolamine (PE), phosphatidylinositol (PG) and cardiolipins (CL). These lipids differ in the lipid headgroup structure and number of lipid tails (i.e., 2 for PR and PG, 4 for CL). Additionally, one key protein embedded in the bacterial inner membrane is O-antigen ligase (WaaL). WaaL functions to synthesize lipopolysaccharides which are a key component of the outer membrane of Gram-negative bacteria. In the current work, we use computational biochemistry, to understand the structure of WaaL and interactions between the protein and the bacteria inner membrane. Through using computational modeling we examine the membrane properties such as curvature, thickness, area per lipid, lipid contacts and protein-lipid interactions, as well as protein specific properties such as RMAD (atomic movement), and RMSF (dynamic motion). This approach aims to enhance our understanding of antibiotic resistance mechanisms and inform the development of targeted antibiotics for *E.coli* and other Gram-negative bacterial species.

Khandoker Munira Mehjabin, Biology

*Exploring the genetic landscape of Rhodobacter capsulatus using comparative genomics of 12 strains*

*Rhodobacter capsulatus* is a representative of the group of purple, non-sulphur, photoheterotrophic bacteria, which thrive in diverse habitats across both fresh water and marine environments. It is a model organism for studying Gene Transfer Agents (GTAs), which are phage-like genetic elements that mediate transfer of cellular genomic DNA between cells. This study focuses on the comparative genomic analysis of 12 strains of *R. capsulatus,* and aims to decipher evolutionary relationships, identify unique genomic features, and elucidate functional differences among them. All selected strains have closed complete genome sequences, and my comparative analyses aim to explore various genomic aspects, including average nucleotide identity (ANI) comparisons, phylogeny, core and pan genomes, genomic synteny, GTA gene cluster conservation, GTA receptor-related gene conservations, motility gene clusters, CRISPR-Cas systems, prophages, other mobile genetic elements, restriction-modification systems, plasmids, and toxin-antitoxin modules. Through this holistic approach, I endeavor to unravel the evolutionary trajectories and functional diversity of the 12 *R. capsulatus* strains, providing valuable insights into microbial ecology, evolution, and biotechnological potential of this bacterium.

Lily Perchard, Biochemistry

*Binding Specificity Analysis of the FUT8 Active Site, A Computational Study*

Many proteins go through a process called glycosylation, in which chains of carbohydrates (glycans) are added to protein. Numerous cell processes including pathogen identification, cell-cell adhesion, cell communication, and signal transmission, are mediated by glycans. The involvement of glycans in various cell functions makes them a crucial component to study concerning health and disease. N-linked glycosylation involves the addition of a glycan to an asparagine residue of a protein. The enzyme fucosyltransferases 8 (FUT8) is involved in a particular step of N-linked glycosylation, known as fucosylation. In this reaction, fructose is added to the innermost carbohydrate of the N-linked glycan. The stability of membrane proteins and cell-cell adhesion are significantly affected by this alteration. Additionally, upregulated FUT8 is observed in various cancers and leads to cancer metastasis, migration, and invasion. As such, inhibitors for FUT8 have been suggested as a method of therapeutic drugs for cancer metastasis. The structure of the enzyme and the binding of the ideal native substrate has been provided by earlier research; however, the specificity of the active site is not well understood. In this computational study, the binding of various ligands to FUT8 is discussed. This study also discusses the implication of FUT8 inhibitors as a therapeutic agent for cancer.

Shannon Waye, Psychology

*Non-Invasive Electrical Stimulation of Cells Chemically Predisposed for Excitability as a Cell Type-Specific Treatment for Depression*

Depression is a serious condition that affects millions of Canadians each year. Although various treatments have been developed, many of them are associated with serious limitations, including slow onset of relief or dangerous side effects. This highlights the need for new treatments that can effectively and safely relieve depressive symptoms. We tested a novel experimental technique called EC stimulation, which combines non-invasive electrical brain stimulation with a drug that targets a specific type of ion channel in the frontal lobe of the brain. Together, these treatments can influence the activity of a single type of cell within a small area of the brain by making those cells more likely to release chemical signals. Targeting the frontal lobe will increase the activity of cells that have been found to be underactive in patients suffering from depression. We examined whether this kind of stimulation can reverse depressive-like symptoms in a rodent model of depression, and if this effect was related to changes in chemical signals in other parts of the brain, in order to guide further research towards EC stimulation as a simple, inexpensive, and safe treatment for depression.

## Session 2

Kiana Alfaro, Biology

### *Visualization of interactions between chemoautotrophic symbionts and gill epithelial cells of marine molluscs using confocal microscopy*

Many species of marine clams from the family *Thyasiridae* form symbioses with sulphur oxidizing bacteria, which are maintained externally on gill epithelial cells. Transmission electron microscope images suggest that host cells phagocytose and lyse symbionts to obtain nutrients. However, as this technique can only reveal two-dimensional sections of cells, interactions between host and symbionts, particularly with regards to phagocytosis and lysis, remain incompletely characterized. Here, fluorescent labeling and confocal microscopy of *T. cf. gouldi* gills are used to visualize host nuclei, actin, acidic organelles, and symbiotic bacteria. We found that DAPI stained host nuclei but not symbionts. Actin labeling using phalloidin labeled microvilli but did not show obvious phagocytotic structures. The combined use of LysoTracker and CTC to label acidic organelles and symbionts, respectively, proved problematic due to colocalization, but labeling suggested low numbers of acidic organelles (lysosomes) and active symbionts. Results obtained, along with a review of transmission electron microscope images of *T.* cf. *gouldi* gill cells, suggest that nutrient transfer pathways may involve more morphologically complex structures and potentially different processes than previously thought. In future work, single gill cells will be reconstructed using FIB-SEM to visualize host cellular structures and symbiont cells in three dimensions.

Emma Burnett, Biochemistry

*Smart Fats: Investigating Phospholipid Influence on Omega-3 Bioavailability*

Omega-3 fats, also known as n-3 polyunsaturated fatty acids (PUFAs) have been extensively studied for their positive association with cognitive, neural, and visual development throughout the developmental stages of life. The Western diet is low in many of these essential fatty acids, therefore the use of supplements such as fish oil (FO) has become more common. Previous studies have shown differences in bioavailability based on the dietary lipid consumed. However, few studies have examined the direct impact of phospholipids (PL) consumption on the redistribution of n-3 PUFA post-absorption. The aim of this study is to determine if the consumption of a phospholipid-based supplement like krill oil (KO) or the supplementation of PL with FO has a positive effect on the bioavailability of n-3 PUFA. This study will use a randomized crossover postprandial design using juvenile pigs (n=15), as models for the adolescent human digestive system. After a 12-hour fasting period, each pig will randomly receive each of the 5 test meals (FO, FO+PL, KO, n-6 PUFA, n-9 monounsaturated fatty acid) separated by a 48-hour washout period. Blood samples will be collected at baseline and then hourly for 10 hours following administration of the test meal. Plasma fatty acid analysis will be performed using gas chromatography with flame ionization detection and mass spectrometry to examine n-3 PUFA absorption and distribution. It is expected that the consumption of n-3 PUFA as PL and triacylglycerides with a PL dietary source will increase the redistribution onto PL post-absorption, therefore, increasing its bioavailability.

Gordon de Jong, Marine Institute

*Applying environmental DNA metabarcoding in Canadian marine conservation areas*

Establishing marine conservation areas (MCAs) is one of the measures taken by Canada to achieve the goal of conserving 30% of our ocean area by 2030. However, consistent monitoring is required to evaluate whether these MCAs are benefiting biodiversity. Environmental DNA (eDNA) metabarcoding is a powerful tool that can aid in surveying remote environments, including the deep ocean. Within a wider program aimed at monitoring and assessing MCAs, the goal of this project is to provide a stronger understanding of the applications of eDNA metabarcoding for monitoring MCAs in the Newfoundland and Labrador region. Specifically, we focus on how different eDNA methodologies affect the detection and quantification of marine community composition. To achieve this, we pair experimental collections of seawater samples of ~10-fold different volumes with field collections at various depths within MCAs spanning thousands of km2. COI, 18S, and 12S markers will be applied to all samples to characterize the metazoan and fish communities. This study will fill key knowledge gaps on the benefits and inherent limitations of eDNA metabarcoding methodologies to monitor Canadian MCAs, including the effects of sample volume on taxa detections. Further, our results will provide novel insights into the spatial differences in communities detected in the MCAs and remote environments, thereby informing future sampling designs. These applications of eDNA metabarcoding will contribute to the monitoring and assessment needs within Canada's MCAs now and as Canada advances the conservation goals of protecting 30% of the ocean by 2030.

Méliane Deshaies, Ocean Sciences

*Ecosystem services performed by the sea cucumber Cucumaria frondosa: a look at carbon storage in Atlantic and Arctic populations*

*Cucumaria frondosa* is a cold-water echinoderm inhabiting the sea floor of the Atlantic and Arctic oceans. This species often occurs in locally dense populations across its broad distribution range, and it has garnered attention in the last three decades as a new commercial fishery along the Canadian Atlantic coast. With industrial fisheries expanding and high demand from international markets, the exploitation of the species needs to be monitored closely to prevent possible ecological consequences. The objective of my study is to valorise the ecological importance of *C. frondosa* in Arctic and North Atlantic regions. At a population level, the large biomass could actively play a role in nutrient storage, and even possibly act as carbon sink. Quantifying the amount of carbon stored in the biomass of these populations would help emphasize their significance in ecosystem functioning and their ability to contribute to the mitigation of the climate crisis as an ecosystem service. Findings will then be used to measure the ecological cost of removing *C. frondosa* through industrial fishing. This would help guide sustainable extraction levels, inform new fisheries, including those that might develop around pristine Arctic populations, and develop arguments for their protection.

Matt Drodge, Biology

*Exploring the use of marine yeasts from coastal Newfoundland for beer fermentation*

Beer has been a part of human life for a very long time. Despite this, beer brewing has seen relatively few changes throughout human history. Attempting to streamline the brewing process, industrial breweries typically restrict the types of yeast strains they use. Currently, two main types of yeasts are used for brewing most beers, *Saccharomyces cerevisiae*, for brewing lagers, and *Saccharomyces pastorianus* for brewing ales. Microbreweries, which produce "craft" beers, are more willing to experiment with their brewing recipes to produce new styles of beers. Recognition that yeasts have a major influence on a beer's taste and quality, has driven the industry to explore the use of new types of yeasts to create new types of beer. Earth's oceans cover most of its surface, yet marine environments are largely unexplored for isolating yeasts. This study will explore areas of coastal Newfoundland to discover new types of marine yeasts. This will be the first investigation of yeast biodiversity in coastal Newfoundland and could possibly lead to the discovery of new yeast species. Ocean yeasts discovered through this project will be assessed for their potential to brew beer, potentially discovering ocean yeasts that can be used to make new kinds of beers.

Abigail Earle, Biology

## *Assessing the Relationship Between Climate Change and Body Size of Small Mammals in Canada's Boreal Forest*

Increasing global temperatures induced by climate change have prompted countless examinations of the challenges confronting species worldwide. As organisms adapt to temperature shifts by altering various traits including geographic distribution, phenology, physiology, morphology, and life history, one particularly sensitive trait emerges: body size. Across diverse taxa, body mass demonstrates a strong correlation with temperature, with anthropogenically-induced climate change showing evidence in driving reductions in mass across taxonomic groups. This trend underscores the urgency to understand its ecological ramifications. Limited information exists, however, regarding the impacts of climate change on small mammals. I investigated the trend of body mass change in three dominant boreal mammals—snowshoe hares, red-backed voles, and deer mice—in the Kluane lake region of the Yukon, Canada over four decades. I tested the hypothesis that climate change is decreasing the body mass of certain mammals due to thermoregulatory needs in warmer climates. Drawing on Bergmann's Rule, I predicted that the body mass of snowshoe hares would show a decrease with shorter winters and higher temperatures, but sheltered voles and mice will be buffered from any detectable change in body mass due to their subnivean habitat. Snowshoe hares exhibited a statistically significant decrease in spring body mass since the 1970's, whereas deer mice did not change body mass over time, and red-back voles increased in mass. This mass increase in voles is possibly due to indirect effects of climate change on resource availability. Further research is needed to comprehensively understand the effects of climate change on body size across taxa. This study highlights the importance of considering species-specific responses to warming climates and underscores the need for large-scale comparative analyses to explain patterns of variation in body size.

Rachel Forbes, Ocean Sciences

*Greenland shark (Somniosus microcephalus) local abundance estimates in the Eastern Canadian Arctic*

Greenland sharks (*Somniosus microcephalus*) are large, deep-sea sharks that have slow metabolisms, resulting in slow growth, late maturity, and the longest estimated vertebrate lifespan. These traits interact, causing the sharks to be vulnerable to overfishing. Local abundances and distributions of Greenland sharks have not been well studied, and the global population size remains unknown. Our research objective is to estimate local abundances of Greenland sharks in the Eastern Canadian Arctic and Subarctic using Baited Remote Underwater Video (BRUV) deployments. The BRUV lander systems are equipped with bait, a high-definition camera, reference lasers, and a white light source, and are dropped to the bottom of the ocean recording continuously for 6-10 hours before being retrieved. We can gain valuable information from this non-invasive study method, such as shark length, swimming speed, behaviour, and individual traits, which can then be used in models to estimate local shark abundance. It is important to evaluate Greenland shark biogeography so that this vulnerable species can be protected and be considered in the sustainability assessments of expanding Arctic fisheries.

Lauren Gover, Biology

*Population structure of the northern sea cucumber around a nursery ground in the Canadian Arctic*

The northern sea cucumber, *Cucumaria frondosa*, is an ecologically and commercially important species that is targeted by a subsistence fishery in the Canadian Arctic. The aim of this study was to characterize the size and density distribution of the population of *C. frondosa* with depth in the first characterized nursery ground in Qikiqtait, Nunavut, Canada. A remotely operated vehicle was deployed at three sites to capture video footage of the benthos from ~1.5– 11 m depth, encompassing the nursery and the shallow range of the species' bathymetric distribution. A method to superimpose virtual quadrats over still video frames was developed to quantitatively measure sea cucumber density. Density trends with depth were inconsistent across study sites, suggesting that environmental conditions and resources may be variable at different depths throughout Qikiqtait. Size measurements revealed that smaller individuals (1–5 cm length) were present at the shallow (1.5–4.5 m) and deeper (>6.5–11 m) waters but absent from intermediate depths (>4.5–6.5 m). Larger individuals (>10 cm length) were observed across all examined depth zones but primarily in the intermediate zone. This provides evidence of the spatial coexistence of juveniles and adults in relatively shallow waters, suggesting that recruits migrating from the nursery (≤2 m) may not be able find suitable habitat, may be locally outcompeted, or may not survive due to predation in that zone. This information fills a key knowledge gap in our knowledge of the ecology of the northern sea cucumber in the vicinity of nursery grounds, which is critically important to understand population metrics and sustainably manage subsistence fisheries.

Kenzie Grace, Psychology

*Legacies of Stress: The Impact of Anxiety-Like Behaviour on Offspring*

While the effect of predator stress on the individual has been well documented, it is a more recent finding that offspring of stressed parents are impacted behaviourally, biologically, and physiologically. Our current goal is to determine whether these impacts are due to the presence of the stressor or the extent of the anxiety-like response in the F0 generation. We exposed male and female mice to either a rat (PS) or an empty chamber (C) for 5 minutes. Following this, we observed their anxiety-like behaviour using the Open Field Test and ranked them based on time spent in the centre of the apparatus. They were then bred with a mate of the same rank within their condition (PSxPS, CxC). Offspring were then tested as adolescents using tests for anxiety-like, depression-like, and social behaviour. Once adults, all offspring, regardless of condition, underwent a 2-minute rat exposure, then repeated the behavioural battery previously described. Analyses are currently ongoing, however, preliminary results show significant interactions between group (PS parents vs. C parents) and parental anxiety (High vs. Low). These are particular to the adult behaviour, suggesting these effects are 'unlocked' once the offspring themselves undergo stress.

Laura Grasmeyer, Biochemistry

*The Effects of Fructose Consumption and Sex on Erythritol Synthesis*

Erythritol, a 4-carbon sugar alcohol found both in our diets as an artificial sweetener and produced endogenously, has shown promise as a predictive biomarker of coronary heart disease and type two diabetes. Previous work has identified a positive correlation between glucose consumption and eryhtritol synthesis, identifying that its synthesis occurs through the pentose phosphate pathway, a branch of glucose metabolism. Diet composition, exercise, and sex are likely to influence erythritol metabolism, however, the effect of these factors on erythritol synthesis remains largely unexplored. In this study, we investigate the potential for erythritol synthesis from fructose in mice and examine any sex-related differences in erythritol production. Fructose-containing diets were provided to male and female mice for 24 weeks, then plasma erythritol concentrations were quantified using GC-MS to determine the relationship between sex and erythritol production. With this work, we aim to develop a greater understanding of the factors that influence erythritol synthesis and its metabolism. Ultimately, insights into erythritol metabolism may help develop an understanding of erythritol's function as a biomarker of cardiometabolic diseases.

Kajal Gupta, Biology

*Multiomics analysis to discover novel antibiotics in Streptomyces*

The emergence of antibiotic resistance has drastically reduced the efficacy of antibiotics and has led to an ever-increasing demand for novel antibiotics. *Streptomyces* are gram-positive, aerobic bacteria capable of synthesizing bioactive specialized metabolites, some of which are widely used as antibiotics. Specialized metabolites are produced by a group of genes arranged in a Biosynthetic gene cluster. Genomics analysis of *Streptomyces* species has revealed an average of 30 Biosynthetic gene clusters in each species. However, only 3-5 specialized metabolites are produced in laboratory conditions, and most Biosynthetic gene clusters are silent. Genetic modifications and varied growth conditions can activate some of these silent Biosynthetic gene clusters. Subsequently, Multiomics can provide complete information on the antibiotic synthesized by *Streptomyces* under varying conditions. In this study, a *Streptomyces* species was found to synthesize a novel antibacterial compound in a specific growth condition. Therefore, we sequenced the genome of the species and examined the transcriptomics profile of the *Streptomyces* under active and non-active conditions. After that, we matched the expression of the Biosynthetic gene cluster to the metabolome of the *Streptomyces* under the two conditions. This elucidated the specialized metabolite responsible for the antibacterial activity and its corresponding Biosynthetic gene cluster.

Jenna Hanrahan, Chemistry

*Magnetic resonance imaging to detect structural brain changes in Huntington's disease: a review from mouse models*

Huntington's disease is associated with widespread brain atrophy and magnetic resonance imaging (MRI) is used clinically as a biomarker for disease progression. MRI can provide key information about both structure and function of the brain throughout the lifetime. High resolution MRI of mouse brains has become a powerful tool in Huntington's research. In this review we provide an overview of the MRI findings from mouse models of Huntington's disease. The search was conducted using PubMed and Web of Science databases up to January 2024 using the following search terms: "Huntington's disease" and "mouse" and "magnetic resonance imaging". Title and abstract screening followed by full text review yielded MRI studies of nine different mouse models of Huntington's disease. Imaging approaches used included both ex vivo and in vivo imaging, diffusion MRI, anatomic MRI and both cross-sectional and longitudinal studies. Results varied between studies and mouse models, with a majority of studies showing some regional brain volume loss in both females and males. MRI plays an important role in establishing face validity of the mouse as a model of Huntington's disease and has provided novel insights into how the Huntington's brain works and changes with disease progression.

Zoey Healey, Psychology

*The Impact of Marital Breadwinning Roles on The Likelihood of Being Hired*

Despite efforts striving for gender equality in the workplace significant differences in equality persist and societal gender norms prevail. Men remain the primary earners in 84% of dual-income heterosexual marriages (Fry et al., 2023). Researchers have proposed several theories that may explain the prevailing gender inequalities in the workplace including the glass ceiling, the glass elevator, the lack of fit model, and the role congruity theory. Many theories are based on stereotypical traits and characteristics, and how men are associated with high status positions – thus giving them a biased leg-up on women in the workplace. I propose that an important aspect contributing to the maintenance of this gender gap happens at the very beginning of the workplace process, that is, the hiring process. The present study seeks to investigate the gender biases and initial impressions that may be present during the hiring process and how an applicant's marital breadwinning status may impact their likelihood of being hired for a mid-level managerial position.

Mikayla Hickey, Biochemistry

*Forget the Fructose? Investigating Sex, Diet, and Exercise-Related Differences in Glycemic Regulation in Mice*

High fructose consumption is associated with dysregulated carbohydrate and lipid metabolism. Dysregulated carbohydrate and lipid metabolism often precede the development of type 2 diabetes and cardiovascular disease. Previous research suggests that dietary fructose alters metabolic outcomes in a sex-dependent manner. This study aimed to determine if voluntary wheel running, sex, and previous fructose exposure from the diet would impact body weight, liver weight, liver and adipose tissue histology, energy expenditure, and normal glucose and lipid metabolism. Aged C57BL/6J mice (n=64), half with access to a running wheel were fed high-fat diets containing 20% of total energy intake from fructose for 24 weeks. Comprehensive cage monitoring systems were used to measure energy expenditure by indirect calorimetry, food intake, and activity. Before necropsy, fasted mice received 0.5 g/kg U-13C-fructose via oral gavage to assess postprandial fructose metabolism. Blood samples taken via the saphenous vein were collected at baseline and 15- and 30-minutes post-gavage. When paired with a high-fat diet, high fructose consumption with or without access to a running wheel did not affect body weight or liver weight. However, males had significantly higher liver-to-body weight ratios (7.6±1.1%) compared to females (4.5±0.5%). Additionally, previous exposure to fructose from diet significantly raised blood glucose levels 30 minutes after a bolus dose of fructose was delivered. Energy expenditure differences between sexes were also observed. This preliminary data suggests that sex but not access to regular exercise impact glycemia in mice consuming chronically high levels of energy and fructose.

