The 12th annual UWinnipeg

Three-Minute Thesis Competition Finals

Thursday, March 13, 2025
UWinnipeg | 3C00

3MT® THREE MINUTE THESIS
FOUNDED BY THE UNIVERSITY OF QUEENSLAND

Order of Events

Introduction

Kent Suss
Budgets, Programs, and Priorities Officer, Faculty of Graduate Studies

Welcome and Land Acknowledegment

Dr. Todd Mondor
President and Vice-Chancellor

Brief on the Competition

Kent Suss
Budgets, Programs, and Priorities Officer, Faculty of Graduate Studies

Presentations

Judge Conferral

People's Choice Vote

Reception

Research in Focus Awards Ceremony

Akshi Malik
Program Officer, Health Sciences,
Research Partnerships and Impact, UW Research Office

Announcement of Competition Winners

Dr. Todd Mondor
President and Vice-Chancellor

Dr. Kyle Devine
Dean, Faculty of Graduate Studies

Closing Remarks

Dr. Kyle Devine
Dean of Graduate Studies

Competition Judges

Jennifer Cleary
Chief Executive Officer, Research Manitoba

Nermin Sa'd
Director of Programming and Global Initiatives, North Forge

Paul Samyn
Editor, Winnipeg Free Press

Presentations

1. **Ranjini Mukherjee**
   MSc in Bioscience, Technology, and Public Policy
   Polar Bears and Pollutants: Using Cells to Improve Risk Assessments

2. **Faith Akinyemi**
   MSc in Applied Computer Science and Society
   From Data to Dinner: Predicting harvests before they happen

3. **Rubeena Gosal**
   MSc in Bioscience, Technology, and Public Policy
   Molecular Puzzles, Home Depot Buckets, and the Quest for a Fertility Agonist

4. **Tabitha Evans**
   MA in Environmental and Social Change
   Transdisciplinary Research Teams Co-Produce Essential Climate Knowledge and Solutions

5. **Noah Lewicki**
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   Ready to Rumble: Milk Fights Liver Disease

6. **Hardi Matholia**
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7. **Dhulmy Bandara**
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   Fixing Soil Heavy Metals – A Play by Plants and Modified Organic Materials

8. **Malcolm Reimer**
   MSc in Bioscience, Technology, and Public Policy
   Environmental emergence cues for hibernating bats

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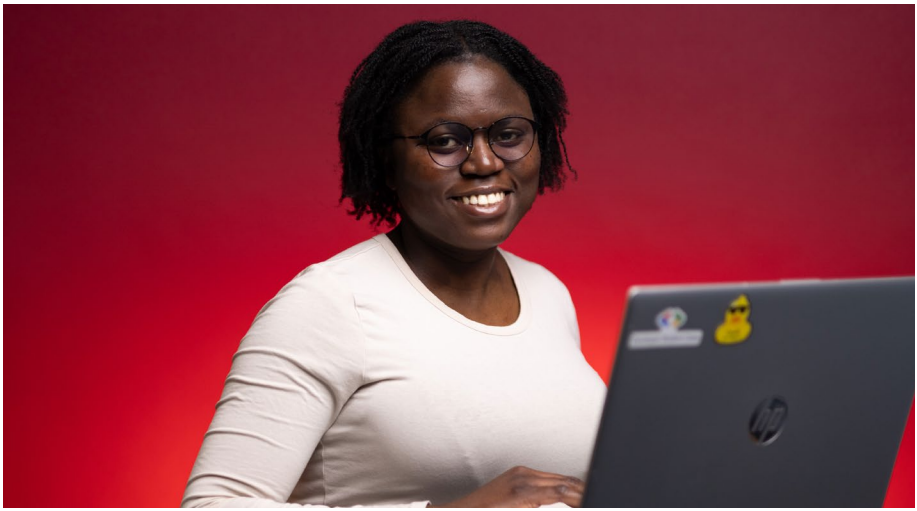
Ranjini Mukherjee

MSc in Bioscience, Technology, and Public Policy
Supervisor: Dr. Jean-Pierre Desforges

Polar Bears and Pollutants: Using Cells to Improve Risk Assessments

Polar bears (Ursus maritimus) are apex marine predators in the Arctic, exposed to high levels of persistent organic pollutants (POPs) through biomagnification. While previous studies have detected legacy and emerging contaminants in polar bears, their biological effects remain unclear due to ecological and biological confounders. This study improves chemical risk assessment using in vitro methods with primary polar bear cells to evaluate species-specific toxicity of priority Arctic contaminants. It employs New Approach Methodologies (NAMs) through in vitro dose-response experiments to assess individual POPs and Chemicals of Emerging Arctic Concern (CEACs) across key physiological systems, including immune, endocrine, reproductive, and hepatic function. Given Arctic Indigenous communities' reliance on traditional diets, they are particularly vulnerable to these pollutants. This research will enhance understanding of POP and CEAC toxicity, informing safer chemical management strategies to protect Arctic wildlife and human health.