Alyssa Janes, Biochemistry

*The effect of probiotics on Blood-Brain Barrier integrity and the blood lipidome in a pre-tangle rat model of Alzheimer's Disease*

Alzheimer's Disease (AD), a chronic neurodegenerative disease, affects approximately 660,000 Canadians, with this number predicted to triple by 2050. Emerging evidence suggests that cognitive decline in AD is closely related to the hyperphosphorylation of tau proteins, forming clumps called tangles inside neurons. Importantly, hyperphosphorylated "pre-tangle" tau exists in the brainstem by age 20, providing a significant intervention window in AD development. One novel therapy is the manipulation of the gut-brain axis via probiotic supplementation. An imbalanced gut microbiome leads to increased intestinal barrier permeability, while AD increases Blood-Brain Barrier permeability. The result is a pathway for bacterial metabolites into the brain, promoting disease through neuroinflammation. Probiotics, which foster a balanced gut microbiome, are thought to improve barrier integrities, decrease inflammation, and improve blood lipid profiles. It is not yet known, however, if probiotics start their benefits in pre-clinical AD. The present study assesses this relationship by supplementing probiotics in a pre-tangle rat model. Specifically, changes in Blood-Brain Barrier integrity and blood lipid profiles are being investigated. Ultimately, the aim is to provide a precedent for the use of probiotics to delay AD progression and improve health outcomes.

Madison Lasaga, Psychology

*I See Dead People: Measuring the Severity of Horror Media-induced Intrusive Memories*

The “paradox of horror” contends that we enjoy horror despite being frightened. Nevertheless, many individuals find themselves feeling haunted by intrusive memories of particularly scary movie scenes. Presumably, those who enjoy the horror genre do not experience intrusive memories of horror media content as severely as those who do enjoy it. Investigating experiences of intrusive memories of horror media content could provide insight into factors (e.g., emotion regulation) which affect one’s ability to manage intrusive memories of real-life horrors. However, no measure of the severity of intrusive horror memories currently exists. Our objective is to develop and validate a scale which measures the severity of these horror media-induced intrusive memories. Our proposed subscales include distress, vividness, interference, intentionality, and perceived control. Our research team aims to develop and test a pilot set of items – using Exploratory Factor Analysis to empirically test the underlying factor structure and modify the scale accordingly. In a subsequent sample, we will utilize Confirmatory Factor Analysis (including invariance testing across horror and non-horror fans) to further validate the factor structure. By introducing this novel scale, we aim to bridge the research gap between recreational fear and the cognitive mechanisms of controlling unwanted thoughts and memories.

Drew Locke, Biochemistry

*Metabolic biomarkers of neurodegeneration in a novel mouse model*

The brain is one of the most metabolically active organs and healthy brain metabolism is critical for normal memory and cognitive function. Recent evidence suggests a link between metabolic dysfunction and neurodegenerative diseases such as Alzheimer's disease (AD). While it is challenging to determine molecular and cellular mechanisms that precede the onset of AD in humans, animal models provide an opportunity to directly study the disease pathophysiology. This study aims to study brain metabolism throughout disease progression in a novel mouse model that reproduces several clinical features of AD. Brain tissue samples were collected from the decrepit mouse model of neurodegeneration (a spontaneous mutation in a mitochondrial-associated gene) from 50 days (before disease onset) to 150 days (premature death). Healthy controls were included. Metabolite profiles were determined using $^{1}$H high-resolution magic angle spinning magnetic resonance spectroscopy on a Bruker 600 MHz spectrometer with a 3.2 mm MAS solid-state NMR probe. Data was analyzed using MestReNova. We investigated whether metabolites differed between five anatomical regions of the brain. We will also present preliminary results demonstrating changes in the metabolite profiles in the decrepit and control mice over their lifetime. The study demonstrates the promise of NMR metabolomics to study brain health.

Courtney Loveless, Psychology

*What's the model got to do with it? A comparison of inferences from the Common Fate and Actor-Partner Interdependence Dyadic modeling approaches for relationships research*

Relationships research is replete with statistical methods that allow for the study of complex interpersonal relationships. One approach known as the Actor-Partner Interdependence Model––which models the effects one partner's traits on their own and their partners' outcomes — has gained popularity, subserving other approaches such as the Common Fate Modeling approach—which allows researchers to conceptualize constructs as relational variables. These two approaches are radically different in terms of their inferences and their casual assumptions. In this study, I will argue for the equal merit of both approaches and present an illustrative comparison of these two statistical models. To do so, I will draw from an exemplar dataset looking at self-compassion—a kindful disposition toward one's self—as a predictor of self-reported motivation to correct interpersonal mistakes in relationships using a sample of 219 midlife married couples. Although the findings from both models carry the same basic message, the underlying statistical assumptions are entirely different and require consideration by researchers who are interested in the study of interpersonal relationships. This study has implications for conduct of research in this area, and for the empirical study and application to couples/relationship therapy.

Elizabeth Mack, Biology

*Reconstructing Historical Seabird Populations and Viral Exploration Using Sediment Analysis*

Preserving seabird populations is imperative, given their cultural heritage and ecological importance in eastern Canada. Seabird over-exploitation from colonists resulted in dramatic population declines during the 1800s to 1900s which had far-reaching effects in both marine and terrestrial ecosystems. While these populations have only recently begun to recover, they face a new threat – climate change. Current wildlife monitoring data for seabirds is insufficient in terms of duration and coverage to identify trends in natural and anthropogenic factors influencing population changes. To properly conserve seabirds, we must determine the historical population to distinguish between natural fluctuations in population size and more concerning, consistent downward trends. My research will use sediment from seabird islands to reconstruct historical populations over centuries to millennia. We will determine when regional seabird colonies were established as well as align the historical record with past environmental conditions to see how these populations fluctuate within warmer and colder climates. Additionally, we will explore the diversity of viruses present in the sediment samples to understand the dynamics of virus-host interactions in these environments. The findings will not only provide insights into past dynamics but will also offer critical guidance for the conservation of current seabirds.

Sashwat Prasadh, Physics and Physical Oceanography

*Resolving Age Discrepancy: Stellar Merger and Evolution of Three Galactic Cepheid Binaries*

Binary star systems are among the most important in stellar astrophysics. The two stars in a binary system are supposed to form from the same cloud of gas, and therefore, they should have the same age. However, there appears to be binary systems that show an apparent age discrepancy between the two stars. We study three such Galactic binary systems, with each system containing a Cepheid and a blue companion. We attempt to resolve this age discrepancy in the system through the theory of stellar mergers simulated as a mass accretion, and subsequent evolution applied to a single star model. Stellar evolution tracks ranging from 3 to 13 Solar masses(M0) are calculated using MESA in steps of 0.25 M0 and plotted on an Hertzsprung-Russell diagram. Based on the stage of evolution (location on HRD) we estimate that the Cepheid is younger than its companion by at least 50%, 56%, and 57% for the three Galactic Cepheids: SV Persei, RW Camelopardalis, and KN Centaur respectively. The Cepheid is consistent with a rejuvenated merger product of two stars, the coalescence of which has since evolved and appears younger than its companion. The merger model involves evolving a star from ZAMS to a certain age, accreting mass for a brief period, and then continuing evolving. Using the described methodology, the age of the merged Cepheid is matched to its companion, and thereby resolving the age discrepancy in the three Galactic binary systems.

Emma Rodgers, Psychology

*The Effect of Gut Probiotic Supplementation on Microglial Activation and Peripheral Blood Inflammation in a Pretangle Animal Model*

Alzheimer's Disease (AD) is a neurodegenerative disease characterized by memory loss, difficulty completing daily tasks, and disorientation. The causes of AD are unknown; however, environmental, lifestyle, and genetic factors may play a role. The two main neuropathological indicators of AD are amyloid beta plaques and neurofibrillary tangles of abnormally phosphorylated tau. Inflammation, in both the brain and peripheral blood, has also been identified as a key player in the progression of AD. Novel research has shown that the gut microbiome plays a key role in the development of AD via the gut-brain axis, and that gut diversity is decreased in AD. To determine the effects of probiotic supplementation on neuroinflammation and peripheral blood inflammation present in AD, the current study used a pretangle rat model which seeds hyperphosphorylated human tau (htauE14) in the rat LC. Neuroinflammation was assessed using ionized calcium binding adaptor molecule 1 (Iba-1) staining of microglial cells and peripheral blood inflammation was assessed using tumor necrosis factor alpha (TNF-a). TNF-a was significantly increased in E14 rats on a control diet compared to all other groups. Probiotics had no significant effect on Iba-1 expression. However, Iba-1 was significantly higher in E14/control diet rats compared to GFP/control diet rats. These results suggest that pre-tangle tau indeed elevate peripheral and brain inflammation and probiotic supplementation reduced inflammation associated with pre-tangle tau, at least in the blood. Keywords: Alzheimer's disease, pretangle, probiotics, gut-brain axis, inflammation, and neurofibrillary tangles.

Seyed Mohammad Taheri Ghahfarokhi, Computer Science

*BacTermFinder: Bacteria-agnostic Comprehensive Terminator Finder using a CNN Ensemble*

Terminator is a region in the DNA that ends the transcription process. Knowing the location of bacterial terminators will lead to a better understanding of how bacteria's transcription works. This might facilitate bio-engineering and support bacterial genomic studies. Currently, multiple tools are available for predicting bacterial terminators. However, most methods are specialized for certain bacteria or terminator types. In this work, we developed BacTermFinder, a tool that utilized Deep Learning models, specifically an ensemble of Convolutional Neural Networks (CNNs), with four different genomic representations trained on 46,386 bacterial terminators identified using RNA-seq technologies. Based on our results, BacTermFinder's average recall score is significantly higher than the next best approach (0.56 ± 0.19 vs 0.45 ± 0.20) in our diverse test set of five different bacteria while reducing the number of false positives. Moreover, BacTermFinder's model identifies both types of terminators (intrinsic and factor-dependent) and even generalizes to *Archea*.

Corrie Vincent, Biology

*Function of the concanamycin phytotoxins in the potato common scab pathogen Streptomyces scabiei*

Potato common scab (CS) is an economically important plant disease that occurs worldwide, including in potato growing regions in Canada. The presence of CS lesions on potato tubers reduces the quality and market value of the crop, leading to significant financial losses for growers. The soil-dwelling bacterium *Streptomyces scabiei* is distributed worldwide and is the best characterized causative agent of CS. *S. scabiei* produces several chemical compounds that have been demonstrated to exhibit toxic effects against plants. For example, the diketopiperazine thaxtomin A is the principal pathogenicity factor produced by *S. scabiei*, and its role in the development and severity of CS disease symptoms has been well established. *S. scabiei* also biosynthesizes polyketide compounds belonging to the concanamycin family, which are known to have toxic activity against plants, though their exact role in the pathogenicity of *S. scabiei* remains unclear. The purpose of this research is to investigate the function of the concanamycins in CS disease development. Mutant strains of *S. scabiei* that are altered in the production of concanamycins and/or thaxtomin A have been constructed, and the mutants along with wild-type *S. scabiei* will be used in various plant bioassays to assess the virulence phenotype of each. The results of this study will provide new insight into the molecular mechanisms of plant pathogenicity in *S. scabiei* and improve our understanding of how this organism causes disease.

Session 3

Hallie Arno, Ocean Sciences

*Consequences of interbreeding between farmed and wild salmon under climate change: effects on thermal tolerance*

Atlantic Salmon aquaculture escapees often have lower fitness than their wild counterparts due to generations of selective breeding. Hybridization between wild and domestic aquaculture fish can compound anthropogenic threats to wild populations. One such threat is warming waters, particularly for young salmon who have limited mobility and therefore limited chances for behavioral adaptation. Previous research has shown that there may be a genetic component to thermal tolerance in fish, suggesting that outbreeding from hybridization with domestic fish could change the population's ability to withstand warming temperatures. To test the differences in thermal tolerance between wild salmon, domestic salmon, and their hybrids, we measured the critical thermal maximum, or the maximum temperature that fish can withstand, and compared differences between populations in southeastern Newfoundland, Canada. Preliminary results indicate that domestic Atlantic Salmon have a lower critical thermal maximum than fish from wild rivers, suggesting that hybridization could be harmful to wild populations as the climate warms. We plan on conducting whole-genome sequencing and analyzing DNA methylation to determine which genes and epigenetic factors impact thermal tolerance. This research provides insights into the cumulative impacts of multiple anthropogenic threats to wild salmon populations.

Catherine Barrett, Kinesiology

*Brain Plasticity, Maternal Physiology, and Exercise Science: A Scoping Review*

The perinatal period is defined as conception to one year after childbirth. During this time, extreme shifts in hormones, neurochemistry, and life experience drive changes in the brain. In the maternal brain, these changes are known as perinatal brain plasticity. This scoping review will aim to explore exercise interventions and brain outcomes during reproduction. A systematic search was completed in Medline, Embase, CINAHL, PsycINFO, SportDiscuss. The key concepts of the search were brain plasticity; maternal reproductive period (preconception, pregnancy, postpartum); and exercise interventions. The search produced 2167 unique articles; 2588 duplicates were removed. Covidence software was used for the screening procedure. Following title and abstract screening 2160 articles were deemed irrelevant and removed. 7 articles moved forward to full text screening where 1 article was excluded for wrong intervention leaving 6 papers for extraction. Extraction revealed 4 out of 6 studies were conducted in rodents, 1 was conducted in both a human and a rodent model, and 1 in humans alone. Findings from this scoping review support the crucial need to investigate whether the effects observed in animal models apply to humans through future research on the connection between exercise interventions and human maternal brain plasticity.

Kavi Heerah, Environmental Science

*A call for improved monitoring in small systems across the northern peat and boreal environment*

Canada is home to boreal and peat environments; regions that are significant stores of carbon. These regions serve as sources of carbon to coastal environments. Carbon export has been increasing from boreal regions. Hurricanes reach further north with Hurricane Larry hitting Newfoundland in 2021. Storms can transport a significant amount of the annual budget of rivers. The path of Hurricane Larry allowed us to sample three catchments of varying size and landcover before and after landfall. We saw increases in carbon, colour and iron exported but the changes in export varied due to subtle landcover differences. South River, with a smaller amount of peat and wetlands experienced the greatest increase exporting 4.32 times its baseflow. Poor road conditions and the timing of the storm prevented us from sampling during the initial peak in discharge or peaks occurring after sampling. This prevents a full understanding on the fate of carbon exported. Automatic sensors are used to monitor large systems, but recent research has highlighted the importance of small systems. These small systems experience greater increases in storm fluxes due to lower catchment complexity. As storms become more frequent Canada needs to monitor the numerous small systems draining into the coastal environment.

Nur Adila Puteri Irwan, Biochemistry

*Investigating the potential of Roselle improving the shelf-life of meat*

Meat and meat products are difficult to preserve as they are susceptible to oxidative damage and microbiological growth, creating concerns about food safety and shelf life. Amid rising health concerns and customer desire for natural preservation methods, this research delves into the potential of Roselle (*Hibiscus sabdariffa*) powder extract, a natural antioxidant and antibacterial agent, as a sustainable alternative to chemical preservatives. The purpose of this study is to evaluate the preservation efficiency of Roselle powder extract in raw meat, to determine its viability as a natural preservative in the food industry. The comparative analysis includes BHT and garlic. The aim of this study is to present a scientifically supported rationale for using Roselle extract as a natural preservation solution by assessing its antioxidant and antibacterial characteristics, as well as analysing its impact on meat quality. GC-MS analysis was utilized for phytochemical profiling, whereas Total Phenolic Content and Total Flavonoid Content tests were used to quantify antioxidants. Additionally, DPPH and FRAP assays are used to assess antioxidant capability. Plate Agar Counts were used to assess antibacterial activity, and statistical analysis was performed to confirm Roselle extract's efficiency as a meat preservative. The study is currently underway, and the methodology indicated offers a thorough assessment of Roselle extract's preservation performance. The results are expected to measure the impact of Roselle extract on meat preservation and will be reported after the experimental phase is completed.

Wanyue Li, Biology

## *Regulation of plant pathogenicity in Streptomyces scabiei*

*Streptomyces scabiei* is a Gram-positive, filamentous bacterium that is predominantly found in soil. This organism is a plant pathogen that causes common scab (CS) of potato, a disease that is characterized by the presence of brown, scab-like lesions on the tuber surface. CS results in significant economic losses to potato growers by decreasing the quality and marketability of affected crops. The principal virulence factor responsible for CS disease is a phytotoxic specialized metabolite called thaxtomin A. In addition, *S. scabiei* produces other phytotoxins, secreted proteins and phytohormones that are known or supposed to contribute to its pathogenicity. MtrAB is a two-component system that has been shown to control the expression of specialized metabolites in nonpathogenic species of *Streptomyces* such as *Streptomyces coelicolor* and *Streptomyces venezuelae*. MtrAB is highly conserved in *Streptomyces*, including *S. scabiei*, and it is hypothesized that this system controls the expression of genes that produce phytotoxic specialized metabolites and other potential virulence factors in S. scabiei. The goal of my study is to investigate the importance of MtrAB in the regulation of plant pathogenicity in S. scabiei. To address this, I will construct mtrA and mtrB gene deletion and overexpression strains of *S. scabiei*, and I will assess the virulence phenotype and the production of thaxtomin A and other phytotoxins by each strain using plant bioassays and high performance liquid chromatography, respectively. The results of my study will provide new insights into the regulation of *S. scabiei* plant pathogenicity and CS disease development, and this knowledge has the potential to enable the development of novel strategies for managing CS disease in order to reduce the economic impact on growers.

Mary Londero, Ocean Sciences

## *Integrating scientific and community knowledge for marine conservation through the I-ADApT frame: a Burgeo, NL case study*

Global conservation efforts around the world have increased in recent years in part due to the signing of the Kunming-Montreal Global Diversity Framework at COP15 in 2022. This framework focuses on conserving global biodiversity by adding conservation targets for all Parties committed. These targets have made their way into Canadian policy as the country aims to conserve 25% of its land and oceans by 2025 and 30% by 2030. Consequently, conservation programs and initiatives have arisen nationally with proposed conservation projects appearing across all provinces and territories. As part of this, the South Coast Fjords national Marine Conservation Area (NMCA) in Newfoundland and Labrador has been proposed. This NMCA would be about 9,100km$^2$ encompassing five communities: Burgeo, Ramea, Grey River, François, and McCallum. This conservation effort began in 2001 with an original proposal submitted by the Town of Burgeo. Though this conservation has been on-going, information regarding the natural, social, and governance systems in the area remains limited. This research aims to fill information gaps, using a decision-support tool, I-ADApT (IMBER Assessment based on Description and responses, and Appraisal tool for Typology). By applying the I-ADApT Framework to the proposed NMCA of the South Coast Fjords, a better picture of the area is created, based on past research and current knowledge, and includes information about stressors, impacts, and responses. Highlighting the gaps in information offers a space to community members to contribute their information and demonstrate what their priorities are. This, in turn, helps guide future research in addition to informing decisions about conservation areas, with regards to the proposed South Coast Fjords NMCA.

Kyla Malayang, Psychology

## *Receiving feedback for newly learned material interacts with environmental context to influence judgments of learning (JOL) and recall performance*

Academic success refers to the achievement of educationally purposeful activities, which can contribute to the skills that post–secondary students develop. To optimize performance on an upcoming test, university students are typically recommended to (re)study to-be-learned material in a variety of environmental contexts. In preparation for academic exams, students likely restudy to-be-learned material, but may not receive informative feedback about the accuracy of the learning strategies that they applied to reach their desired level of mastery. The literature has, however, demonstrated that receiving feedback during the learning process can shape the relative effects of restudying in more than one environmental setting on subsequent memory performance. I investigated whether receiving feedback for newly learned material interacts with the effects of physical location on both prospective judgments of future memory performance (e.g., judgments of learning) and actual memory performance. To accomplish this, participants (N = 98) completed two sessions of restudying, followed by practice testing, on a list of Swahili–English word associations obtained from Nelson and Dunlosky (1994; e.g., "ROHO – SOUL"). Some participants received feedback about the accuracy of each response during practice testing, whereas others did not. Participants then completed a cued–recall test of to–be–learned material, without feedback. We found that receiving feedback for restudied material interacts with environmental context to influence both judgements of learning and cued–recall performance. This interaction was driven by significant differences in performance among participants allocated to the reinstated context groups, but not among those allocated to the reinstated context groups. We discuss implications for the interactive benefits of these factors in relation to student learning.

Amy Mitchell, Chemistry

*Iron Catalysis for the Conversion of Carbon Dioxide*

Carbon dioxide ($CO_2$) shows promise as a renewable feedstock option, with its high abundance and low toxicity supporting the desirability of its use. Beneficial materials can be produced through $CO_2$ conversion reactions with the support of catalytic systems. Iron based catalysts are of interest due to the low toxicity, earth abundance, and overall inexpensive nature of the metal. It has been found that aminobisphenolate ligands can be designed specifically for catalytic systems, adjusting their properties through structural modification for selective outcomes. Catalytic iron (III) aminobisphenolate compounds have been used for the conversion of $CO_2$ and epoxides to cyclic- and poly-carbonate products. An aminobisphenolate ligand featuring a morpholine pendant arm, has previously been studied in aluminum-containing catalysts. The morpholine group has the potential for additional stabilization in metal-based catalysts through interactions between the metal center and the oxygen of the pendant arm. This research project will focus on the study of metal complexes featuring the desirable iron (III) metal center and the aminobisphenolate ligand with a morpholine pendant arm for selective catalytic reactions involving $CO_2$.

Kelsey Molloy, Biochemistry

*The Impact of a High Omega-3 Diet on Kidney Fatty Acid Composition in a Schizophrenia-Induced Maternal Immune Activation Model*

Omega (n)-3 polyunsaturated fatty acids (PUFA) have been suggested to elicit beneficial health effects in schizophrenia (SCZ), and associated complications such as kidney disease. A typical western diet is high in n-6 PUFA and is generally associated with chronic disease development. Therefore, it is recommended to consume an optimum amount of n-3 and n-6 PUFA to maintain health. Maternal immune activation (MIA) mouse models induce infection-associated inflammation during gestation that leads to SCZ-like symptoms in adult offspring. MIA was induced in test dams on GD 14, a high or low n-3 PUFA diet was initiated after induction. Mothers and offspring continued with the diet until weaning on PND 22, offspring then switched to a regular chow diet. Offspring were sacrificed and kidneys were collected on PND 92, snap frozen in liquid nitrogen, and stored at -80℃ till further analysis. Total fatty acids were extracted from kidney samples, and transmethylated to perform fatty acid analysis using GC-FID. Despite a lack of significance, there was a consistent trend to show higher levels of n-3 PUFA in offspring from dams exposed to LPS and high n-3 PUFA, compared to the low n-3 PUFA groups. This result shows promise for an increased uptake of n-3 PUFA in offspring exposed to MIA that were fed the high n-3 diet. Our findings further suggest that exposure to n-3 PUFA during the postnatal period may be required to increase the incorporation of n-3 PUFA in kidneys to protect against oxidative stress and inflammation.

Leila Nazari, Chemistry

*Spontaneous Au Nanoparticle Electrogeneration / Poly (9-vinylcarbazole) Electropolymerization Thin Films at three different Immiscible, Polarizable Liquid/Liquid interfaces*

Nanoparticle-embedded polymers play a crucial role in various fields, including biomedicine, electrochemical sensors, electrophotography, and computer displays, owing to the synergistic effects of each component. Surprisingly, methods utilizing the liquid/liquid interface prove to be an effective and straightforward approach for creating versatile metamaterials with adjustable properties for a range of applications. Herein, we report an electrochemical method to synthesize poly (9-vinyl-carbazole)-metal nanoparticle composite thin-film at 3 interfaces between two immiscible electrolyte solutions (ITIES), including water|1,2-dichloroethane (W|DCE), water|α,α,α-trifluorotoluene (W|TFT), and a water |ionic liquid (W|IL). The liquid/liquid interface is a highly reproducible boundary where simultaneous electrodeposition of metal nanoparticles and electropolymerization of monomers can take place. In this system, 9-vinylcarbazole monomer was dissolved in the oil or IL phase, while $KAuCl_4$ metal salt was installed in the aqueous phase. The Galvani potential difference across the 25 µm diameter and large interface was controlled externally via a potentiostat using cyclic voltammetry (CV). Interestingly, the choice of hydrophobic organic solvent or IL was found to influence NPs size distribution and polymer morphology. Similarly, changing monomer concentrations also impacted film structure and nanoparticle size dispersity. These nanocomposite films will be of interest in electrocatalytic, biomedical, and energy storage applications.

Mahammed Zaid Patel, Biochemistry

*Unravelling somatic cell piRNA-guided gene regulation: protein-RNA-protein Interactions in piRNA-MIWI and piRNA-MILI silencing complexes*

Piwi-interacting RNAs (piRNAs) are small RNA molecules crucial for repressing retrotransposons, primarily within germline cells. piRNAs, along with the PIWI-class proteins MILI and MIWI, forms RNA-induced silencing complexs (RISC) that silence retrotransposons during posttranscriptional gene regulation. While the regulatory roles of piRNA-PIWIs in germline cells are well established, their function in somatic cells, governed by the interacting partners of PIWIs within the piRISC complex remains largely unknown. In our study, we employ a multi-faceted approach encompassing co-Immunoprecipitation, RNA pulldown assays, mass spectrometry, and bioinformatic analyses to unravel the intricate network of protein-protein and RNA-protein interactions intrinsic to the piRNA-MIWI and piRNA-MILI complexes within mouse somatic tissues. We aim to elucidate the assembly and composition of the piRISC complexes specific to a particular tissue/cell type, shedding light on their context-dependent roles in the post-transcriptional gene silencing. Initial findings revealed that MIWI protein is expressed in the stomach and lung, while the expression of MILI is seen in the pancreas and brain. Additionally, we aim to explore whether the regulatory mechanisms observed in somatic cells mirror those in the germline, potentially expanding the scope of piRNA-mediated control of gene expression. By addressing the composition and the function of these piRNA regulatory complexes in different somatic tissue types, our research is expected to offer valuable insights into the broader implications of piRNA function beyond the germline and advance our current understanding of RNA-based regulatory mechanisms in diverse cellular processes and animal development.

Chloe Penney, Chemistry

*Non-targeted screening of unknown per- and polyfluoroalkyl substances in cosmetics and human plasma using ion mobility-mass spectrometry*

Per-/polyfluoroalkyl substances (PFAS) are a class of persistent and bioaccumulative organic chemicals. PFAS are associated with adverse health effects, including during pregnancy and neonatal development. PFAS have been detected in the majority of blood tested in western countries. Recent studies have also found PFAS to be present in cosmetics, a potential source of human exposure. While regulation of prototypal PFAS has driven a decline in the concentrations of some PFAS, there remains a significant fraction of unknown extractable organofluorine content in cosmetics and biological media. Non-targeted screening revealed known and unknown PFAS in 25 cosmetic products available for purchase in Canada, as well as in 20 human plasma samples from pregnant people from the Avalon Birth Cohort study. A cyclic ion mobility mass spectrometer, coupled with liquid and gas chromatography (LC and GC) was used for analysis. By filtering the mass-to-charge ratio (m/z) and collision cross section (CCS) data, unknown PFAS were recognized as having relatively compact CCS for their m/z. GCMS and LCMS experiments of the cosmetics revealed perfluoroamide ethoxylates and carboxylic acids respectively. Defluorinated analogues of PFOA have been observed in maternal blood samples, but not in the group studied in the Avalon Birth Cohort.

Rebecca Ralph, Biology

*Development of machine learning methods to estimate local fluid flow environments surrounding marine pelagic organisms*

Many marine organisms exhibit behavioral and physiological responses to their physical surroundings, including characteristics of their local fluid environment, such as turbulence. In the laboratory study of pelagic life, it is therefore crucial to have a method to characterize the fluid environment surrounding organisms. Particle image velocimetry (PIV) is a technique that characterizes a fluid velocity field using tracer particles dispersed in the fluid. These tracer particles are imaged twice in rapid succession with a high-speed camera, and correlation analysis of the two images is used to estimate the velocity field. Although PIV is widely used to study organism-fluid interactions, it suffers from inaccuracy when images are of poor quality (e.g., low contrast) or when the fluid velocity field has very small-scale structure. Furthermore, PIV does not incorporate the laws of fluid mechanics. Recent developments in machine learning have raised the possibility that neural network techniques may be able to resolve these problems. In this approach, a neural network can be trained to learn the optimal mapping between experimental particle images and the associated velocity field. In this talk, I will present our preliminary results learned from developing a proof-of-concept simulated 1D PIV setup to be used as a benchmark for neural network methods currently under development. This work has the potential to provide improved velocity estimates by implicitly incorporating the laws of fluid mechanics into the flow measurement algorithms.

Arshad Ali Shaikh, Biology

*Deciphering the role of a pleiotropic regulator in Streptomyces clavuligerus*

The discovery of specialized bacterial metabolites and their use in treating diseases is considered one of the most significant advances in medicine, but the growing threat of antibiotic resistance needs to be addressed. This requires the development of new antimicrobial compounds using new approaches. The *Streptomyces* synthesize a large variety of specialized metabolites (SMs) and have numerous biosynthetic gene clusters (BGCs) responsible for their production. Based on the numbers of BGCs present in different *Streptomyces* species, it has been noted that up to 90% of specialized metabolites are not produced under laboratory conditions and are known as “cryptic” since their identities and functions are unknown. Therefore, there is a need to devise methods to activate such “cryptic” BGCs for specialized metabolite production to exploit their products. The described work focused on *Streptomyces clavuligerus*, a clavulanic acid producer, a potent β-lactamase inhibitor. In this study, a pleiotropic regulator in *S. clavuligerus* was manipulated, and its effect on different promoters, reported to affect SMs production, was observed. Our work uses traditional methods used for the genetic manipulation of *Streptomyces* to understand the regulation of the BGCs responsible for SMs production.

Amy Stephenson, Chemistry

*Sex differences in metabolite concentrations in the mouse placenta*

The placenta is an essential organ that develops throughout pregnancy to help the fetus reach its full growth potential. It is essential in meeting the metabolic demands of the fetus, supplying it with oxygen and nutrients from the maternal circulation. It is also critical in facilitating waste disposal. Placental structure and function are known to be sexually dimorphic; however, the differences in placental metabolites between male and female fetuses has not been studied. This study aims to determine whether there are sex differences in metabolite profiles in the mouse placenta. Placental tissue samples were collected from healthy pregnant CD-1 mice in late gestation (n=14). The tissue was flash frozen in liquid nitrogen and stored at -80 °C. Skin biopsies were collected for determination of fetal sex using a polymerase chain reaction for sex-determining region Y (Sry). Metabolite profiles were determined using $^{1}$H high-resolution magic angle spinning magnetic resonance spectroscopy (HRMAS MRS) on a Bruker 600 MHz spectrometer with a 3.2 mm MAS solid-state NMR probe. Data was analyzed using MestReNova and MetaboAnalyst. The relative concentration of several metabolites that are essential nutrients for fetal development were found to be significantly different between female and male placentas. This study adds to the growing literature that has demonstrated sex differences in healthy placental function and emphasizes the importance of examining both sexes in metabolomics studies.

Madelyn Swackhamer, Biology

*Elucidating the Role of cpe and 2-Hydroxymethylclavam in Clavulanic Acid Biosynthesis in Streptomyces Species*

Clavulanic acid (CA), a β-lactamase inhibitor, is prescribed with certain antibiotics to overcome some antibiotic-resistant infections. CA is a member of the clavam class of antibiotics, which includes a subclass called the 5S clavams. CA is made by fermentation of *Streptomyces* bacteria, during which a cluster of 16 genes are activated. It was recently demonstrated that when cpe, the 11$^{th}$ gene in the cluster, is overexpressed in a species of Streptomyces, a 5S clavam called 2-hydroxymethylclavam (2-HMC) is produced in media that does not permit the production of such metabolites. To investigate this finding, we have conducted metabolomic analysis on cpe knockout and overexpression strains. We will compare the metabolomic profiles of the strains to decipher the role of cpe. Additionally, we aim to create a cpe overexpression mutant for a species of *Streptomyces* that is known to produce CA but not 5S clavams. This strain will be grown in fermentation media and metabolites will be extracted using organic solvents. Production of 2-HMC by this strain will be assessed using bioassays and high-performance liquid chromatography. This analysis will help to elucidate the function of cpe in clavam production and provide insight into how 2-HMC may be involved in CA synthesis.

Eshra Tabassum, Biochemistry

*Analyzing amino acid-sugar π-interactions formed by carbohydrate- active enzyme using computational modelling*

Carbohydrate- active enzymes such as glycoside hydrolases and glycosyltransferases play an important role in the metabolism of carbohydrates such as their breakdown and synthesize, as well as being involved in cell-cell communication and immune responses. Studying these enzymes has diverse applications, including drug discovery against aberrant glycosylation or glycan-proteins related diseases, vaccine development against pathogens with glycosylated surfaces, and engineering enzymes to optimize activity. However, non-covalent interactions of these enzymes are understudied. This project aims to explore the structure and energetics of π-interactions found in active sites of glycoside hydrolases and glycosyltransferases to identify the strongest or most common contacts. To achieve this, Computational modeling software has been used to search over 300 enzyme structures, identifying sugar-protein interactions with aromatic amino acids (tyrosine, Tryptophan, histidine, and phenylalanine). Tyrosine is the most common amino acid in the active site of complexes formed by glycosyltransferases and tryptophan in glycosyl hydrolase complexes. This study aims to highlight what structural and geometric features enzymes and substrates should have for the optimal use of these enzymes to inform their applications in enzyme engineering, synthesis of glycoprotein-based drugs, and vaccine design.

Kyle Warren, Biochemistry

*GlycoRNA Energy Landscapes: Implications on Large-Scale GlycoRNA Behaviour*

GlycoRNA is a novel post-transcriptional RNA modification consisting of a chain of sugar residues (glycan) attached to an RNA nucleobase. Within our cells, glycoRNA influences intercellular communication and immune system functions. One class of RNA that has been shown to be glycosylated is tRNA. In tRNA, one glycosylation site is the modified guanine nucleobase, wybutosine (yW), where N-acetylglucosamine (GlcNAc) has been shown to be the first sugar of the glycan. Nevertheless, the conformational preferences between the glycan modified yW-72 and yW-86 (methylated and unmethylated wybutosine molecules, respectively) have not yet been determined. Computational methods are ideally situated to infer glycosylated nucleobase behaviours and structure. In the current work, density functional theory calculations were performed on both yW-72 and yW-86 with either $\alpha$- or $\beta$-GlcNAc bound. With these calculations, the possible sugar-nucleobase conformations were discovered allowing us to identify the energetic and conformational spread of the molecular orientations. Ultimately, the structural and energetic information gained from the yW conformational searches will direct complete glycoRNA molecule modelling, leading to a robust understanding of how glycoRNA behaves in the human body and its subsequent implications on human health and disease.

Kera Whitten, Ocean Sciences

*Spatial Mapping and Reproduction Output of a Large Colony of Deep-Sea Coral*

The arborescent deep-sea coral *Paragorgia arborea* is ecologically important for deep-sea ecosystems as it offers habitat-forming, long-living structures that provide protection for many species and enhance their recruitment, thus increasing biodiversity in deep-water communities in the North Pacific and North Atlantic oceans. As deep-sea environments become increasingly at risk due to anthropogenic effects such as climate change, industrial development, and ever deeper fisheries, these large habitat-forming fan corals are getting locally depleted. Additionally, *P. arborea* is a long-lived slow-growing animal, which reinforces the need to understand its life history and potential for recovery. The present study reports on previously undocumented reproductive output (average gamete production) and fecundity patterns of polyps inside a large colony that had been collected off the coast of Newfoundland during a trawl survey conducted by the Department of Fisheries and Oceans years ago. The broken coral was reconstituted and reproductive polyps, known as siphonozoids were identified and analyzed using microscopy. The unique formation of oocytes along the inside rim of individual tissue bulges were explored in addition to morphological and biochemical differences between growth zones. Oocyte density was compared across the latter to understand spatial variation in fecundity and relative to branch age and growth patterns.

Cole Winsor, Biochemistry

*Quantifying the effectiveness of dietary precursors on creatine synthesis in Yucatan miniature piglets*

Neonatal development requires a surplus of creatine to accommodate rapidly growing tissue. We have shown that ~75% of the creatine needs is synthesized by neonatal piglets, while 25% must be provided in the diet. To produce creatine, arginine is first used to make guanidinoacetate (GAA), which is then methylated by methionine. Arginine can be provided in the diet or endogenously synthesized via citrulline. To test the effectiveness of creatine precursors when fed in the diet, Yucatan miniature piglets (17–22 d old; n=40) were fed diets with added: 1) +Alanine (control), 2) +Creatine, 3) +Citrulline, 4) +Arginine, 5) +GAA; all diets contained excess methionine. Creatine synthesis was measured using 3H-methyl-methionine. Preliminary data showed that muscle creatine concentration and synthesized 3H-creatine were highest in +Citrulline piglets. These results suggest that citrulline may be the most effective precursor to increase creatine production in neonatal piglets. Further analyses into other tissues will allow us to isolate the key organs involved in creatine synthesis by analyzing trans-organ balance across the liver, gut, muscle, brain, and kidney. Since creatine synthesis requires essential amino acids, providing alternative precursors that meet the creatine demands of neonates can spare these amino acids for protein and growth.

Olivia Wyper, Chemistry

*Sea-ing Things Differently: Discovering Uses for Seaweed*

Over the last decade, it has become imperative to find alternatives to fossil fuel-based products as global warming continues to accelerate. It is only now that we face irreversible levels of climate change that scientists and researchers alike are looking for other ways of keeping up with the Earth's energy demand. One area of the world that hasn't been completely explored is our oceans, and specifically, seaweed. Seaweed, also known as macroalgae, has become more popular in the last 5 years for its novel properties, with reports of anti-cancer and anti-microbial benefits from biopolymers such as fucoidan. More recently, characterization of fucoidans have been of interest to scientists to determine what gives seaweed its unique behaviour, with greener extraction techniques also being of interest. Due to the fact that there is a large amount of variation within seaweeds, determining the structure has proven to be difficult. Variation between seaweed species exists, as well as between species due to external factors such as temperature, salinity, and wind speed, just to name a few. Advanced analytical equipment such as mass spectrometry (MS) has been employed to determine structural information of the fucoidans, which will be key to understanding its role in dermatological applications.

Nidhi Yadav, Environmental Science

## *Unlocking the mysteries of microbial carbon pump in the Northwest Atlantic Ocean through optical lens of dissolved organic matter*

Dissolved organic matter (DOM) is the most substantial pool of organic carbon in the ocean. In the open ocean DOM is predominantly produced by phytoplankton through exudation, and it undergoes sequential transformations by microorganisms. The microbial carbon pump (MCP) is a crucial mechanism in which heterotrophic bacteria transforms labile forms of DOM into stable form known as recalcitrant dissolved organic matter (RDOM). The accumulation of RDOM in deep water helps immensely in carbon sequestration. Therefore, any perturbations in the system could impact the functioning of the MCP and overall carbon inventory. To gain more insights into the MCP, we tracked a large *Phaeocystis* bloom in the Labrador Sea during May/June 2022 aboard the R/V Celtic Explorer. We utilized optical properties (i.e., absorbance and fluorescence) to identify and trace various fractions of DOM over the course of the bloom. Parallel Factor Analysis (PARAFAC), a multivariate statistical approach, was utilized to elucidate the specifics of individual fluorophore groups present in the samples. PARAFAC identified five distinct fluorescent components in 174 excitation-emission matrices (EEMs). Among these fluorophores, three components (C1, C2 and C4) exhibit humic-like characteristics, while the other two (C3 and C5) have protein-like signatures. The spatial and temporal distribution of these components serves as a proxy for various biogeochemical processes in the ocean. The relationship between the between these components and parameters such as chlorophyll-a, dissolved oxygen, and nutrients was thoroughly investigated, and provided valuable insights into crucial biogeochemical processes particularly remineralization.

## Session 4

Olivia Bishop, Psychology

*The Prevalence of Aggressive Obsessions in Youth with Obsessive-Compulsive Disorder: A Meta-Analysis*

Despite obsessive-compulsive disorder (OCD) being a recognizable psychiatric disorder, certain presentations of OCD are still highly stigmatized and misidentified by healthcare professionals. Namely, aggressive obsessions, which include ego-dystonic, intrusive thoughts and fears of accidentally or intentionally harming the self or others, are vastly under researched. With current prevalence estimates for aggressive obsessions in pediatric OCD ranging anywhere from 8.7% to 81.6%, the primary aim of the current meta-analysis was to provide the first meta-analytic estimate of the worldwide prevalence of aggressive obsessions among youth (age ≤ 18) with clinician-diagnosed OCD. A systematic review was conducted of the following databases: PsycINFO, PubMed, and CINAHL. Of the 4218 articles imported and screened in Covidence, 823 received a full-text review, with 20 studies (N = 2525) ultimately coded. Data were analyzed using a random-effects model which revealed a lifetime prevalence rate of 54.6% and a current prevalence rate of 61.4%. Mean age of the sample was found to be a significant moderator for lifetime estimates. With over half of youth experiencing aggressive obsessions in their lifetime, continuing education is required for healthcare professionals to be able to identify and properly treat this common, but often overlooked, symptom dimension.