Faith Akinyemi

MSc in Applied Computer Science and Society
Supervisors: Dr. Michael Beck and Dr. Christopher Bidinosti

From Data to Dinner: Predicting Harvests Before They Happen

My research uses field images to predict crop yield, leveraging machine learning techniques to extract patterns and features correlating yield. These features include plant health indicators, growth stages, or canopy coverage.

I am particularly interested in using these features to develop models that improve the accuracy of yield prediction, helping farmers make data-driven decisions. My approach considers temporal changes in the crop, capturing how its characteristics evolve.

My work contributes to precision agriculture, a field that seeks to optimize resource use, increase productivity, and promote sustainability in farming. My research has the potential to transform traditional agricultural practices by integrating advanced AI methods.

Rubeena Gosal

MSc in Bioscience, Technology, and Public Policy
Supervisor: Dr. Tabitha Wood

Molecular Puzzles, Home Depot Buckets, and the Quest for a Fertility Agonist

Infertility affects millions worldwide, yet treatment options remain limited, particularly for those with polycystic ovary syndrome (PCOS)—the leading cause of anovulatory infertility. At the root of the issue is a hormone imbalance that disrupts follicle-stimulating hormone (FSH) signaling, preventing ovulation.

My research focuses on restoring this signal by identifying small molecules that can activate the FSH receptor (FSHR). Using computational modelling, I screen thousands of compounds through molecular docking—searching for the right fit like a missing puzzle piece. But proteins aren't static, and molecular dynamics simulations allow us to test whether these molecules actually stay bound. Once promising candidates are found, synthetic chemistry takes over, using reactions like the Truce-Smiles rearrangement to reshape and refine molecules into viable therapeutics.

By bridging computer modeling with chemistry, my work aims to develop new treatments for infertility—offering solutions where "just keep trying" has never been good enough.

Tabitha Evans

MA in Environmental and Social Change
Supervisor: Dr. Ryan Bullock

Transdisciplinary Research Teams Co-Produce Essential Climate Knowledge and Solutions

Transdisciplinary research approaches to climate change mitigation are being used more often given their strengths in collaboration, knowledge integration and collective decision making. Such approaches warrant more attention to understand how diverse teams produce knowledge and practice problem-solving. My thesis research explores the strengths and challenges of transdisciplinary research to offer future avenues for team collaboration and policy decision–making processes.

Noah Lewicki

MSc in Bioscience, Technology, and Public Policy
Supervisor: Dr. Sanoji Wijenayake

Ready to Rumble: Milk Fights Liver Disease

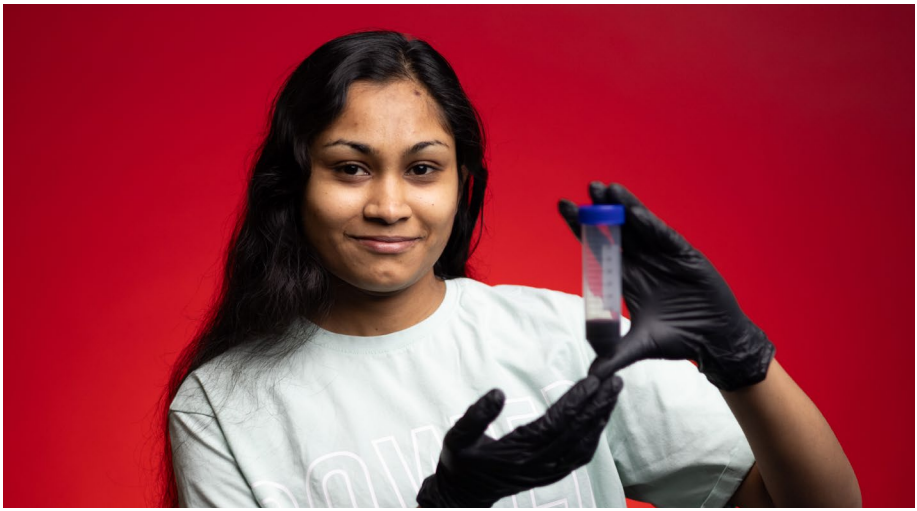
Obesity during pregnancy can have long-term health effects on offspring, increasing their risk of conditions like non-alcoholic fatty liver disease (NAFLD). NAFLD is the most common liver disease in children, and is characterized by excess fat buildup in the liver, leading to inflammation, liver damage and liver failure. Breast/chest feeding helps counteract the effects of obesity, but what about for NAFLD? Human milk contains biological nanovesicles called milk-derived extracellular vesicles (MEVs). MEVs positively influence metabolism and can be anti-inflammatory. My study explores how MEVs impact NAFLD risk in offspring with gestational obesity. I hypothesize that MEVs will provide protection against NAFLD and reduce chronic liver inflammation and fat buildup in offspring. Understanding MEVs' role could shape policies promoting breastfeeding and the enhancement of infant formulas with MEVs, providing a new approach to improve long-term health outcomes for children.

Hardi Matholia

MSc in Applied Computer Science and Society
Supervisor: Dr. Mary Adedayo

Guardians of the Database Galaxy: A Forensic Analysis of MongoDB

This study looks at how to keep data safe in MongoDB, a type of database used by many businesses to store large amounts of information. As more companies use MongoDB, it becomes a target for hackers who may try to steal or delete important data. While there has been a lot of research into protecting traditional databases, there is less focus on databases like MongoDB. This study explores ways to detect and stop harmful activities in MongoDB, as well as how to recover deleted data. By analyzing the database's logs, we can track and prevent unauthorized actions. The goal is to create a tool that helps protect databases from attacks like data theft or loss, and ensures data is recoverable if something goes wrong. This tool will help businesses protect their data and recover it when necessary.



Dhulmy Bandara

MSc in Environmental and Social Change
Supervisor: Dr. Srimathie Indraratne

Fixing Soil Heavy Metals – A Play by Plants and Modified Organic Materials

Heavy metal contamination in boreal forest soil particularly by Cadmium (Cd), Copper (Cu), Lead (Pb), and Zinc (Zn) is an environmental issue associated with mining. Heavy metal contaminated soil causes food chain contamination, detrimental effects on humans, contamination of natural waters and impairment of plant growth. Chemical immobilization combined with phytostabilization is a promising remediation strategy of heavy metal contaminated soil. In this technique, various kinds of amendments are added to soil which immobilize heavy metals whereas an established vegetation cover stabilizes heavy metals within the rhizosphere zone. This project will assess the effectiveness of modified biochar as amendments in immobilizing Cd, Cu, Pb, Zn in acidic boreal forest soils with different levels of concentrations. Additionally, it will evaluate the phytostabilization potential of native Canadian grass species to reduce mobility and bioavailability of these heavy metals contributing to development of effective remediation measures in multi-metal contaminated boreal forest ecosystems.

Malcolm Reimer

MSc in Bioscience, Technology, and Public Policy
Supervisor: Dr. Craig Willis

Environmental Emergence Cues for Hibernating Bats

In the cool depths of a limestone cave, temperature, humidity, and darkness are constant – ideal conditions for hibernators to save energy over winter. Endangered little brown bats (Myotis lucifugus) may hibernate for up to eight months, emerging in spring with minimal stored fat. Exiting the cave on warm, calm days with higher insect activity could provide an opportunity to forage and recover from hibernation. But without weather cues from the outside world, how might hibernating bats anticipate good conditions for emergence? Atmospheric pressure changes, which precede warm and cold fronts, are sensed by many animals, and little brown bats appear to synchronize activity during hibernation with pressure patterns as spring approaches. Using infrared cameras and radio telemetry, my research monitors the activity of bats throughout their hibernation at a Manitoba cave to reveal how air pressure and weather influence their emergence timing and behaviour.

The 3-Minute Thesis (3MT®) is an annual, university-wide research communication competition, originally developed by The University of Queensland, which challenges postgraduate degree students to communicate their scholarly work and its significance to a panel of non-specialist judges in just three minutes.

Graduate students from various disciplines compete for a $2,000 first-place prize, a $1,000 runner-up prize, and a $500 People's Choice prize selected by the audience.

The University of Winnipeg's first-place winner has the opportunity to move forward to the Western Regional Competition being hosted by the University of Victoria

Acknowledgements

We acknowledge that we are gathered on ancestral lands, on Treaty One Territory. These lands are the heartland of the Métis people. We acknowledge that our water is sourced from Shoal Lake 40 First Nation.

Thank you to our student presenters and judges without whom this event would not be possible. Thank you to all the UWinnipeg staff and faculty members who played a role in bringing this event to life.

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