Matthew Caines, Psychology

*Increasing Information Elicitation: An Evaluation of the Model Statement, a Mock Transcript, and Teach to Talk on Information Yield and Recall Accuracy*

Investigative interviewing is vital to the criminal justice system, linking eyewitness accounts to the pursuit of justice. Given the importance of investigative interviewing for solving crimes, researchers continue to develop interviewing techniques for obtaining detailed and accurate accounts. One technique is social proof, whereby individuals look to the behaviors of others to determine their own in unfamiliar situations. The efficacy of three social proof tactics in enhancing interviewee recall were examined. Participants (N = 51) viewed a video depicting a verbal altercation, completed a distractor task to disrupt short-term memory, and were interviewed about the video they viewed using either an open-ended prompt (i.e., Control) or one of three tactics: (a) Mock Transcript, (b) Model Statement, or (c) Teach to Talk. Recall performance was coded by the number of correct details, incorrect details, and confabulations reported. I hypothesize that the three interviewing tactics will enhance recall beyond what is achieved in the absence of any such strategies. Due to the exploratory nature of the study, there is no hypothesis for the performance of any one tactic relative to the performance of the others. Data collection is ongoing and will be completed and analyzed by March 20, 2024.

Mehzabin Chowdhury, Ocean Sciences

## *Effect of Vibrio anguillarum infection on lumpfish (Cyclopterus lumpus) gut microbiome using full-length 16S rRNA amplicon sequencing*

The gut microbiome is a vital component in all organisms including fish. The microbiota exists in symbiosis with the host providing several beneficial functions, such as nutrient metabolism and mucosal immune regulation. Anti-inflammatory and pro-inflammatory bacterial species maintain a healthy mucosal immune balance. How this balance could be affected by pathogens in marine teleost is unexplored. *V. anguillarum* is a significant pathogen in aquaculture, affecting various economically important fish species, including lumpfish, which are used for the biocontrol of sea lice in salmon farms. This research aims to understand how *V.anguillarum* infection alters the lumpfish gut microbiota, a key organ of the innate immune system. I hypothesize that *V. anguillarum* infection will lead to compositional changes in the gut microbiome of lumpfish, with an increase in pathogenic microbes and a decrease in beneficial bacteria. Here, I am investigating the impact of *V. anguillarum* on the gut microbiome of lumpfish (*Cyclopterus lumpus*) at the early stages of the infection. The gut microbiome of lumpfish will be studied in samples from previously conducted infection trials by full-length 16S rRNA amplicon sequencing (Nanopore-Minion). DNA from hindguts of both infected and non-infected lumpfish at 6, 24, and 48 h were collected. Extracted DNA is evaluated for integrity and purity followed by library preparation and nanopore sequencing. Preliminary results are expected to reveal significant shifts in the gut microbial community in response to *V. anguillarum* infection, providing insights into the pathogen-host interaction and potential strategies for improving fish health and survival in aquaculture settings.

Yuthika Jalim, Ocean Sciences

*Interactions between a passive suspension feeder and an active filter feeder: competitive or complementary?*

The orange-footed sea cucumber, *Cucumaria frondosa*, is a benthic suspension-feeding species, and an integral part of food webs that links primary production to the seafloor. Active filter feeders like the blue mussel *Mytilus edulis* carry out a similar role. Bivalves and sea cucumbers sometimes co-occur, and sea cucumber nurseries have recently been discovered inside mussel beds in the Arctic. Both these species have been proposed as candidates to extract waste from fish cages in integrated multi-trophic aquaculture (IMTA) systems or in bivalve culture. However, the trophic position of passive suspension-feeding sea cucumbers relative to active filter-feeding bivalves remains poorly known, including whether interactions between these two species might be competitive. The goal of this study is to cosmpare the diet and trophic level of *C. frondosa* to *M. edulis* in environments where they naturally co-occur. Populations from two locations (Newfoundland and Nunavut) were compared to investigate whether latitude influences trophic structure. A combination of gut contents and stable isotope analyses were used. The aim is to understand whether the filter feeder and suspension feeder compete for the same plankton resources or whether they co-exist as complementary species. This knowledge can be subsequently applied to aquaculture development at a broader scale.

Wanglong Lu, Computer Sciences

*Visual Style Prompt Learning Using Diffusion Models for Blind Face Restoration*

Blind face restoration aims to recover high-quality facial images from various unidentified degradations, posing significant challenges due to the minimal information retrievable from the degraded images. Prior knowledge-based methods, leveraging geometric priors and facial features, have led to advancements in face restoration but often fall short of capturing exhaustive details. To address this, we introduce a visual style prompt learning framework that utilizes Diffusion Probabilistic Models (DMs) to explicitly generate visual prompts within the latent space of pre-trained generative models. These prompts are designed to guide the restoration process. To fully utilize the visual prompts and enhance the extraction of informative and rich patterns, we introduce a Style-Modulated AggRegation Transformation (SMART) layer. Extensive experiments on four public datasets demonstrate the superiority of our method in achieving high-quality blind face restoration.

Isobel McMahon, Psychology

*Perceptions of Cannabis Consumption During Pregnancy and Lactation: A Patient Informed Survey*

Cannabis is one of the most frequently consumed substances during pregnancy and lactation and has various potential health impacts for the developing fetus/infant. The current study's primary objective was to examine risk perception of perinatal cannabis use among Canadian parents. A national sample of current and prospective parents was recruited through Angus Reid for this experimental vignette survey. Five sets of vignettes were developed to examine risk perception across various factors (i.e., perinatal stage, frequency, cannabinoid, reason for use, and method of consumption). Participants were randomly assigned to two vignettes and risk perception was assessed. Participant cannabis use and demographic characteristics were also collected. Our sample included 821 participants who were primarily well educated (M =17.5 years, SD = 3.1) and employed full-time (73.5%). Participants viewed the risk of cannabis consumption in pregnancy and lactation to be high and riskier than the formula feeding control; no differences were observed across frequency, composition, or method of consumption. Canadian parents in our study viewed cannabis consumption during pregnancy and lactation as risky and perceptions were unaffected by any cannabis use factors. Replication is planned with a community sample to engage a more diverse participant group.

Thomas O'Brien, Biochemistry

*Is Maternal Exposure to Polyethylene Micro and Nanoplastics Causing Placental Dysfunction?*

Recently microplastics have been detected in human blood and placenta, but its poorly understood on what impact they may have on human health. Using a mouse model our group has previously found that polystyrene micro- and nanoplastics can cause fetal growth restriction during gestation. This study aimed to investigate the effects of maternal exposure to PE micro- and nanoplastics on feto-placental health. 3 randomly sorted healthy groups of pregnant CD-1 dams were exposed to different conditions: 106 ng/L of 740-4990 nm polyethylene with surfactant in drinking water (n=12), surfactant alone in drinking water (n=12) or regular filtered drinking water (n=11). At embryonic day 17.5 the response of the placental and fetal hemodynamic were investigated using high-frequency ultrasound. It was found that maternal exposure did not impact fetal growth, however there was evidence of a significant impact on the placental function with a 43% increase in umbilical artery flow in the PE group compared to control group ($p>0.01$). These observed results can suggest that PE has potential to cause poor pregnancy outcomes through abnormal placental function.

Lesley Piercey, Biochemistry

*Computational Insights into Bacteria Membranes for Antibiotic Discovery*

According to Public Health Ontario, it is estimated that antibiotic resistance caused 5,400 deaths in Canada in 2018, making it a major national health threat. Specifically, Gram-negative bacteria contain two membranes, namely the inner and outer membrane. The inner membrane is composed of various lipids which act as a second line of defense against harmful agents. This makes them especially capable of developing antibiotic resistance. Using computer modeling, we can mimic the composition of the inner membrane to see how it will behave over time and respond to its environment. The purpose of this project is to determine how differences in lipid composition will affect the structural properties of *P.aeruginosa* and *K.pneumoniae* membranes. By comparing the structure of these two membranes, we can draw conclusions about how each bacteria will respond to antibiotics. Additionally, the effects of a WaaL protein on *P.aeruginosa* membrane properties was determined. WaaL is responsible for synthesizing lipopolysaccharides (LPS), which can protect the bacteria against threats such as antibodies. The structural information gained in this study on the inner membrane of Gram-negative bacteria and the WaaL enzyme are an essential first step towards developing new antibiotics that target these systems.

Molly Pomeroy, Biochemistry

## *From Tap to Tax: Investigating Beverage Choices, Water Attitudes, and Sociodemographic Impacts of the NL SSB Tax*

Background: Sugar-sweetened beverages (SSBs) are highly consumed in Canada despite that Health Canada recommends water as the preferred drink. To combat rising rates of diabetes and obesity, Newfoundland and Labrador (NL) was the first Canadian province to introduce an SSB tax. There may be inequitable impacts of the tax, however, as about 130 communities in NL are under boil advisories, affecting 16% of the population. Persistent boil water advisories and unequal access to safe drinking water could prevent a decrease in SSB consumption, reducing the effectiveness of the sugar tax. Objectives: This research aims to assess the relationship between beverage intakes, equity-based demographics, and water attitudes in NL. Methods: We completed a cross-sectional online survey with adults 19 years and older in NL, recruited using convenience and panel sampling methodologies. Participants answered questions about sociodemographics (boil water advisories, food insecurity, income), beverage intake (including water), attitudes towards beverages (smell, colour, taste, quality safety), and SSB tax awareness. Proportions and cross-tabulations assessed the prevalence of water and SSB intake by boil water advisory status; regression models will be used to understand the influence of sociodemographic factors on beverage choice and intake. Results: We have preliminarily analyzed 1,223 responses. Overall, 24% (n=296) of participants had negative attitudes towards drinking water. Of participants experiencing a boil water advisory (n=73), 60% had negative attitudes toward tap water. Further analysis will reveal associations between other equity-based demographics and beverage intake. Conclusions: This investigation is important as vulnerable populations may be disproportionately affected by implementing the SSB tax.

Laura Priddle, Psychology

*Understanding the Role of the MECP2 Nuclear Protein and its Implications in Huntington's Disease Treatments*

Huntington's disease (HD) is a neurogenerative disease presenting with chorea, dystonia, cognitive decline, behavioural issues, and incoordination; stemming from a mutation in the huntingtin gene (Htt). Current treatment avenues for HD show a plausible course of action through methods of non-selective lowering of Htt, with the intention of mitigating all downstream pathogenic effects of the mutant huntingtin gene (mHtt). While successful at targeting mHtt, these non-selective therapies cannot distinguish it from the wild-type-Htt (wtHtt), and consequently both forms of the Htt gene are affected. The huntingtin protein (Htt) is known to have a direct interaction with methyl-CpG binding protein (MeCP2), a strong regulator of the chromatin structure. Therefore, this study aims to evaluate the specific effects of wtHtt knockdown on the degree of nuclear MeCP2 expression. Neuronal cell cultures, siRNAmediated wtHtt knockdown, immunocytochemistry, imaging techniques, and statistical analysis were employed to investigate this relationship. We discovered increased MeCP2 intensity in pyramidal neurons following wtHtt knockdown, specifically at the first time point evaluated in the study, as well as abnormal fluctuations in MeCP2 expression. Unexpectedly, MeCP2 expression was heterogenous across nuclei and varied inconsistently across the observed time points when wtHtt was knocked down. All in all, overexpression of MeCP2 has been linked to numerous devastating consequences such as an immunodeficient state, presence of epileptic seizures, and early death. This relationship needs to be further investigated as the consequences of MeCP2 overexpression should be a serious consideration for Htt knockdown treatments.

Sushmitha Ramakrishna, Biochemistry

## *CSDE1 as regulator of the miR-20a-5p/TMBIM6 Axis in Melanoma*

RNA-binding proteins (RBPs), such as CSDE1, have crucial role in translational reprogramming that determines the fate of number of RNAs during biological processes. CSDE1 role is bidirectional, it not only enhances and inhibits mRNA translation but also regulates mRNA abundance. Similarly, microRNAs (miRNAs), the small non-coding RNAs also suppress mRNA translation and stability, primarily targeting the 3' untranslated region (UTR) of mRNAs. The interaction between CSDE1 and miRNAs on the 3' UTRs regulates target mRNA expression, thus playing a significant role in post-transcriptional repression of the miRNA-targeted mRNAs. The interaction between CSDE1 and the miRNA pathway has been the subject of recent study, which reveals its involvement in promoting the tumorigenic properties of metastatic melanoma cells. The association suggests the possibility of a complicated regulatory network affecting gene expression, especially in relation to the development of melanoma tumors. Despite these insights, the detailed molecular mechanisms through which CSDE1 affects gene expression in melanoma development remain to be fully uncovered. Understanding the specific roles of CSDE1 in melanoma tumorigenesis is crucial for identifying new therapeutic targets and strategies against this aggressive cancer type. In our study, we measured the expression of TMBIM6 at both the mRNA and protein levels in melanoma cells depleted of CSDE1 expression. We performed luciferase reporter assays for the disturbed miR-20a-5p target site in the 3'UTR of TMBIM6 mRNA, revealing miR-20a-5p binding is indeed crucial for translational repression of TMBIM6. We also concluded that the interaction of CSDE1 with miRISC of miR-20a-5p is RNA-dependent. Further, we find that miR-20a-5p suppresses the expression of TMBIM6 in melanoma and that miR-20a-5p/AGO2 silencing complex interacts with CSDE1. Moreover, CSDE1 hinders the binding of AGO2 and miRNA-20a-5p complex to the TMBIM6 mRNA in melanoma cells. Understanding the intricate relationships among RBPs, miRNAs, and mRNA metabolism could illuminate the molecular underpinnings of melanoma and potentially unveil new therapeutic strategies targeting CSDE1 and miR-20a-5p.

Alison Randell, Psychology

*Examining the contributions of sex chromosomes and hormones on the sex bias in the maternal immune activation rodent model of autism spectrum disorder*

Autism spectrum disorder (ASD) is a neurodevelopmental disorder that is diagnosed in males four times more than it is females. One environmental risk factor associated with ASD is maternal immune activation (MIA), where inflammatory markers are passed from mother to fetus following exposure to an infectious agent, affecting fetal neurodevelopment. Sex differences in neurodevelopment can result from sex chromosome compliment and/or gonadal hormones. The current study combines the Four Core Genotype rodent model, that decouples the contributions of sex chromosomes from gonadal hormones, with the MIA rodent model of ASD, to investigate the underlying mechanisms that cause males to be more susceptible to ASD. Measuring development through fetal and placental weight, as well as Doppler ultrasound measures of the umbilical artery, we found that the MIA XY chromosome fetuses had significantly abnormal developmental parameters, indicating that the Y chromosome could be the key factor interacting with MIA to produce an increased risk of ASD development in males.

Lily Reid, Psychology

*The Effects of Preconception Stress Exposure on Subsequent Generations*

The present study investigated the effect of parental preconception stress on adolescent offspring. Evidence has previously suggested a generational impact of maternal stress during pregnancy. However, more recently there is research that suggests a preconception-based effect of stress. Contributing to these findings, the present study utilized male and female mice (F0) that were randomly selected to be subjected to either predator stress in the form of a live rat or a control condition, for five minutes. The anxiety-like behaviour of the F0 generation was evaluated using the Open Field Test (OFT) two days after the rat exposure test, and each mouse was ranked as having either high anxiety or low anxiety. A new generation of mice (F1) was established when the predator stressed mice were mated with one another, and the control mice were mated with one another. The behaviour of the F1 generation was then tested during adolescence using a series of tests to determine their anxiety-like behaviour. The behavioural tests included the Open Field Test, Elevated Plus Maze, Social Interaction Test, Light Dark Box, and Forced Swim Test. Though data analysis is still ongoing, the current research is a crucial component in understanding the transmission of stress-related disorders and associated individual impacts.

Lauren Ringer, Chemistry

*Early life exposure to micro- and nanoplastics*

The exposure of microplastic and nanoplastic (MNPs) and the consequent impacts on human health is a widely discussed phenomenon today. Studies have revealed that plastics accumulate in the human body. Additionally, new evidence of microplastics in human placentas has sparked curiosity concerning the possible effects plastics have on fetal development. Previous research in the Cahill lab analyzed the maternal exposure of micro- and nanoplastics on pregnancy and postnatal development in mice. The results were striking: at environmentally relevant MNP concentrations, exposure resulted in fetal growth restriction, placental dysfunction and abnormal brain postnatal development. The findings presented at SEA Conference will be from a questionnaire answered by parents and/or pregnant people recruited from Newfoundland and Labrador clinics and support groups. Exclusion criteria: age below 18 years, unable to provide informed consent. The 4-page anonymous questionnaire asks about socioeconomic status, family composition, knowledge of MNPs, as well as sources of exposure and health effects. Quantitative data will be analyzed using a Fisher's test (e.g. participant age, socioeconomic status). Qualitative analysis will focus on categories reported descriptively and presented as percentages (e.g. X% of people were surprised that MNPs have been found in human placental tissue). The outcome measures include evaluating public awareness of MNPs and the influence that previous knowledge, parental age and socioeconomic status have on results. The aim is to gain a deeper insight of the knowledge level about plastics of Newfoundland and Labradorians current and expecting parents.

Katelyn Ryan, Psychology

*Behavioral Examination of Healthy Huntingtin gene Knockout in Adult Mice*

Huntington's Disease (HD) is a fatal neurodegenerative disease that causes motor, cognitive, and psychiatric deficits for those whose wildtype HTT undergoes a repeat expansion of the gene. Everyone is born with healthy HTT, and it has been deemed necessary for embryonic development, however the behavioral examination of conditional knockout adult mice HTT will help detect depressive- and/or anxiety-like deficits in a mouse model. To do this, adult mice (age 2 – 4 months) underwent stereotaxic surgery to deplete wildtype Htt, and 8 -10 months following the mice were subjected to a series of behavioral tests including the open field test (OFT), elevated plus maze (EPM), forced swim test (FST), Morris Water Maze (MWM), and Fear Conditioning (FC). There were significant differences found between genetic treatment groups (Control and Experimental depletion of Htt) on the OFT, EPM, and MWM leading to the discussion of crucial roles that Htt can have in the adult body and if it would be considered a necessity for healthy individuals.

Somayeh Saliminasab, Earth Sciences

*Influence of Cations Type on Microplastics Deposition to Quartz Sand*

Microplastic pollution in subsurface environments (e.g., soil and groundwater) is a growing concern. Systematic research is essential to identify the key factors, such as aggregation and deposition, that may influence MPs' and NPs' behavior, fate, and transport mechanisms in soils and groundwater. Our research presents findings from a series of controlled batch experiments designed to investigate how divalent cations (e.g., calcium) and monovalent cations (e.g., sodium) influence the deposition of three different microplastics, including released low-density polyethylene (LDPE) and polypropylene (PP) micro- and nano-plastics, as well as synthetic polystyrene microspheres (PS) in quartz sand, figuring out key mechanisms that govern their fate in subsurface environment. The results from our experiments indicated that similar to polystyrene microspheres, the LDPE and PP particles did not adsorb to quartz sand at pH 5 in 3 mM NaCl solution. In contrast, substantial amounts of LDPE, PP, and PS were adsorbed onto quartz sand in 1 mM CaCl2 at pH 5. This could be attributed to the less negative zeta potential of LDPE, PP, and PS in the 1mM CaCl2 background solution because of the lower electrostatic repulsion between particles.

## Sogand Sasanmoghadam, Biochemistry

### *Antibiotic Impact on Bacterial Growth*

Exploring the Role of Teichoic Acid in *Bacillus Subtilis* Sensitivity to AMP-Induced Damage. The rise in antibiotic resistance has resulted in hazardous infections. In response to the increasing threat of a post-antibiotic era, understanding the molecular mechanism between anti-microbial peptides(AMPs) and bacterial cell wall components like teichoic acid (TA) takes on crucial importance in order to defend against infections. Our understanding of whether a cell envelope's TA acts as the first line of bacterial defense against AMPs like MSI-78 remains incomplete. Therefore, we are investigating whether *Bacillus subtilis* mutants with reduced TA levels will have an impact on the accessibility of MSI-78 to the cell envelope and its binding to the cytoplasmic membrane. Moreover, we will examine if TA protects or sensitizes Bacillus subtilis to MSI-78 –induce damage. This study analyses the surface charge of *Bacillus subtilis* with and without MSI-78 using Zeta-sizing in order to understand if MSI-78 binds on the bacterial surface or if it locates more deeply in the cell envelope. We will also analyze the lipid acyl chain dynamics in intact Bacillus subtilis using flow cytometry and deuterium NMR to discover how it affects the lipid acyl chains. The results measure ifMSI-78 permeabilizes the membrane and contributes to membrane disruption. In addition, we will repeat zeta-potential measurements, deuterium NMR and flow cytometry with *Bacillus subtilis* mutants that produce less TA. The study proposes that if we observe more MSI-78 -induced acyl chain disorder in the mutants, then TA may protect *Bacillus. subtilis* from MSI-78. Finally, we intend to compare the results above with a Cell-penetrating peptide (CPP) of similar charge such as DPV6 or HIV-1 Rev. This would indicate if the TA interactions observed for the AMP are based on charge or if other components of the peptide structure are relevant. The outcomes could show the role of TA bindings in Bacillus subtilis' response to MSI-78, which could have potentially meaningful impact in infection fighting processes and antibiotic resistance. Understanding these interactions could develop the mechanism of action TA-AMP binding and antimicrobial strategies.

Oladapo Simeon, Biology

## *Microbiology of a serpentinizing environment in the Tablelands, NL, Canada*

Serpentinization is a subsurface process that involves the oxidation of ferromagnesian minerals in ultramafic rock, reducing water to produce hydrogen gas. This creates conditions for hydrocarbon production and thereby the potential to support chemolithotrophic life. Serpentine environments are extreme, with high pH values, low nutrients, and low redox potential, which has led to the evolution of specialized microorganisms that are able to live in such conditions and utilize reduced substrates in serpentine-hosted springs to fuel their metabolism. This study focuses on microbial diversity in Newfoundland's serpentinite-hosted groundwater springs in the Tablelands. This research aims to broaden the understanding of the microbial diversity in serpentine-hosted springs accessed through locations of groundwater discharge. To better understand the microbiology of this environment, waters from the serpentinite-hosted groundwater springs, as well as adjacent rivers (i.e. control sites), were filtered through 0.2 µm and 0.02 µm filters to capture cellular organisms and eDNA, including viruses, respectively. Grains of ultramafic rock that had incubated for approximately one year in the subsurface along the ultra-basic groundwater flowpath were also sampled. The DNA extracted from the 0.2 µm filters underwent ribosomal RNA gene amplification, targeting the V4-V5 region, to identify the cellular organisms present. DNA extracted from the 0.02 µm was sequenced directly to identify viral sequences. The spring samples showed distinct and lower diversity cellular communities compared to the adjacent rivers. Analysis of the incubated ultramafic grains revealed variations within (i.e., by depth) and across wells. Sequencing of the viral DNA fraction produced mostly completely novel sequences, suggesting the springs harbor novel viral representatives that have not been found anywhere else previously. Further analyses will be conducted to attempt to gain insights into survival mechanisms and metabolic pathways used by the organisms at these sites. Understanding microbial adaptation in such environments illuminates fundamental aspects of life's resilience.

Rachael Stephan, Ocean Sciences

*Photosynthetic acclimation to static low irradiance and spectral quality in the kelp Laminaria digitata*

*Laminaria digitata* is a shallow subtidal kelp that is abundant along the rocky coasts of the northwestern North Atlantic. It is an important primary producer and ecosystem engineer that supports numerous marine species. The coastal environment is highly heterogeneous with fluctuating abiotic parameters. *Laminaria digitata* has evolved acclimation strategies to endure this variance, including optimizing pigment contents and photosynthetic kinetics under the light environment. A laboratory experiment was conducted to test the hypotheses that *L. digitata* (1) exhibits symptoms of stress under constraining combinations of low irradiance and spectral quality; and (2) has the highest levels of electron transport rates in the high irradiance treatments with even proportions of white and blue light. Kelp thalli were maintained in tanks with a controlled light environment that varied over two levels of irradiance (15 and 30 µmol photons $m^{-2}$ $s^{-1}$) and three levels of spectral light quality (white-dominant light, mixed white-and-blue light, and blue-dominant light) for eight days. Photosynthetic efficiency parameters and rapid light curves were measured using PAM fluorometry, and pigment concentrations were measured via chemical extraction and spectrophotometry. Model outputs did not support these hypotheses, which may result from the treatments not being dissimilar or light-limiting enough to show interactions or the resilience of *L. digitata*. These results establish a baseline for further examination of the influence of varying irradiance and spectral quality on the ecophysiology of *L. digitata*.

Ian Tompkins, Chemistry

*Characterizing iron binding ligands in the ocean using Immobilized Metal Affinity Chromatography*

Seawater contains a large amount of dissolved organic matter (DOM), a complex carbon pool containing water-soluble compounds of varying chemical compositions. One sub-pool of DOM is humic substances (HS), a complex and uncharacterized fraction which includes organic ligands that can bind to transition metals such as iron. In coastal regions HS are dominated by terrestrial sources. Recent publications have theorized that these terrestrially derived humic ligands may play an essential role in the marine iron cycle by preventing the precipitation of iron. Iron is insoluble in oxic marine waters, where the Fe (III) oxidation state is thermodynamically favoured, resulting in the formation of solid iron oxide minerals. This formation of iron oxide renders iron unavailable for primary producers to use in their metabolic processes and leaves dissolved iron at sub nanomolar concentrations. However, organic ligands can complex with iron, keeping it in solution and allowing it to be used as a micronutrient. Due to the complexity of DOM and HS in particular, these ligands remain uncharacterized, and thus their influence on primary productivity and other biological processes remains an important topic of study. To better understand this phenomenon iron-binding ligands are extracted from water samples using Immobilized Metal Affinity Chromatography (IMAC). The method uses a series of different eluents and a fraction collector allowing for separation based on retention time. The results show three distinct ligand classes of varying binding strength and chemical composition.

Ella Vivian, Ocean Sciences

*Characterization of Microplastics Collected by a Sediment Trap in the Gulf of Mexico*

In 2015, the global production of plastics exceeded 380 million metric tons, of which 9% is recycled and 80% is disposed of, making its way into the natural environment. When these plastics break down to a size less than 5 mm, they are considered microplastics. In this study, we analyzed microplastics captured by a sediment trap between September 2017 and September 2018, deployed at a depth of 1,650 meters in the Northern Gulf of Mexico. Seven cups, each representing 17 days, were analyzed and microplastics were isolated by filtration after the digestion of organics and counted under a stereomicroscope. Sedimentation rates for each cup were calculated to be 127 microplastic particles/$m^2$/day, 55 microplastic particles/$m^2$/day, 90 microplastic particles/$m^2$/day, 97 microplastic particles/$m^2$/day, 77 microplastic particles/$m^2$/day, 64 microplastic particles/$m^2$/day, and 28 microplastic particles/$m^2$/day. The plastics were then analyzed by Raman microscopy to identify the composition of the microplastic. Seven plastics were successfully identified as polyester, spandex, acrylic, and modal. Discoveries made in this study aim to answer the question of how microplastics make their way to great depths within the water column. This is collaborative work along with other research from the Anthropogenic Effects on the Oceanography of Newfoundland (AEON) Laboratory.

Mary Whelan, Earth Sciences

*Signs of Life at Sites of Terrestrial Serpentinization - An Analog Study for Ultramafic Celestial Bodies*

Serpentinization is a hydration reaction that occurs when ultramafic minerals incorporate water into their crystal structures. Secondary reactions make the water ultra-basic (pH >10) and reducing (<- 100 mV), with an enrichment of methane ($CH_4$) gas. The fluid discharges at groundwater springs, which we sampled as proxies for subsurface processes. In this study, three sites of terrestrial serpentinization were studied: The Tablelands (NL, CAN), The Cedars (CA, USA), and Aqua de Ney (CA, USA). This study set out to characterize the field sites, quantify the flux of $CH_4$, and link the source of $CH_4$ to molecular and isotopic biosignatures found. The Aqua de Ney spring (abiogenic $CH_4$) had the highest $CH_4$ flux from the spring surface (13.3 mol*m $^{-2}$*min $^{-1}$), while no $CH_4$ could be detected by flux experiments at the other field sites. Dissolved gas analysis from The Cedars (microbial $CH_4$) and the Tablelands (non-microbial $CH_4$) revealed concentrations of 5497 µmol/L and 4931 µmol/L $CH_4$ respectively. Since serpentinization outcrops have been found on other celestial bodies and support microbial life on Earth, these data may be used for characterization of extra-terrestrial serpentinite outcrops and may play a role in the search for microbial life away from Earth.

Kati Whelan, Psychology

*Implementing Digitized Measurement-Based Care in NL: Exploring Provider and Patient-Partner Perceptions and Experiences with the Digital Platform*

Our team collaborated with the provincial government and NL Health Services to implement a digital measurement-based care platform within mental health and addiction services in NL. This study investigates the platform's usability among healthcare providers and people with lived experience of mental health and substance use concerns (PWLLE). Key areas explored include available resources, visual representation of self-assessment data, impact on collaboration between providers and PWLLE, and barriers and facilitators influencing platform use. Adhering to user-centered design principles, participants engaged in predetermined tasks on the platform during virtual interviews while verbalizing their thoughts, followed by discussions on barriers and facilitators. Six providers and four PWLLE participated, with sessions recorded, transcribed, and thematically analyzed iteratively. Findings revealed diverse perspectives, highlighting both positive aspects and areas for improvement in platform features and accessibility. Addressing these varied perceptions and challenges holds broader implications for advancing mental healthcare practices and the theoretical foundations of measurement-based care. Practical insights from the results can inform decision-making and interventions, potentially enhancing the delivery of mental healthcare services in Newfoundland and Labrador. Usability testing, along with identifying facilitators and barriers, is essential for promoting engagement and therapeutic efficacy in digital measurement-based care platforms.

## Oral Presentation Abstracts

## 1A: Climate Change & the Environment

Sydney Collins, Cognitive and Behavioural Ecology

### *Leach's Storm-Petrel parental behaviour is consistent and predicts reproductive success*

Diverse taxa exhibit animal personality traits that are associated with reproductive success and survival. Some parental behaviours are considered personality traits due to their repeatability, and these behaviours may be particularly important for long-lived species that face trade-offs between current and future reproduction. The declining Leach's Storm-Petrel (*Hydrobates leucorhous*) is a long-lived seabird that annually invests heavily in a single chick. Passive integrated transponder technology was used to investigate individual consistency of parental behaviour and its relationship with reproductive success at a large colony in Newfoundland and Labrador, Canada. Specifically, we measured incubation attentiveness - number of burrow entrance visits during an incubation bout; incubation bout duration - duration of a parental egg-incubation shift; foraging trip duration - duration of a single parental foraging trip; provisioning bout duration - duration of a chick-provisioning burrow visit. Incubation attentiveness, provisioning bout duration, and foraging trip duration during both incubation and chick-rearing exhibited inter-annual repeatability. Intra-annual repeatability of all parental behaviours varied among years. Reproductive success positively correlated with incubation bout duration and negatively correlated with incubation attentiveness and the duration of foraging trips during chick-rearing. Consistent individual differences in the reproductive strategies of Leach's Storm-Petrels have implications for reproductive success and population growth.

Oforbuike Egbe, Chemistry

## *Selective Tuning of Polycrystalline Copper Substrate with Nanoparticle - Ionic Liquid Hybrid Catalyst for $CO_2$ Reduction*

The electrochemical carbon dioxide reduction (eCO2R) to produce multi-carbon products is an appealing strategy for mitigating climate change while yielding valuable chemicals. However, the challenge lies in designing an electrocatalyst capable of efficiently converting $CO_2$ into desired products at lower cathodic potentials under mild reaction conditions, lowering the overall energy demand for practical implementation. Copper-based catalysts show promise by forming $^*CO$ active intermediates that can undergo further reduction or coupling reactions to generate multi-carbon ($C_2^+$) products. Yet, the low selectivity of $C_2^+$ products on metallic Cu catalysts, caused by facet instability at high overpotentials (>1.0 V), necessitates tuning selectivity at lower overpotentials for enhanced energetic efficiency. This work explores surface modification of polycrystalline copper electrodes with nanoparticles embedded in an alkylphosphonium-based ionic liquid (IL) layer as a viable approach to tuning product selectivity in $eCO_2R$. ILs provide a hydrophobic interface altering the cathode's local pH and offering a hydrophobic, ionic microenvironment for stabilizing metal nanoparticles over a broad potential range while also potentially contributing to enhanced $CO_2$-surface coordination/product selectivity. Quantification of liquid phase composition post-electrolysis under ambient conditions was performed using $^1$H-NMR utilizing a water-suppression protocol. Nanoparticle catalyst morphology was examined using electron microscopy (TEM and SEM) before and after electrolysis. These findings contribute valuable information towards overcoming challenges in achieving efficient and selective electrochemical $CO_2$ reduction for sustainable liquid fuel production.

Chantelle Clermont, Ocean Sciences

*Spatial and temporal variability in green sea urchin (Strongylocentrotus droebachiensis) covering behaviour*

Green sea urchin, *Strongylocentrotus droebachiensis*, exhibits covering behaviour whereby it picks up and holds materials (debris) on its aboral surface. Covering presumably involves energetic trade-offs to accommodate critical functions such as aggregation, foraging, and displacement. Little is known about factors triggering this behaviour and how it may vary spatially and temporally. We monitored covering in green sea urchins over 5 months (May to September) at three depths (shallow: 5 m, intermediate: 10 m, and deep: 15 m) in an urchin barren in Flatrock Cove (southeastern Newfoundland). The proximity of shallow urchins to a kelp bed (mainly *Alaria esculenta*) enabled examination of the impacts of greater accessibility to covering materials compared to deeper urchins. There were significant 2-way interactions among the three variables examined: sea urchin body size (test diameter), depth, and time (survey date). Small (<2 cm) urchins covered ~15 times more often than large (>2 cm) ones, while the latter covered ~23 times more often in shallow than in deeper water. Regardless of size, covering occurred ~16 times more frequently in July and August than in May, June, or September. Our results indicate that in situ covering in *S. droebachiensis* is inversely related to body size and water depth while varying seasonally. These findings and those of a companion study indicate that wave action is an important driver of covering in green sea urchin, especially in small individuals exposed to high hydrodynamic forces.

Mikhailey Wheeler, Chemistry

*Using Green Chemistry and carbon dioxide to make plastics*

The concept of Green Chemistry was published by Anastas and Warner in 1998, giving scientists 12 principles to make chemistry inherently safer. Unfortunately, within the polymers/plastics industry, many of the traditional fossil-fuel derived polymers have several problems during their lifetime. Most lack biodegradability, have toxic production processes, and are very difficult to recycle. Therefore, focus is shifting to using renewable and bio-based feedstocks in syntheses rather than depleting fossil-fuel resources. This creates a potentially environmentally benign product while avoiding toxic reagents and processes. Another area of this field is incorporating carbon dioxide into the synthesis of plastics. The carbon dioxide is kept in the polymer structure (instead of accumulating in the atmosphere), creating a carbon storage method. This talk will provide examples of how the 12 Principles of Green Chemistry can be applied to produce carbon dioxide-containing, non-toxic, and environmentally safe plastics.

Jeremy Hussey, Biology

*Investigating Disturbance Mediated Alterations of Macrolichen and Bryophyte Stoichiometric Ratios and Biodiversity Patterns Following Intense Moose Herbivory in the Eastern Boreal Forest*

The boreal forest is the largest terrestrial biome in the world, characterized by conifer dominate stands and frequent disturbance patterns. The island of Newfoundland is home to one of the most southern stretches of this boreal biome and is impacted by disturbance events, including cyclical insect outbreaks, forest fires, and domestic timber harvesting. However, the natural regenerative processes that follow such disturbances are being altered by the introduction of a non-native herbivore – the moose. The objective of this research was to explore the impact of intense moose herbivory following a disturbance event on lichen biodiversity and elemental C/N cycling. Lichens have relatively high diversity in Newfoundland, and their non-vascular, photosynthetic nature allow them to absorb molecules directly from the air, making them a suitable proxy group to investigate changes in biodiversity and C/N content between disturbed and healthy mature stands. Preliminary data shows higher arboreal lichen diversity in mature stands, yet higher ground lichen diversity in disturbed patches. Furthermore, C/N ratios remain consistent between disturbed/mature stands yet vary depending on disturbance type. Through this study we aim to attain a better understanding of how disturbances coupled with non-native herbivores are impacting forest regeneration, thus allowing for more holistic management practices.

Maleki Rad, Earth Sciences

*Biodegradation of thermo-oxidative pretreated low-density polyethylene (LDPE) and polyvinyl chloride (PVC) microplastics by Achromobacter denitrificans Ebl13*

Microplastics pretreatment prior to biodegradation is an efficient approach for their bioremediation. We isolated *Achromobacter denitrificans* from compost and used it for biodegradation of thermo-oxidative pretreated polyvinyl chloride (PVC) and low-density polyethylene (LDPE). About 12.3% and 6.5% weight loss, and 326.4 and 112.32 mg $L^{-1}$ extracellular protein were observed in bacterial flasks with PVC and LDPE, respectively. The pH in treated PVC reached to 5.12 and the thermal stability increased by 29°C. The chemical modification in LDPE was demonstrated through oxidation of antioxidants (Phenol group), formation of new groups (Aldehyde group), and chain fracture in the main backbone by Fourier transform infrared spectroscopy. Formation of peaks at the range of 1700–1850 $cm^{-1}$ in LDPE attributed to formation of carbonyl groups as the degradation result. Scanning electron microscopy confirmed LDPE and PVC degradation by surface alterations. Consequently, thermo-oxidative pretreatment can be considered as a suitable strategy for improving microplastics biodegradation.

Katrina Cruickshanks, Biology

*Old growth aspirations: the effects of survey height and age on lichen communities in hardwood forests of Nova Scotia*

Lichens, often referred to as photosynthetic fungi, contribute significantly to biodiversity and ecosystem health. Although these resilient organisms can live almost anywhere, most rare lichens are restricted to old growth forests, and Nova Scotia (NS) Canada hosts nearly half of Canada's rare and at-risk liches. Young to mature (40-80 years) forests currently dominate NS, but we know little about rare lichens' ability to recolonize maturing forests. Studying lichens in tall forests without climbing or felling trees is also challenging, since many lichens preferentially occupy canopies. This study 1) quantifies differences in lichen communities between the lower trunk and canopy of trees with varying ages across NS; and 2) investigates at what stage of forest maturity conditions become suitable for rare lichens. We targeted forests from four age categories and climbed trees to access the canopy. We estimated lichen cover at the lower trunk and canopy of 101 trees (mainly sugar maple and yellow birch). Results show greater lichen diversity in the canopy of old growth forests (100+ years). By understanding how lichen communities differ in younger forests, we can identify priority conservation areas that closely resemble the communities known from older forests, while investigating the mechanisms driving this resemblance.

Megan Fitzgerald, Chemistry

*Marine Materials: Using Seafood Waste to Create Hydrogel Materials with Broad Applications*

Mussel shells, crab shells and brown algae - common seafood waste in Newfoundland, can be used to make materials such as hydrogel beads, patches and films. Polymers from seaweed and crab shells can be combined with mussel shell waste to make new composite materials with interesting properties! Composite materials have applications in healthcare such as wound dressings for burns and abrasions. They can also be used as drug delivery mechanisms for drugs used to treat the digestive tract, specifically the large intestine. Films can be used to make biodegradable plastics that have applications in food packaging.

Cyler Vos, Chemistry

*Sustainable Production of Polymers Through Renewable Resources and Chromium Catalysts*

Polymers have become important materials in our everyday life having uses in adhesives, rubber, common packaging, fabrics, and even more high tech uses such as in medical implants and in electronics. However, many of these materials' production involves energy-intensive processes that use petroleum-based and toxic chemicals. This can cause negative environmental impacts to occur with limited recyclability of these products due to their non-renewable building blocks. The use of renewable resources to form these polymers in a sustainable manner is of growing importance as our world drives to maintain a circular economy, therefore the sustainable production of these polymers has been a focus of our research. Using chromium containing catalysts the sustainable production of these polymers can be achieved, allowing for faster and less energy-intensive polymer production when compared to similar industrial processes. Furthermore, relevant polymers such as polyesters and polycarbonates can be formed from renewable resources including chemicals derived from naturally occurring starches, rinds of citrus fruits, and using $CO_2$ showing the potential for a further use of carbon captured $CO_2$ from the atmosphere. This talk will encompass how we have used chromium catalysts for a more energy-conscious and ecofriendly approach to sustainable polymer production while using renewable resources.

Dr. Jahrul Alam, Mathematics and Statistics

*The implications of extreme weather events in wind energy projects*

This presentation focuses on the intricate dynamics of extreme weather events, exploring their implications on wind energy projects. Winter storms, tropical disturbances, and high winds not only intensify mechanical stress and fatigue on wind turbines but also have the potential to reshape the overall wind patterns, thereby influencing the long-term wind energy potential of windy regions like Newfoundland and beyond. This talk advocates for comprehensive research and adaptive strategies tailored to address the multifaceted challenges arising from extreme weather and cold climate in the context of wind energy projects. Considering cutting-edge simulation technologies, including Large Eddy Simulations and Adaptive Wavelet Collocation Methods, the talk provides an understanding of the impact of complex terrain on electricity generation by wind turbines. An important outcome of the simulation results suggests that meeting 20% of Canada's energy needs through wind power would require approximately 5000 square km of complex terrain for onshore wind farms. Remarkably, this projection is five times less than the area needed for offshore wind farms. These findings underscore the importance of atmospheric turbulence considering the broader implication of complex topography and mountains.

## 1B: Technology, Innovation & Exploration

William Kellough, Mathematics & Statistics

*How to Play With Fire: An Adversarial Graph Burning Model*

Graph burning is a discrete-time process that models information spreading in a social network. In this model, the vertices of a fixed graph are labelled as either burned or unburned, with all vertices being labelled as unburned at the start of the process. There are two steps in each round of the process: first, any unburned vertex adjacent to a burned vertex becomes burned, then an unburned vertex is chosen to become burned. The process continues until all the vertices in the graph are burned. We consider a generalization of graph burning where instead of a fixed graph, the graph burning process is applied to a graph that intelligently adds new vertices to itself every round with the objective of making it as hard as possible to burn. This creates a two-player game dynamic where one player is trying to burn as much of the growing graph as they can, while the other player is trying to build the graph and make it harder to burn. In this talk, we discuss how successful each player is based on the rate at which new vertices are added to the graph.

Ugonna Ani, Biochemistry

*Examining The Challenges And Benefits Of Flexible Experiential Learning Opportunities In Undergraduate Life Science Courses*

Experiential learning in undergraduate courses is a salient teaching strategy that allows for hands-on, real-world applications and activities to improve students' comprehension of concepts. By increasing access to flexible experiential learning opportunities in undergraduate life sciences, courses can also take into account each student's unique needs, interests, and learning pace to deepen their understanding of life science concepts and connect theoretical knowledge to real-world applications. In this proposed mixed-method study, qualitative methods and quantitative methods will be used to investigate the potential difficulties and impact of flexible, experiential laboratory opportunities on measures of student success. The participants will be undergraduate students enrolled in laboratory-based, introductory courses in Biochemistry, Biology, and Chemistry at the Memorial University of Newfoundland. Participating students will complete pre- and post-intervention assessments for students' self-efficacy, engagement, and academic success. Post-intervention, students will also be invited to participate in focus groups, and instructor interviews will be conducted to assess instructor perceptions of student learning and ease of implementation. The knowledge from this study can be used by educators and institutions to design more targeted and supportive experiential learning programs that cater to students' needs, interests, and learning pace.

Chengjun Yue, Mathematics & Statistics

*A trace principle for fractional Laplacian with an application to image process*

We establish a trace principle of the mapping $f(x)\mapsto u_\alpha(x,t)$ from the fractional $L^1$Hardy-Sobolev space $H^{\alpha,1}(\mathbb{R}^n)$, $\alpha \in (0,2)$ into the weak Lebesgue space $WL^q_\mu(\mathbb{R}^{n+1})$, where $u_\alpha(x,t)$, $\alpha \in (0,2)$ is the solution of the equation: $\Delta_{x,t}\, u_\alpha(x,t)+(1-\alpha)\, t^{-1}\, \partial\, u_\alpha(x,t)=0$ on $\mathbb{R}_+^{n+1} = \mathbb{R}^n \times (0,\infty)$ subject to $u_\alpha(x,0) = f(x)$ on $\mathbb{R}^n$. Building upon the trace principles, we exploit $(H^{\alpha,1}, L^q)$$ and $(H^{\alpha,1}$, log) model for image denoising.

Weiyang Li, Mathematics & Statistics

*Liouville-type Laws Quasilinear Equations with Absorption*

In this talk, I will introduce the Liouville type theorems for the m-Laplacian equation with gradient term $-\Delta_m u + |\nabla u|^q = f(u)$ in exterior domains of $\mathbb{R}^N$. Here q>m -1 and the function *f* satisfies *f* (s) > $cs^p$ near zero where c is a positive constant.

Shramana Sarkar, Earth Sciences

*Can ultra-trace element aqueous geochemistry aid critical mineral exploration for Li-Cs-Ta pegmatite deposits?*

*Lithium-Caesium-Tantalum (LCT) pegmatite deposits are an important economic source of these critical minerals, but further deposit discoveries and mine development are needed to meet global societal demands such as the green technology transition. These deposits remain challenging to discover due to their small geological footprint and physical properties that are incompatible with geophysical exploration methods. Direct geological prospecting and geochemical exploration methods remain the most effective strategies, but the latter has focused almost exclusively to date on the chemical composition of solid reservoirs (rocks, till, soil) that record signatures from these deposits only within proximity to mineralization. Aqueous geochemical methods of exploration, with the potential to pinpoint chemical fingerprints dispersed further from these deposits in natural waters, remain largely untested. Recent discoveries of Li-rich and Cs-rich pegmatite deposits in southern Newfoundland have spurred on new economic investment and further LCT deposit exploration while providing a unique opportunity to use the region as a natural laboratory to develop new aqueous geochemical exploration strategies. This project will apply novel ultra-trace element analytical methods to test the ability to detect variations in stream water dissolved element budgets, both in the regional area of LCT pegmatite deposit prospectivity and directly downstream of known deposits.*

Dr. Len Zedel, Physics and Physical Oceanography

*Doppler sonar records of fish movement through a strong tidal stream: 3-months of observations from Grand Passage Nova Scotia*

Coastal passages with strong tidal streams present potential for renewable energy generation with in-stream hydrokinetic turbines. However, there are concerns that these systems will lead to environmental impacts when marine life interacts with moving turbine blades. We explore measurements of fish movement using Doppler current profilers as a way of quantifying the frequency of such interactions. Fish are detected in Doppler sonar data using calibrated backscatter levels in each of the four acoustic beams; by reprocessing un-averaged data it is possible to extract both fish and water velocities independently. This approach is used to analyze three months of Doppler sonar data collected in Grand Passage Nova Scotia from September until December 2014. There are fish detections at all times during the observations, but large numbers are only seen on three occasions and then only for durations of a few hours. Most of the observations show fish moving at the same speed as the water.

Fathima Manooja, Computer Science

*Task-based Parallelism in SPH*

Parallelism is a technique that is used to speed up scientific computations by executing different parts of the program concurrently. Task-based parallelism is a type of parallelism that requires redesigning the entire program but is more efficient than the common approaches to parallelism which are easier to implement. Here we look at what was done to apply task-based parallelism to an astrophysical simulation code.

Cody King-Poole, Chemistry

*High Performance Marine Coatings from Sulfur Nanoparticles*

High Performance Marine Coatings from Sulfur Nanoparticles Coatings have a very important role in the modern world and are very important for the durability and longevity of a wide variety of products, including marine vessels, powerlines, and parts. Coatings must be durable, long lasting, have strong adhesion, and be able to repel contaminants from their surfaces, however current commercial coatings tend to lack in one or more areas. My research is focused on designing a high-performance sulfur rich coating using nanoparticles prepared through miniemulsion. The ideal coating synthesized will have many desirable properties due to being made from sulfur, which creates nanoparticles with high adhesion strength, and will be able to self-heal due to their dynamic covalent bonds. With the ability to have many other desirable properties such as being physically robust, icephobic, or corrosion resistant based on the wide range of comonomer(s) able to react with sulfur. By using sulfur, it is also possible to create these coatings through a green, solvent free approach. My prepared coatings have potential to increase the lifespan and usefulness of products, while also potentially reduce upkeep costs by reducing fouling and ice buildup on surfaces.

Sathees Duglas, Sustainable Aquaculture

*Comparative Immune Response of Atlantic Salmon Head Kidney Cell Line to Vibrio anguillarum serovars O1 and O2.*

Fish raised for food are susceptible to infectious diseases, limiting aquaculture productivity. *Vibrio anguillarum* is a frequent Gram-negative pathogen that causes vibriosis in several fish species. *V. anguillarum* O1 and O2 are the most virulent and common serovar. Cellular host immune response to different *V. anguillarum* serovars is unknow. Here we develop an infection model of *V. anguillarum* in the Atlantic Salmon Head Kidney (ASK) cell line and study its immue response by RNA-seq to *V. anguillarum* serovar O1 and O2 at 1- and 2-hours post-infection (hpi). We identified 424 unique differentially expressed genes (DEGs) at 1 hpi and 2066 DEGs at 2 hpi in cells infected with *V. anguillarum* O1. In contrast, only 2 unique DEGs at 1 hpi and 1315 DEGs at 2 hpi were identified in cells infected with *V. anguillarum* O2. Gene ontology (GO) analysis enriched pathways related to calcium signaling and cytokine-cytokine receptor at 1 hpi with serovar O1. At 2 hpi with serovar 01, retinol metabolism, MAPK pathways, and TGF- beta signaling were enriched. In contrast, ASK cells infected with O2 servar bile acid biosynthesis, TNF signaling, IL-17 signaling were enriched at 1 hpi, and at 2 hpi NF kepa B signaling pathways were additionally enriched. Here we find that *V. anguillarum* is a potential extracellular pathogen, and *V. anguillarum* O1 and O2 induce clear different cellular immune response suggesting different mechanisms of pathogenesis. This cellular infection model will allow us to evaluate immune stimualtory compounds to prevent vibriosis.

Debasmita Behera, Civil Engineering

*Application of ZnO and $Fe_2O_3$ nanoparticle for enhanced lipid production in microalga Scenedesmus obliquus: A Sustainable approach for biofuel production.*

The current global energy crisis is driving the search for alternative clean energy sources like biofuels as promising substitutes for fossil fuels. In the past few years, biodiesel has shown to be a promising alternative to conventional diesel. One of the most plausible sources for producing biodiesel today is microalgae due to its ability to accumulate lipids. Most of the researchers reported that microalgal lipids can be converted to biodiesel. Different types of nanoparticles are used to enhance the accumulation of lipids in microalgae. Microalgae have the potential to absorb different metal contents like phosphorus, nitrogen, and carbon, along with iron, zinc, etc., as nutrients for their growth. The current study aims to observe the effect of ZnO and $Fe_2O_3$ nanoparticles on lipid accumulation in microalgae. Microalgae species, *Scenedesmus sp.*, was cultured for 15 days by adding ZnO and $Fe_2O_3$ nanoparticles individually to its growth medium. The highest biomass was obtained on the $10^{th}$ day of culture with $Fe_2O_3$ nanoparticles. The biomass obtained with $Fe_2O_3$ nanoparticles was 8.42% higher than those grown without nanoparticles. The highest lipid productivity (% of dry cell weight) was obtained from the microalgae cultured with ZnO nanoparticles on the $10^{th}$ day of the culture. It was 35.52% higher than those grown without nanoparticle application. These findings reveal that ZnO nanoparticles can enhance lipid productivity in microalgae. Optimisation of nanoparticle dose and longer culture time can reveal the trend of lipid accumulation in the microalgae.

Haoming Luo, Computer Science

*AI in breast cancer detection*

Breast cancer remains a significant global health concern, emphasizing the need for accurate and efficient diagnostic methods. In this evolving landscape of medical diagnostics, there is a growing adoption of artificial intelligence (AI) tools. These AI-based solutions have become indispensable in the area of oncology, especially for radiologists. They enable more precise identification and evaluation of abnormalities in medical images, serving as a strong initial method of analysis, and even providing a supporting secondary review for cases suggestive of cancer. This research focuses on the employment of a multichannel convolutional neural network (CNN) for the purpose of breast cancer detection, which includes both supervised and unsupervised learning methods in deep convolutional neural networks. By utilizing edge-cutting machine learning techniques, the objective of this study is to come up with more effective diagnostic strategies and eventually improve the accuracy of breast cancer detection. We aim to make substantial progress in the early detection and timely treatment of breast cancer, ultimately helping to reduce the number of deaths caused by the disease.

## 2A: Climate Change & the Environment

Joseph Baafi, Biology

### *Modeling the Impact of Seasonality on Mosquito Population Dynamics: Insights for Vector Control Strategies*

Mosquitoes are important vectors for the transmission of some major infectious diseases of humans, i.e., malaria, dengue, west Nile virus and Zika virus. The burden of these diseases is different for different regions, being highest in tropical and subtropical areas, which have high annual rainfall, warm temperatures, and less pronounced seasonality. The life cycle of mosquitoes consists of four distinct stages: eggs, larvae, pupae, and adults. These life stages have different mortality rates and only adults can reproduce. Seasonal weather may affect the population dynamics of mosquitoes, and the relative abundance of different mosquito stages, since the maturation rate to the next stage depends on temperature, and because egg survival depends on rainfall. We developed a stage-structured model that considers laboratory experiments describing how temperature and rainfall affects the reproduction, maturation and survival of different Anopheles mosquito stages, the species that transmits the parasite that causes malaria. We consider seasonal temperature and rainfall patterns and describe the stage-structured population dynamics of the Anopheles mosquito in Ain Mahbel, Algeria, Cape Town, South Africa, Nairobi, Kenya and Kumasi, Ghana. We find that regional differences in seasonal weather patterns affect mosquito population dynamics. Control strategies often target one specific life stage, for example, applying larvicides to kill mosquito larvae, or spraying insecticides to kill adult mosquitoes. Our findings suggest that differences in seasonal weather patterns affect mosquito stage structure, and best approaches to vector control may vary between regions.

Tori Burt, Cognitive and Behavioural Ecology

*Exploring multi-modal behavioural attraction in Leach's Storm-Petrels*

Many seabird species are attracted to artificial light at night (ALAN) from anthropogenic infrastructure, often resulting in them becoming stranded. Once grounded, they struggle to take flight and are subject to predation, starvation, and collisions. Stranding on-land is particularly concerning for Leach's Storm-Petrels (hereafter LESP; *Hydrobates leucorhous*), which are classified as "Threatened" by the Committee on the Status of Endangered Wildlife in Canada. My previous research explored the effectiveness of reducing ALAN at a coastal seafood processing plant in Bay de Verde, adjacent to the LESP's largest colony, Baccalieu Island, NL, which sees many hundreds of LESP strandings annually. Results showed that a partial reduction of ALAN at this plant significantly reduced LESP strandings. Despite this success, some birds stranded even when lights were reduced. Aside from vision, LESPs rely heavily on olfaction for foraging, homing, and identification, yet it is unknown if smell is associated with strandings, or how scent and light may interact. My current research involves the simultaneous presentation of an olfactory and visual cue to assess their potential influences on LESP behaviour. I aim to provide insight into LESP stranding and inform how olfactory and visual cues could be considered in behavioural research and conservation strategies.

Tshering Dendup, Earth Sciences

*Geophysical Study of the Historical Landfill at Wishingwell Park*.

The City of St. John's, like many other populous and modern cities, suffered challenges in keeping up with increasing demands on disposal infrastructure and sustainable waste management. Stretches along most riverbanks and at the outskirts of city limits continued to be illegal dump sites for many years after the institution of a municipal council in 1902. The Wishingwell area was chosen as the city's first public landfill to resolve these issues. However, it was officially abandoned in 1963 after burying accumulated waste in trench(es). Later, the area was covered and converted to the present-day park. There is no traceable record of any remediation efforts and only one previous investigation using a seismic technique. The present research integrates four geophysical methods – magnetics, electromagnetics, ground penetrating radar (GPR) and geoelectrical – to study the area non-invasively. These surveys show highly conductive anomalies, which are likely responses of buried metallic wastes, under the embanked cover as seen in archival images. Magnetic maps of the area depict distinct linear features roughly trending east-west, some of which can also be observed in inverted geoelectrical and GPR sections. This observation supports conjecture from seismic study, although the new work indicates the existence of more than one trench.

Sachel Christian- Robinson

*Seeing value in seafood waste*

The growth in population and a change in worldwide diets have set the aquaculture industry on a trajectory of rapid growth, making it one of the fastest-growing industries of the century. Yet such growth and further anticipated increases give greater prominence to the issue of effective waste management strategies to deal with the high levels of by-products incurred pre- and post-consumption resulting from premature catches, dead catches, and inedible portions. In the case of mollusk farming, the predominant by-product is shell comprising almost entirely of calcium carbonate. This biogenic calcium carbonate can be used as a low-cost, renewable alternative to offset the demands of its mined counterpart. Using this would steer waste away from landfills and the ocean, minimizing the environmental impact on land and aquatic ecosystems. Fundamentally, this would be an effective strategy to remove waste from the aquaculture industry and close the loop leading to a circular economy. Biogenic calcium carbonate from blue mussel shells farmed in Newfoundland and Labrador have been explored in several ways including as a source for nacre and a raw material for the synthesis of salt and adsorbent for water treatment.

Nurul Bin Ibrahim, Physics and Physical Oceanography

*Deep Learning Investigation of Turbulent Jets*

Recent advances in machine learning, particularly neural networks (NNs), have provided valuable insights into fluid dynamics and turbulence. In this work, we use NNs to study zonal jet formation in stratified turbulence. Zonal jets (localized regions of strong east/west flow), known as vertically sheared horizontal flows, often form spontaneously in simulations of stably stratified turbulence. Similar jets form near the equator in the atmosphere (the quasi- biennial oscillation of Earth's stratosphere) and in the ocean (the equatorial deep jets). Their existence is attributed to the interactions between the eddy momentum fluxes, transported by the field of waves and turbulence, and their own structure. We explore and develop several NN architectures to explore the relationship between the jet structure and the turbulence in the context of the stochastically excited stably stratified Boussinesq system. We compare our NN's predictions to those of a second- order turbulence closure theory, known as statistical state dynamics (SSD), which has successfully been used to understand jet formation in stratified turbulence.

Victoria Heath, Ocean Sciences

*Characterizing mechanisms of variation in thermal tolerance in Atlantic salmon* (Salmo salar*)*

No studies in wild Atlantic salmon have examined variation in thermal tolerance across large spatial scales or its genetic basis. I will use experiments with genomic and transcriptomic approaches to identify critical genes and mechanisms underlying thermal tolerance. The data generated will be used to design targeted assays and field-based experiments that will be applied across a larger number of populations to address current gaps in knowledge. The main foci of my research are to: 1) measure variation in thermal tolerance ($CT_{max}$) across three populations of Atlantic salmon; 2) compare transcriptomic responses of Atlantic salmon from the same three populations under two different temperature treatments (15°C vs. 20°C); 3) design targeted assays for identified genetic markers and gene expression differences to test on 15 populations of Atlantic salmon in the wild for comparison with thermal tolerance/stress; 4) identify populations experiencing thermal stress and locate populations that are most vulnerable under climate change.

Alex Day, Biology

*Spring 2022 Northwest Atlantic Thick-billed Murre Mortality*

Polar animals are facing rampant environmental destabilization due to climate change. Seabirds, one of the most vulnerable groups of vertebrates, experience acute and chronic threats that must be addressed to ensure their future survival. Thousands of thick-billed murres (*Uria lomvia*) perished along the southern Labrador and northeastern Newfoundland coasts in spring 2022. A sea ice anomaly happened directly before the mortality event, affecting feeding habitat and decreasing sea water temperatures to below zero. I investigated causes of death through necropsies, which allowed me document mass, morphology, age and sex information and their corresponding mortality associations. My next step is mapping the spatial and temporal patterns of mortality.

Sarah Boudreau, Chemistry

*Isolating Hydroxyapatite from Atlantic Salmon Processing Waste – Transforming Trash to Treasure!*

The need for protein is increasing exponentially as population grows and leads to more waste from food processing industries. At the same time, the demand for fish is higher than ever and solutions are needed to address associated waste management issues because Current disposal methods are environmentally damaging. While waste bones are considered low value as they are inedible, they are a potential feedstock for hydroxyapatite (HAP). HAP is a versatile mineral that has been used in biomedicine, environmental remediation, and catalysis. Existing literature methods for isolating HAP from waste are too hazardous for industrial use. To overcome this, we developed an industrially viable method to isolate collagen-containing HAP from Atlantic salmon waste using enzymes. The enzymatic treatment was optimized using Design of Experiments (analytical data and weight loss calculations as responses), resulting in a successful method requiring only 6 h, 15 μL $g^{-1}$ Neutrase and 7.5 μL $g^{-1}$ Lipozyme CALB L at 40 °C in tap water. To validate our method for industrial application, we successfully isolated >100 g of HAP by treating 15 salmon frames (backbones) and performed a simplified gate-to-gate life cycle analysis. Ongoing research into synthesizing HAP nanoparticles from the cleaned bones will be briefly discussed.

Rajesh Barua, Biology

*Efficient in vitro propagation of Vaccinium membranaceum in liquid culture using bioreactors and antioxidant enzyme profiling in micropropagules*

A bioreactor micropropagation method that enables the propagation of huckleberry (*Vaccinium membranaceum*) plants from both node and leaf explants, was developed. Adventitious shoots were regenerated on a semi-solid nutrient medium containing 10 µm thidiazuron from leaf explant of huckleberry clone. Temporary immersion and stationary bioreactors containing a liquid medium along with sigma bottles containing a semi-solid medium supplemented with zeatin were used for the proliferation of regenerated shoots. Proliferated shoots were rooted on a 2 peat: 1 perlite (v/v) medium and acclimatized under ex vitro condition. The highest amounts of three bioactive substances: total flavonoid content, antioxidant activity and proanthocyanin were found in greenhouse-grown tissue plant. Total phenolics and catalase activity were observed best in growtek cultured shoot. RITA cultured shoot got the highest value at glutathione reductase enzyme and leaf cultured shoots got highest value at superoxide dismutase enzyme. Although leaf cultured explants demonstrated almost the lowest amount in all phytocompounds' results.

Emmerson Wilson, Biology

*Predicting carbon in the maritime boreal forest under sequential disturbances*

Nature-based climate solutions are gaining recognition for their potential to help address the dangerous levels of carbon in our atmosphere. One such solution could be managing natural disturbances (e.g., insects, fire, invasive species) because disturbances often reduce carbon storage. We conducted a field study to spatially estimate the carbon currently stored across the boreal forests of the two National Parks in Newfoundland, as well as estimate the potential carbon loss from disturbances. We assessed the correlation between carbon stocks at field sites with varying disturbance histories and a suite of remotely sensed environmental variables (e.g., stand height, elevation), then projected these relationships across each park. Mature forests had, on average, 3.8x more total carbon than areas that had been insect-defoliated and then browsed by moose. Forest characteristics (e.g., stand height) were the most informative predictors of above-ground carbon. Conversely, we found no evidence that our environmental variables related to below-ground carbon patterns. Overall, we find there is potential to increase carbon storage by limiting invasive moose herbivory in areas recovering from native insect defoliation.

Nova Hanson, Ocean Sciences

*Investigating the "hairy snail" holobiont of Alviniconcha from hydrothermal vents in the western Pacific*

Symbiotic relationships at deep-sea hydrothermal vents are of key interest because these habitats occur across geologically distinct settings, with hydrothermal fluid chemistries varying substantially in temperature, pH, and reduced chemical concentrations. Therefore, animals that both feed on external sources and rely on internal symbionts may exhibit different levels of mixotrophy depending on the fluid chemistry. We assessed host feeding and gill endosymbiont characteristics in the genus of hairy snails, *Alviniconcha*, which dominate hydrothermal vent communities in the southwestern Pacific and Indian oceans. We used SEM imaging to assess radular tooth wear and found evidence supporting differential mixotrophy: radular wear differed significantly within and between vent sites and species. To determine whether differences in feeding might reflect differences in symbiont type and population density, TEM was used to examine the gill epithelial cells harbouring symbionts. We observed dense gill endosymbiont populations, but with site differences in symbiont morphotype. All species within *Alviniconcha* are currently listed on the IUCN Red List of Threatened Species as Vulnerable or Endangered, based on their extremely restricted habitat and lack of protection against deep-sea mining. Without the immediate implementation of protection, there is a future risk of extinction of these and other vent endemic species.

## 2B: Health & Wellness

Rashid jafardoustBostani, Biochemistry

*Identifying the bone marrow cells affected by extracellular vesicles released from CD24-stimulated B cells.*

Extracellular vesicles (EVs), which are small membrane-bound vesicles, carry bioactive molecules such as DNA, RNA, proteins, and lipids. EVs play a crucial role in cell-to-cell communication. Our lab previously discovered that the engagement of the cell surface protein CD24 on B lymphocytes (B cells) causes the release of EVs. We found that stimulation of CD24 on the donor cells caused the transfer of lipids, CD24, and the B cell receptor (BCR) to recipient cells. Bone marrow is a crucial hematopoietic tissue responsible for producing and maturing various blood cells, including B cells. In the bone marrow, stromal cells regulate hematopoiesis, including B cell development. The objective of this study is to determine if EVs released by B cells can be taken up by Bone marrow cells and the subsequent impact on B cell development. Our findings indicate that M2-10B4 bone marrow stromal cells are not the major target of the EVs released by CD24-stimulated B cells. Our future aim is to determine which cell types can uptake the EVs released by CD24-stimulated B cells in the bone marrow and the consequences of EV uptake on recipient cells. Overall, this study seeks to unravel the cellular interactions and functional consequences of EV uptake by bone marrow cells, focusing on the uptake of EVs released by CD24-stimulated B cells.

Justine Yick, Psychology

*Examining How Need for Cognition, Drawing, and Writing Interact with Memory Performance*

Research has shown that drawing while studying benefits memory more than simply writing – a phenomenon known as the drawing effect. However, it is unknown whether this benefit varies across different personality factors. As such, the present study explores the relationship between the drawing effect and a personality factor known as Need for Cognition (NFC) – one's tendency to think deeply about cognitive problems. A sample of 100 undergraduate students studied a series of words, drawing half of the words, and writing the other half repeatedly. Participants were then measured on their level of NFC. This talk will discuss current findings and the implications for study strategy recommendations.

Aaron Pye, Biochemistry

*A Computational Analysis of Glycosylated tRNA Structure*

GlycoRNAs are a recently discovered group of RNA molecules that are not fully understood. These novel biomolecules are comprised of RNA molecules with attached chains of sugar residues called glycans. GlycoRNAs are expressed on the cell surface and may participate in various cellular processes, such as cell signaling and autoimmune disease. Glycans have been found on many different types of RNA in a variety of cell types, with tRNA being frequently glycosylated. $Acp^3U$, a modified uracil nucleobase that occurs in tRNA, has been established as a glycan attachment site. We aim to shed light on glycoRNA structure by modeling a glyco-tRNA molecule. Density functional theory calculations were performed using a glycosylated $acp^3U$ model to obtain information about the conformational flexibility of the molecule. Results from these calculations were used to place the glyco-$acp^3U$ in a tRNA molecule, creating a glyco-tRNA model. Structures of natural tRNA and our glyco-tRNA model were compared with molecular dynamics simulations. Analysis of glyco-tRNA structure could indicate new cellular functions of glycoRNA. This research will guide future methods, such as clickable labeling models or purification methods based around glyco-tRNA structure, eventually leading to a full characterization of glycoRNA and its roles inside and outside the cell.

Claire Hynes, Biochemistry

*Characterization of CSDE1 missense variants in autism spectrum disorders*

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder, characterized by behavioral abnormalities, such as communication deficits and repetitive behaviors. Autism is often accompanied with intellectual disability, language delay and other conditions. Several factors contribute to the development of ASD, including a hereditary component. CSDE1 is an ASD risk gene, as disruptive variants of CSDE1 have been associated with ASD in children and young adults. CSDE1 is an RNA-binding protein (RBP) that has been implicated in synapse development and transmission, whose dysfunction underlies the neurological symptom of ASD. However, molecular details governed by CSDE1 in ASD have yet to be determined. Here, we show altered expression of synapse related genes, including HECW2, in patient-derived skin fibroblasts with a novel CSDE1 missense mutation, suggesting a potential mechanism of action by CSDE1. Additionally, we observed changes in the expression of proteins primarily associated with the miRNA pathway, namely, AGO2 and Dicer. Since the functional role of these proteins entails miRNA-mediated gene regulation, studying the link between CSDE1, HECW2 and the microRNA pathway components may unravel a novel pathophysiological mechanism controlled by CSDE1 in ASD pathology and aid in the development of new treatment strategies for ASD.

Quinn Morris, Psychology

*Prevalence and predictors of harm OCD: A meta-analytic review*

Obsessive-compulsive disorder (OCD) is a debilitating and highly complex condition, with unique symptom presentations that have divergent implications for course and treatment. Aggressive obsessions, or intrusive thoughts of harming the self or others, are experienced as particularly distressing, are commonly misdiagnosed by healthcare providers, and are highly stigmatized. The aims of the current study were: 1) to provide an aggregate estimate of the worldwide prevalence of aggressive obsessions among adults (18+) with clinician-diagnosed OCD, and 2) to quantify sources of heterogeneity that contribute to the variability in prevalence estimates to-date through moderator analyses. A systematic review was conducted using PubMed, PsycINFO, and CINAHL databases. Of the 4218 studies imported and screened using Covidence, 91 were ultimately coded for analysis. Prevalence values were aggregated using a random effects meta-analysis, with moderators explored using meta-regression. Preliminary data revealed current and lifetime prevalence rates of 57% and 67.6%, respectively, and reflected substantial heterogeneity. Moderator analyses revealed that samples with higher rates of aggressive obsessions were associated with greater mean age, longer duration of illness, and increased suicidal ideation; with lower rates observed in Asia compared to other regions. Findings support the need for early identification and increased monitoring of individuals experiencing aggressive obsessions.

Syndney Knapman, Psychology

*Validation does not end at creation: Validation of the Profile of Female Sexual Functioning*

Sexual functioning plays a critical role in maintaining overall health and well-being. Midlife individuals are at high-risk for experiencing sexual dysfunction with approximately 39% of women and 29% of men reporting low sexual desire while maintaining that their sexuality remains important to their lives and intimate relationships. Discussion of inadequate attention towards measurement in psychology is steadily growing, highlighting the imperative that sexuality researchers must utilize increasingly robust measures of sexual functioning. A popular measure for sexual functioning, the Profile of Female Sexual Functioning (PFSF), was chosen as no previous validation attempts have been conducted with midlife samples. Via Qualtrics Panels, 700 midlife married Canadians were sampled to examine the psychometric properties of the PFSF through Confirmatory Factor Analysis (CFA) and measurement invariance testing across gender binary groups. The results of the CFA display a mediocre fit, suggesting that using the PFSF as a sole measure of sexual functioning may not be adequate for fully understanding this variables presentation in midlife individuals. Tests of measurement invariance held, suggesting that the PFSF may indeed be interpreted similarly by men and women. Results are discussed in terms of broader implications for measurement of sexual functioning and improvements of this measure are addressed.

Tama Ghosh, Biochemistry

*Examining the structure and function of FUT8 enzyme: A Computational Modeling Approach*

Glycosylation is the addition of a sugar (carbohydrate) to another molecule, and this process plays a vital role in human health and immune response. In many cancers there are changes to glycans (i.e., carbohydrate chains) and therefore targeting these changes is a way to create new treatments and diagnostics tools. The changes to the glycans occur due to the action of enzymes. FUT8 is one such enzyme that plays a key role in glycosylation process in our cells. FUT8 drive the addition of a sugar (α-1,6-fucose) to the innermost sugar (N-acetyl-D-glucosamine, GlcNAc), which is known as core fucosylation. Core fucosylation is important for the modulation of cellular behavior, in both healthy and disease states. Unfortunately, irregular reactivity of FUT8 is one of the factors for cancer. As a result, by modulating FUT8's aberrant activity, a novel approach to drug development can be unfolded. Previous experimental work has indicated that with the changes of glycan structures, the enzymes catalytic activity also changes. The aim of this work is to determine the structure and function of FUT8 using computational modelling of substrate binding to FUT8. This study will lay the groundwork for future research into potential FUT8-targeted cancer therapies.

Noah Pevie, Psychology

*Meaningful Measurement of Body Image in Transgender Populations*

An individual's thoughts, feelings, and perceptions of their body can impact their mental health. While conflated, sex and gender are separate aspects of one's identity. This distinction is instrumental to transgender individuals whose gender identity does not align with their sex assigned at birth. This contrasts with cisgender people, whose gender identity aligns with their sex assigned at birth. Because trans* individuals experience their bodies in a fundamentally different way than cisgender people do, prevailing theories of cisgender body image should not be carelessly applied to trans* people. To gain a deeper understanding of the thoughts, feelings, beliefs, and concerns related to body image within the trans* community, it is crucial to explore how body image is perceived and experienced by individuals in this population. Using information from 10 semi-structured interviews with a diverse sample of transgender people across Canada, thematic analysis revealed five major themes relevant to transgender body image: fear of transphobia; body and gender autonomy; non-linear, evolutionary relationship with one's body; body image as a social experience; and internal and external body evaluations. These results will be discussed concerning the importance of building theory and understanding latent constructs with marginalized groups before pursuing quantitative methods.

Adar Buxton, Biochemistry

*Characterizing the effects of creatine precursors, guanidinoacetic acid and methionine on gut creatine transport using a Caco-2 model*

As an energy buffer, creatine plays an important role in the regeneration of energy in cells with a high energy demand. Over the years, the supplementation of creatine to enhance energy during exercise has become increasingly popular. However, our understanding of creatine transport from the gut into circulation is limited. Creatine is synthesized from guanidinoacetic acid (GAA) and methionine. Results from recent studies suggest that methionine, GAA, and creatine absorption in the gut are interdependent. Using a human intestinal Caco-2 cell line as an in vitro model, we hypothesized that a creatine:methionine:GAA combination (1:4:1) will improve creatine transport across the gut. The Caco-2 cells were allocated to 4 treatment groups which included a creatine control, creatine+methionine, creatine+GAA, or creatine+methionine+GAA and creatine transport into and out of the intestinal cell was measured. Preliminary results showed that cells exposed to creatine+methionine+GAA appeared to enhance creatine appearance in the basolateral buffer, compared to the other treatment groups. However, more work is needed to elucidate the various steps of creatine transport and identify the transporters responsible. With these results, we can develop a combination of nutrients that will improve creatine absorption efficiency, bioavailability, and utilization in the body. (Natural Sciences and Engineering Research Council of Canada).

Yuguan Jiang, Biochemistry

*Exploring novel PIWI-interacting proteins and their function in the piRNA pathway and cell differentiation*

piRNAs are small non-coding RNAs of length 24-31 nucleotides in length. piRNAs are involved in various cellular processes in different species, and the family of proteins called PIWI is known to mediate piRNA function in gene regulation. Two PIWI proteins, MILI and MIWI, are known to interact with piRNAs in mouse embryonic stem cells (mESCs) to form silencing complexes, and these RNA-protein complexes control mRNA localization, abundance and translation. However, the interacting partners and their function within these piRNA-MIWI and piRNA-MILI complexes, and the pathways that are affected by these interactions have yet to be fully elucidated. We hypothesize that there is at least one unknown protein in mESCs that will bind to and function with piRNA and MILI or MIWI. By interacting with the MILI/MIWI-piRNA complex, this protein affects gene expression in mESCs, thus resulting in cell differentiation. In our study, we are using immunoprecipitation combined with gel electrophoresis to stain proteins that interact with MILI or MIWI, followed by mass spectrometry to confirm the identity of these novel interacting partners of MILI and MIWI. Additionally, through RNA pulldowns, we have found numerous potential candidate proteins that interact with the piRNA, piR-mmu-1499894, which is highly expressed in mESCs. Comparing the results from mass spectrometry analysis of immunoprecipitations and RNA pulldowns, and further downstream biochemical characterization of the novel candidates provides insights into piRNA functions in stem cells and uncover the mechanism how they control cell differentiation and development.

Kelsey Downer, Psychology

*No Place to Call Home: Housing Stigma Against Previous Offenders*

The stigma that previously incarcerated individuals experience in Canada while attempting to secure housing has a direct impact on their ability to reintegrate into society. As a result of these challenges, many struggle with homelessness. Many individuals who are wrongfully convicted (exonerees)leave prison with a record, making it plausible that these individuals may experience similar housing discrimination to releasees. While there presently exists housing support for individuals who were rightfully convicted (e.g., The John Howard Society), there is presently no housing support for exonerees. My goal is to conduct a conceptual replication of Zannella *et al*,'s (2020) study which emailed apartment listings across Canada utilizing fake email accounts. The potential tenant email varied criminal status (exoneree, release, control) and race (black indigenous, white). The present study will differ from the former one as it will only consider criminal history and the new variable of a diagnosed mental illness. Discrimination will be measured by the number of responses to email inquiries, and the number of responses indicating that the unit is still available; the lower of each type of response corresponds with higher discrimination. I predict that those with a mental illness will be discriminated against more than those without a mental illness. I predict that exonerees will be discriminated against more than those without a criminal history. It is also predicted that exonerees with a mental illness will face the greatest level of discrimination.

## 3A: Technology, Innovation & Exploration

Yvonne He, Biology

### *Packaging patterns in* Rhodobacter capsulatus *gene transfer agents*

Gene transfer agents (GTAs) are phage-like particles produced by some bacteria that transfer cellular genetic information between cells. GTAs resemble tailed phages, with a capsid that contains a piece of the genome from the producing cell and a tail that facilitates binding to the recipient cell. They differ from phages in that they package seemingly random pieces of DNA from the host genome and they cannot package all the genes required for their own production. GTAs are considered to be major contributors of horizontal gene transfer in the ocean and may play vital roles such as spreading antibiotic resistance in the environment. This project will study patterns of DNA packaging in *Rhodobacter capsulatus* by isolating and sequencing the GTA DNA. The sequencing reads will be assembled to generate positional read counts, which will be used to identify any patterns in packaging across genomes. This project will deepen our knowledge of GTA packaging, which will be useful in understanding where GTAs fit in the context of horizontal gene transfer and the possible roles GTAs have played in shaping evolution of microbes.

Saad Equbal Syed, Computer Science

*Light Field Images*

My research at the VAC lab revolves around Holographic Displays. Holographic displays represent state-of-the-art technology aimed at providing immersive and lifelike visual experiences surpassing those of traditional displays. They operate by reconstructing three-dimensional images through interference patterns generated by light waves, using multidirectional pixels known as hogels instead of conventional pixels. Each hogel functions as a miniature light modulator, controlling the phase and amplitude of light to replicate the entire light field of a scene, allowing viewers to perceive depth and parallax as in the real world. However, the generation of holographic imagery necessitates advanced algorithms and significant computational power to compute interference patterns for numerous hogels in real-time. Despite their potential applications in various fields such as entertainment, medical imaging, and education, holographic displays encounter challenges like maintaining high resolution, wide viewing angles, and color accuracy while ensuring real-time performance. Ongoing research endeavors aim to enhance display performance, reduce computational complexity, and improve user experience through innovations in materials, optics, and signal processing techniques. By validating light field simulators against real-world holographic displays, my research at the VAC lab plays an important role in advancing this transformative display technology.

Jesna Fathima, Civil Engineering

## *Removal of antibiotic Azithromycin from synthetic wastewater and simultaneous bioelectricity generation using microalgae-Microbial Fuel Cell (m-MFC)*

*Azithromycin* is a broad-spectrum antibiotic that is widely seen in a variety of environmental systems and has the potential to harm the ecosystem and human health due to its ability to generate antibiotic-resistance genes . Microalgae-Microbial fuel cell (m-MFC) systems have recently gained increasing attention as a flourishing technology in wastewater treatment and energy recovery. Microalgae-Microbial Fuel Cell (m-MFC) integrates electricity generation, wastewater treatment, $CO_2$ sequestration, and biomass production in a single, self-sustainable technology. In the current study, the removal of the antibiotic Azithromycin (AZI) (10, 20, and 50 mg/L) was studied along with the generation of bioelectricity in an m-MFC reactor. The m-MFC reactor was constructed by taking synthetic wastewater with Azithromycin in the anodic chamber and microalgae *P.salina* in the cathodic chamber with carbon felt as electrodes. The results showed that, compared with the open-circuit condition, the generation of bioelectricity (closed-circuit) significantly enhanced the removal of AZI. The maximum voltage obtained in the reactor was 540 mV for 10 mg/L and increasing the concentration of antibiotic significantly affected the power generation. On the other hand, increasing the concentration of antibiotics doesn't find to affect the efficiency of antibiotic removal. Maximum antibiotic degradation of 90% was obtained irrespective of initial antibiotic concentration. The antibiotic degradation is efficiently done in 1-2 days by closing the circuit. The Total Organic Carbon (TOC) removal efficiency of 75-80% and Total Nitrogen (TN) removal efficiency of 80-86% were obtained in the current study. TOC removal efficiency of the reactor decreased by 50% when increasing antibiotic concentration from 10 mg/L to 50 mg/L. The maximum power density obtained in the study was 70-140 $mW/m^3$ which is comparable with the existing microbial fuel cell reactors. This integrated m-MFC can be a breakthrough in the field of algal-mediated removal of antibiotics in wastewater treatment processes.

Mohammad Mousavi, Physics and Physical Oceanography

*Ocean Sound Speed Profile measurement using time-delay profile*

The ocean Sound Speed Profile (SSP) directly affects how acoustic waves propagate in the ocean. So, knowing the SSP is essential in many underwater acoustic applications, such as sound propagation modeling, underwater acoustic imaging, acoustic localization, and acoustic tracking. Underwater sound speed also provides information about the temperature structure using the relationship between ocean temperature and sound speed. SSPs are usually measured by a Sound Velocity Profiler (SVP) or a Conductivity, Temperature, Depth (CTD) profiler. A significant part of the expense of these methods to estimate the SSP is the necessity to operate from a fixed platform for hours or even days. Our presentation focuses on remote sound speed profile estimation using an underwater acoustic pulse-echo method and the time-delay profile between receivers. The transducer transmits acoustic pulses to the medium, and SSP is estimated using received echo signals of marine organisms. To show the approach's validity, using ray acoustics and an assumed sound speed profile, we model the signals reflected from the scatterers as received at the hydrophones. After estimating SSP using our synthetic received signals, the estimated sound speed associated with each reflector depth is compared to the assumed sound speed.

Zhen Shuang, Mathematics and Statistics

*PDE methods in signal processing*

Evolutionary weighted Laplace equations with convex constant coefficients and variable coefficients consisting of power functions are employed to improve signal decomposition. We show the existence of solutions by the Faedo-Galerkin method. We also investigate the asymptotical behaviour of solutions to the equations and find out that time-separated solutions are deeply related to eigenfunctions of the weighted Laplace operator. We accomplish signal decomposition based on different smoothness via solutions to those equations through the transform and inverse transform that depend on fractional order derivatives. Our methods are extremely time efficient and have better quality. Discrete solutions to those equations and signal decomposition are obtained with numerical methods in Matlab.

Dr. Jaime Soto Neira, Ocean Sciences

*Novel hydrocarbon sensing technologies for environmental studies*

Evaluating the environmental aspects associated with the oil and gas industry on aquatic environments and attenuating such impacts by taking advantage of natural physical, chemical, and biological processes corresponds to the first defensive line of our oceans. In particular, oil and gas degradation by local microbial communities plays a fundamental role in removing pollutants from coastal and offshore areas. However, researchers studying the factors modulating the response of micro- and macro-biota to chemical stressors associated with the aforementioned industrial activities in naturally heterogeneous marine environments face the limitation of the currently available analytical techniques for measuring in-and ex-situ distributional patterns of the pollutants. Therefore, we are developing novel instrumental approaches for measuring hydrocarbons and evaluating their impact on marine biota. The envisioned technology aims to surpass the response of currently available methods to factors like matrix effect, pressure, and organic matter interference, providing cost-effective sensors capable of producing robust analytical results during both in situ measurements in aquatic environments and on-bench applications during lab experimentation. Our sensor's compact design and low power consumption will allow deployments using small vessels and straightforward incorporation into autonomous/remotely operated underwater vehicles, and also provide the basis for technology transfer towards other environmental fields.

Chandrika Dissanayaka, Biochemistry

*Bioactivity enhancement of camelina (Camelina sativa L. Crantz) seed meal peptides*

Camelina is considered as a sustainable oilseed crop and a novel source of plant protein. While the oil is of high demand, particularly in aquaculture applications, the defatted protein-rich meal fraction remains underutilized. Glucosinolates/thioglucosides are principal antinutrients present in the seed meals that limit their inclusion in food formulations due to the toxic effects of their cyanogenic degradation products. To remove glucosinolates and upgrade the meal, a novel extraction method involving ammoniated ethanol was used simultaneously with hexane to extract the oil. The resultant meal was effectively detoxified by removing over 95% of glucosinolates. Further enzymatic hydrolysis of the isolated proteins with Alcalase generated peptides with the highest radical scavenging activities, metal chelation and ferric reducing power as well as alpha-amylase inhibitory properties compared to the hexane defatted counterparts. Specifically, peptides of >3 kDa exhibited stronger radical scavengers with better-reducing power and alpha-amylase inhibition. These results demonstrate the nutraceutical potential of low-molecular-weight peptides derived from upgraded camelina seed meal to tackle oxidative stress and control blood glucose levels. Key words: camelina seed meal, radical scavenging, detoxification, reducing blood glucose level, oxidative stress

Ayon Debnath, Computer Science

*Light Field Image Compression*

My honors thesis focuses on tackling the significant challenge of effectively compressing light field images, which are known for their substantial size and rich visual content. While traditional 2D images benefit from established compression techniques like JPEG and HEIF, light field images lack such standards. To address this gap, I plan to adapt the well-known JPEG compression algorithm for use with light field images. The ultimate goal is to develop a modified JPEG compression algorithm that strikes the right balance between compression efficiency and the preservation of essential image details that can be later adapted for the use with light field images. This research aims to make light field technology more practical, facilitating its wider application in areas such as 3D displays and augmented reality experiences.

Narges Vadood, Scientific Computing

*Turbulent dusty Molecular Clouds with SPH-1-fluid vs 2-fluid methods*

The project aims to compare the performance of two theoretically identical formulations for simulating turbulent gas and dust mixtures in Smoothed Particle Hydrodynamics (SPH) using PHANTOM code. While the 2-fluid approach proves computationally intensive for small dust grains, the 1-fluid formulation excels in handling this regime efficiently. However, challenges arise as this method falters when applied to larger grains. The study delves into these nuances and different constraints on both models, providing insights into the trade-offs between computational efficiency and accuracy in simulating diverse grain sizes.

Dr. Kim Welford, Earth Sciences

*The magic of geophysics to solve our modern challenges*

We currently face many environmental and humanitarian challenges for which science can provide possible solutions. In particular, the science of geophysics, which allows us to see into the subsurface without the need for digging, holds the power to help us solve problems like finding the minerals we need to build green technologies, storing excess carbon dioxide so that it does not enter the atmosphere, monitoring global compliance with bans on nuclear weapon testing, and ensuring safe water supplies for society, to name a few. In this presentation, I will explain how the clever use of principles from physics, coupled with a knowledge of our planet, can combine to unlock many tangible ways to make the world a better, safer, and more sustainable place.

Maddie Borland, Biochemistry

*Unlocking the Potential of Harnessing Pigments from Green Sea Urchin Shells and Spines*

The majority of Canadian urchin harvests are green sea urchins, *S. droebachiensis*, where Canada serves as the dominant supplier of live urchins only, due to their lack of processing facilities. Lacking sustainable culture and processing, the sea urchin market has become a highly underutilized resource. Currently, producers and consumers prioritize urchin roe, discarding both the shells and spines as waste, however, improved research on the bioactive compounds available in the pigments of the shells may broaden the industry. The pigments of the shell constituting chemically heterogeneous and biosynthetically unrelated molecules containing chromophores, contribute to the outer shell colour of the urchin and have been found to have widespread pharmaceutical, food, and cosmetic potential. Specifically, polyhydroxylated 1,4-naphthoquinone (PHNQ) structures have potential antimicrobial, antialgal, antioxidant, and cardioprotective capabilities largely researched by complementary and alternative medicine. As such, further research should be performed to determine the biochemical role naphthoquinone pigments play in various urchin species that differ by location, depth, taste, market appeal, and physiological status. There is an opportunity for improved sustainability and expansion of urchin culture in Canada by determining the chemical composition of green sea urchin shells and the pigments present, while also generating human benefit and application for the product.

Shemonto Das, Computer Science

*Unbalanced Fault Classification Using Active Learning in Synthetic Fiber Manufacturing Process*

Fiber manufacturing is a complex and dynamic process where quality control poses unique challenges, requiring timely detection and accurate classification of faults. Automating the quality control process using machine-learning techniques has the potential to reduce costs and increase efficiency. However, training machine-learning models to classify faults requires labeling large quantities of time-series data generated from the sensors, which can be costly and time-consuming. In this work, we developed and evaluated Active Learning (AL) techniques to enhance the performance of fault classification models while reducing the number of instances that require labeling. AL is based on focusing the labeling effort on a small number of selected, informative samples, thereby reducing the cost and time requirements for creating a labeled dataset. Moreover, in manufacturing, the frequencies of different types of faults vary widely, resulting in a class imbalance problem. The selection of instances per class to be labeled is beyond the control of traditional AL techniques, which may lead to significant bias in the classification performance and the selection of instances to be labeled for AL strategies, particularly in a dynamic manufacturing environment. To address this problem, we also develop and incorporate a class-balancing instance selection algorithm that tries to select more instances from the classes with fewer labeled examples. The AL techniques implemented here reduce the amount of labeled data necessary for accurate fault classification by a factor of 5 compared to conventional supervised machine-learning techniques. Additionally, our class-balancing instance selection algorithm effectively addresses the class imbalance problem in our dataset. Overall, our results indicate that our AL pipeline constitutes a promising solution for efficient and accurate fault classification using time-series data from industrial manufacturing.

## 3B: Health & Wellness

Lily Bertolo, Biology

*Fine structure histological anatomy of posterior ocular vasculature in early juvenile lumpfish*

Lumpfish (*Cyclopterus lumpus*) are a teleost fish valued for caviar and their ability to clean sea lice from farmed salmon, preventing significant economic losses in aquaculture. Lumpfish have high visual acuity and may be a good model for human eye disease. However, humans have vascularized eye tissue whereas the lumpfish have a rete mirabile, a counter-current exchange system that oxygenates and nourishes the retina. Little is known about the lumpfish posterior ocular vasculature. The first aim of this project was to characterize the vascular structures that supply blood to the rete mirabile using two methacrylate embedded juvenile lumpfish sliced into 560 serial sections along the coronal and axial planes. We found two main vessels of similar structure that were connected to the rete mirabile through small, branched vessels and extended posteriorly towards the gill regions. The second aim was to identify CLIC2, an intracellular chloride channel likely involved in transepithelial transport and the maintenance of tight junctions. In a series of images of ocular vasculature tissues stained for CLIC2, there was an absence of CLIC2 in the early juvenile stages but a much stronger presence in late-larval and adult stages of the lumpfish life cycle.

Kaitlyn Mayne, Biochemistry

*Exploring CD22 and Siglec-G as functional co-receptors of CD24 on developing B cells from murine bone marrow.*

CD24 is a glycophosphatidylinositol (GPI)-anchored surface adhesion molecule that regulates development of B lymphocytes in the bone marrow through apoptosis. While CD24 is a critical regulatory molecule on B cells in bone marrow, it notably lacks intracellular signaling structures. This indicates a functional co-receptor for CD24 may mediate its homeostatic signaling mechanisms. Siglec G is an endogenous co-receptor of CD24 on other immune cells, but this role has not yet been investigated in B cells. Siglec-2 (CD22) is also a modulator of B cell development and has similar expression patterns to CD24. Thus, I explored CD22 and Siglec-G as a functional co-receptor of CD24. First, we analyzed the specific binding of Siglec-G-Fc or CD22-Fc fusion proteins to CD24 in B cells from CD24KO and WT mice. While Siglec G showed no change in binding, CD22 appeared to exhibit differential binding in CD24KO compared to WT cells. However, statistical analysis showed no significant difference in differential binding patterns. Further attempts to determine whether CD22 plays a role in CD24 signaling were inconclusive due to difficulties with in-vitro CD22 knockdown. Overall, this suggests that CD22 and Siglec-G are not likely candidates as functional co-receptors of CD24 in murine bone marrow B cells. This work is supported by NSERC.

Morgan LeDrew, Biochemistry

*Vitamin D and Muscle Health in Adults in Newfoundland*

Evidence suggests that high latitude and long winter seasons are risk factors for low vitamin D levels, putting Newfoundland's residents at risk. Vitamin D deficiency has been linked to low muscle mass. Therefore, we expect to see low levels of vitamin D, as well as a decreased muscle health in those with deficient levels. The study will determine vitamin D status in adults to then investigate the potential relationship with muscle health. Further investigation includes the identification of biomarkers related to muscle health such as Insulin-like growth factor (IGF-1). Serum vitamin D concentration will be measured from blood samples collected to determine the vitamin D status in each volunteer. Muscle mass will be determined via bioelectrical impedance analysis. Anthropometric data will be taken, as well as strength measured using a handgrip dynamometer. Muscle function will be determined using the Short Physical Performance Battery (SPPB). General, diet, and physical activity questionnaires will be conducted to determine lifestyle factors. Addressing vitamin D deficiency may have implications for the management of chronic diseases and the improvement healthcare programs. Maintaining muscle function with age is crucial for the participation in daily activities, allowing greater quality of life.

Robyn Cumben, Psychology

*Exploring Readiness for Love: Attitudes Toward Repartnership Following the Death of a Partner*

The death of a romantic partner is a universally experienced, highly traumatic, and involuntary relationship dissolution. Repartnership (i.e., entering a new romantic relationship) benefits bereaved individuals by fostering instrumental/emotional support that other relationships cannot replace and can also help offset premature mortality associated with the mental/physical strain of bereavement. Understanding the demographic/psychological predictors of relationship readiness remains largely unknown, especially in individuals under age 60. Traumatic experiences (like the death of a partner) have been well-established as fertile grounds for positive personal growth (i.e., posttraumatic growth [PTG]), and so it is important to understand what factors contribute to such growth. While recruitment is ongoing for the main study, preliminary findings from our pilot questionnaire (N = 23) found that higher PTG and being a man predicted higher relationship readiness. The main study involves the recruitment of 250 individuals who have lost a prior partner via Leger panels. We hypothesize that PTG will remain a significant predictor of relationship readiness. Crucially, our results have implications for clinicians by increasing our collective understanding of the post-death experience and the factors that play into decisions to repartner.

Ishraq Rahman, Biology

*Avian influenza virus infection of seabirds in Newfoundland and Labrador*

Avian influenza A viruses (IAV) have been known to circulate in seabirds and surveillance reports over the last several decades indicate that seabirds are important hosts and play an integral role in ecology of IAV. The current circulation of the highly pathogenic avian influenza (HPAI) clade 2.3.4.4b H5N1 virus has changed the dynamics of the virus within seabird populations. This virus has been maintained in seabird populations over the past several years, an unprecedented phenomenon with continued outbreaks across Europe, North America, South America and Africa. Hence, the HPAI virus is said to have become enzootic among wild birds. Therefore, IAV surveillance and serological studies of seabirds have become crucial. We quantified the history of previous IAV infection using seroprevalence for IAV generally and H5 specifically in Atlantic Puffins, Common Murres, Northern Gannets and Black-legged Kittiwakes from Newfoundland and Labrador in 2022 and 2023. This showed an increase of infections in these populations for all species after the time of introduction of the H5 virus into this region.

Asha De Silva, Biochemistry

*Dietary methionine requirements for metabolites in TPN-fed neonatal piglets*

Feeding preterm neonates Total Parenteral Nutrition (TPN) is often a necessary life-saving measure. A key nutrient in TPN is methionine, which is needed for synthesis of protein and key methylated metabolites, as well as for regulating gene expression patterns that can program risk of diseases later in life. Moreover, we have shown that if methionine is diverted to one metabolite, it is then unavailable for other metabolites. Hence, it is essential to establish the amount of methionine required for each metabolite. Previous studies have determined a methionine requirement of TPN-fed pigs but based only on the methionine requirement for whole-body protein synthesis. It is still unclear how much methionine is used to synthesize creatine, phosphatidylcholine, and DNA methylation. We hypothesize that piglets require more dietary methionine for these non-protein pathways. The proposed project be conducted in 30 TPN-fed Yucatan miniature neonatal piglets. After 6 d of TPN feeding, each pig will receive a different methionine level and synthesis of various metabolites will be measured. Breakpoint curves will determine the methionine requirement for each metabolite. This research will provide recommendations for the optimum methionine level for neonatal TPN solutions to enhance early neonatal development and adult health.

Caitlan Meaney, Biochemistry

*The Impact of Diet Quality on Student Success in Higher Education STEM*

A growing body of research suggests that nutrition plays an important role in cognitive function, including positive correlations with a high-quality diet and academic success. However, there is limited research on how diet quality and intake of specific nutrients which impact cognition, such as omega-3 fatty acids, affect higher education students' success. Given the importance of nutrition in cognitive function, we hypothesize that high diet quality and high omega-3 fatty acid intake will significantly correlate with various measure of student success including grades, student experience and retention. The relationship between diet quality and student success will be investigated within the population of undergraduate STEM students at Memorial University of Newfoundland using a mixed methods approach. This will include a combination of quantitative surveys, qualitative interviews and validated dietary assessment tools. To assess the impact of diet quality and omega-3 fatty acid intake, we will examine three measures of student success – grade point average (GPA), student experience and retention-associated variables. Additionally, we will investigate the facilitators and obstacles to students' healthy food choices. Findings from this study will establish connections that will help guide further research, development of evidence-based interventions, student wellness programs, and campus policies to improve students experience and food choices both on and off campus.

Narges Ghorbani Bavani, Biochemistry

## *The effects of dietary docosahexaenoic acid (DHA) and vitamin D supplementation on vitamin D metabolism in diet-induced obesity (DIO) animal model*

The effects of dietary docosahexaenoic acid and vitamin D supplementation on vitamin D status in diet-induced obesity (DIO) animal model. Background: Obesity is a growing health issue, and vitamin D concentrations are often low in obese individuals. Recent evidence suggests that docosahexaenoic acid (DHA) reduces fat mass accumulation. Therefore, supplementation of DHA and vitamin D through modulations of nuclear factors and genes involved in lipogenesis and lipolysis in adipose tissue may correct vitamin D status in obesity. Objectives: This study aims to determine the impacts of DHA and vitamin D co-supplementation on vitamin D status and metabolism in DOI rat model. Method: Eight-week-old Sprague-Dawley rats (male and female) (n=96) are fed either control or one of five experimental diets for 8 weeks: control (AIN-93M diet (Harlan)); High-Fat (HF) diet (35% kcal fat from total energy); HF diet– vitamin D (contains 0.05 IU/g vitamin D); HF diet + Vitamin D (3 IU/g); HF diet + 1% of dietary weight DHA; or HF diet + 1% DHA + 3 IU/g Vitamin D. To assess vitamin D status, serum 25(OH)D concentrations are assessed using ELISA kits. Furthermore, mRNA expression of vitamin D receptors and genes involved in vitamin D metabolism (Cyp2r1, Cyp2j6, Cyp27a1) in adipose tissue and liver are assessed using RT-qPCR. To assess molecular aspects of fat mass accumulation, mRNA expression of genes involved in lipogenesis and/or lipolysis (such as sterol regulatory element-binding protein 1c, fatty-acid synthase) will be measured using RT-qPCR. Results: In DIO rats, treatment with DHA and vitamin D would increase 25(OH)D concentrations independently. However, the co-supplementation would result in synergistic benefits. Conclusion: This study will elucidate mechanisms by which DHA and vitamin D may correct vitamin D status in DIO rats.

Naomi Akanmori, Biochemistry

*Human Ribokinase activity: Regulation by monovalent cations*

Ribose is a fundamental building block in biological systems, pivotal for nucleotides, amino acids, and enzyme cofactors. Its significance extends to cellular energy metabolism, making it a subject of interest as a dietary supplement. Ribokinase (RK) initiates ribose metabolism by converting it to ribose-5-phosphate (R5P), which enters various metabolic pathways including the pentose phosphate pathway. Notably, RK displays a distinct reliance on monovalent cations, exhibiting heightened activity in the presence of $K^+$ compared to $Na^+$, yet the underlying molecular mechanisms remain elusive. Our research aims to unravel the mechanism of RK activation by $K^+$. We propose that $K^+$ induces a conformational shift in the ATP binding site, optimizing ATP orientation for catalysis, a feat not achieved by $Na^+$. Through crystallographic studies and molecular dynamics (MD) simulations of human RK with $K^+$ or $Na^+$, we seek to elucidate these mechanisms. Initial crystal structures of human RK with $Na^+$ provide reference points, shedding light on substrate binding and product release dynamics. Notably, flexibility in ATP phosphate groups suggests inefficient ATP orientation with $Na^+$. MD simulations corroborate these findings, showcasing agreement with experimental data. This research promises deeper insights into RK regulation and may have implications for understanding $Na^+/K^+$ regulation within cells.

Sarusha Santhiravel, Biochemistry

## *Steam Explosion Enhances the Inhibitory Activities of Soluble Phenolics from Dun Pea* (Pisum sativum sativum var. avense) *on Free Radicals and Reactive Oxygen Species*

Dun pea (*Pisum sativum sativum var. avense*) is one of the field pea cultivars. Peas contain a wide range of bioactive compounds, including phenolics. This study aimed to investigate the effect of steam explosion treatment on the composition of free, esterified, glycosylated and insoluble-bound phenolic compounds of dun pea and their inhibitory activities on free radicals and reactive oxygen species (ROS). Dun pea seeds were subjected to steam explosion treatment at 190°C, 200 psi for 2 min, followed by the extraction of phenolics. The phenolic extracts were analyzed for their total phenolic and flavonoid contents. Their radical scavenging activity was analyzed by DPPH (2,2-diphenyl-1-picrylhydrazyl) and ABTS (2,2-azino-bis(3-etilbenzotiazolin)-6-sulfonic acid) assays as well as ROS, namely, hydroxyl radical, peroxyl radical, hydrogen peroxide ($H_2O_2$) and singlet oxygen ($^1O_2$). After the treatment, total phenolic and flavonoid contents of the free phenolic fraction was increased significantly ($p < 0.05$), while those of the esterified, glycosylated, and insoluble-bound phenolic fractions decreased. A similar pattern was observed in assays for inhibiting free radical and ROS. Thus, steam explosion provides an effective technique for enhancing the antioxidant properties of dun pea, thereby expanding its use in the production of value-added products.

Golbarg Gazerani, Biochemistry

*Therapeutic Potential of Nicotinamide Riboside and a-Cyano-4-HydroxyCinnamic Acid on Myelin Phagocytosis by Pro-inflammatory Macrophages*

Multiple sclerosis (MS) is a progressive and inflammatory disorder affecting the central nervous system (CNS), characterized by the loss of myelin, a crucial fatty substance for neuronal function. While current treatments target the early stages of MS, they often fail to effectively manage disease progression. Macrophages typically rely on aerobic glycolysis during inflammation but switch to oxidative phosphorylation to clear damaged myelin, aiding in the repair of demyelinated neurons. Our study investigates nicotinamide adenine dinucleotide ($NAD^+$) levels to assess changes in macrophage metabolism in response to inflammation. We hypothesized that $NAD^+$ replenishing therapies, such as Nicotinamide Riboside (NR) and $\alpha$-Cyano-4-Hydroxycinnamic Acid (CHCA), could reduce immune activation and enhance myelin debris clearance. Our findings thus far indicate that unexplained roles for NR and CHCA as they reduced macrophage phagocytosis in response to lipopolysaccharide treatment, a proinflammatory stimulation, over different time points. Live/dead assays confirmed the cell viability across these time points, suggesting that the reduced phagocytosis results from the therapeutic agents rather than cell death.

Farzad Mostafavi, Biochemistry

*Molecular Structural Similarity of Protein-Carbohydrate Complexes, A Computational Study*

The interactions between carbohydrates and proteins are crucial in diverse biological processes and have profound implications for human health. For example, carbohydrate-protein interactions are essential for cellular recognition and signaling, as well as dysregulation of these interactions has been proposed to play a role in the development of diseases such as cancer, neurodegenerative disorders, and metabolic diseases. Consequently, a comprehensive understanding of these interactions is essential for developing targeted therapies and interventions. While hydrogen bonding interactions in the field of protein-carbohydrate contacts have been well investigated, CH-π interactions involving aromatic amino acid side chains (i.e., Tyr, Trp, His and Phe) have not received as much attention. Our research indicates that carbohydrates and aromatic amino acid side chains form CH-π interactions with various orientations. Clustering the complexes into different groups according to molecular structural similarities becomes essential to clarify the geometric preferences of these interactions. In this work, we used the Root Mean Squire Deviation (RMSD) clustering method to identify the molecular similarity. This systematic approach provides detailed information about the molecular properties of CH-π interactions in carbohydrate-protein complexes necessary for drug design, ligand docking, and enhance force fields that describe these interactions.

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