2024–2025

In View

HIGHLIGHTING UPEI RESEARCH

UNIVERSITY of Prince Edward ISLAND

A message from the Vice-President, Academic and Research

Welcome to this magazine, *InView*, which highlights some of the innovative research happening at the University of Prince Edward Island! UPEI's researchers are finding solutions to global problems and educating future leaders to turn their discoveries into meaningful benefits to society.

Our faculty members are internationally renowned and award-winning professors in their respective fields of research. They are advancing the frontiers of knowledge to make the province and our world a better place. Students have an exciting opportunity to study and learn from outstanding professors using world-class facilities.

The University is active in a wide range of fundamental and applied research and scholarly activities. There is strong support for this research from government, community, and industry partners. We gratefully acknowledge this support, particularly from granting agencies including the Natural Sciences and Engineering Research Council (NSERC), Social Sciences and Humanities Research Council (SSHRC), Canadian Institutes of Health Research (CIHR), Atlantic Canada Opportunities Agency (ACOA), Innovation PEI, Canada Foundation for Innovation (CFI), and the Canada Research Chair (CRC) program.

UPEI's research has made a significant impact at national and international levels. For example, a team of researchers across Canada, led by Dr. Aitazaz Farooque, Associate Dean of the School of Climate Change and Adaptation, is developing precision agriculture methods that address challenges of climate change. The project has developed in-field management practices to improve soil health, carbon sequestration, and precision agriculture systems that increase farm profitability. Please visit our website at upei.ca/research for more news and information about other research programs.

To all researchers at UPEI, many thanks for your dedication and commitment to advancing new knowledge that benefits our community and the world. To those outside of our campus community, I personally welcome you to our campus to visit our laboratories and learn about our capabilities, and to meet our professors, researchers, and students. I hope you enjoy this research magazine!

Greg F. Naterer, PhD, P.Eng.
Vice-President, Academic and Research

UPEI's Signature Areas of Research Excellence

- Sustainable Development
- Environmental Stewardship
- Healthy Animals
- Healthy Community
- Humanity, Justice, and Organizations

A message from the Associate Vice-President, Research

Research is at the heart of UPEI's mission. Every day, our faculty members and their research teams carry out scholarly and creative works to benefit our local Island community and beyond.

UPEI has many research strengths. Our Strategic Research Plan (2023–2028): Roadmap to Research Excellence groups our fortes into five signature areas of research excellence: Humanity, Justice, and Organizations; Environmental Stewardship; Healthy Communities; Healthy Animals; and Sustainable Development. These clusters only scratch the surface of the many incredible research programs and pathways at UPEI. Many of our researchers work at the intersections of these areas, in fields like Bioscience, Island Studies, Data Science, and One Health. I am continually struck by the interdisciplinary nature of the research being done at UPEI. For example, Dr. Justin Johnson Kakeu's work in Environmental Economics straddles Environmental Stewardship, Healthy Communities, and Humanity, Justice, and Organizations. *(page 9)*.

As Prince Edward Island's only university, we have a unique connection to our community. Our researchers collaborate with local NGOs, government agencies, and industry. These partnerships let us bring our expertise to help solve problems impacting the Island. You can read more about some of our current research partnerships on pages 13, 15 and 17.

Research does not happen in a vacuum. It happens alongside teaching, service, professional practice, and professional development. These key elements of a scholar's role are interconnected, and we wanted to highlight some of the ways they intersect and impact one another. *(pages 18 to 20)*.

Finally, as the Associate Vice-President, Research, and the Dean of Graduate Studies, I cannot overstate the role students play in the research ecosystem here at UPEI. In recent years, we have increased opportunities for undergraduate and graduate student researchers to gain new skills, share their work, and connect with fellow student researchers. The Student Program for Research Engagement and Excellence (SPREE) is one of our success stories *(page 21)*.

I hope that you find this magazine informative and engaging, with this peek into some of the research happening at UPEI in 2024-2025.

Sincerely,

Marva Sweeney Nixon

Dr. Marva Sweeney-Nixon,
Associate Vice-President, Research,
and Dean of Graduate Studies

LAND ACKNOWLEDGEMENT

The University of Prince Edward Island is located on the unceded and ancestral lands of the Mi'kmaw people, known to them as Epekwitk, a traditional district in the territory of Mi'kma'ki.

Table of contents

Managing Editors

Dr. Marva Sweeney-Nixon, Associate Vice-President, Research and Dean of Graduate Studies
and Julie VanLeeuwen, Research Navigator

Design and Production

Emi Abou Wafia, Colin Bowley, Ellery Richardson, UPEI Photography Services

Contributors

Neil Forbes, Anna MacDonald, Apryl Munro, Janice Murphy, Nicole Phillips, Maria Steele, Charlene VanLeeuwen

UPEI research by the numbers

(Based on UPEI by the Numbers, published October 2024)

$11.5 MILLION IN RESEARCH INCOME

$1.0 MILLION IN RESEARCH SUPPORT FUND ALLOCATION

8 ENDOWED AND SPONSORED RESEARCH CHAIRS

13 NSERC UNDERGRADUATE STUDENT RESEARCH AWARDS (OFFICE OF RESEARCH SERVICES)

4 CANADA RESEARCH CHAIRS

5 CANADA GRADUATE RESEARCH SCHOLARSHIPS—MASTER'S PROGRAM (OFFICE OF RESEARCH SERVICES)

6 INSTITUTES AND CENTRES

100 RESEARCH PARTNERSHIP ENGAGEMENTS (OFFICE OF COMMERCIALIZATION, INDUSTRY, AND INNOVATION)

4TH IN CANADA FOR NOT-FOR-PROFIT RESEARCH INCOME AMONG PRIMARILY UNDERGRADUATE INSTITUTIONS (RE$EARCH INFOSOURCE INC., 2024)

UPEI acknowledges the assistance of Canada's tri-council of federal granting agencies—Natural Sciences and Engineering Research Council of Canada (NSERC), the Social Sciences and Humanities Research Council (SSHRC), and the Canadian Institutes of Health Research (CIHR)—through its Research Support Fund, which helps fund services and infrastructure that support research activities at the University.

Turning biomass into renewable fuel

Imagine a car fuelled by sawdust or oat straw. It might seem like a fantasy, but Dr. Yulin Hu is working to make it a reality.

Dr. Hu is an Assistant Professor in the Faculty of Sustainable Design Engineering. In 2022, she was awarded a five-year Natural Sciences and Engineering Research Council (NSERC) Discovery Grant. Since then, she has been building a laboratory focused on turning biomass and organic waste into value-added bioproducts.

One of Dr. Hu's research streams involves developing technologies to produce clean and renewable transportation fuels that can replace fossil fuel-based alternatives. Drop-in fuels are a category of alternative fuels that can be used in existing engines.

Dr. Hu uses biomass, like sawdust, oat straw or other forestry and agricultural waste, or municipal organic waste as her raw materials.

"*We are repurposing waste that already exists. The products we create add to a circular economy and reduce our reliance on fossil-fuels,*" she said.

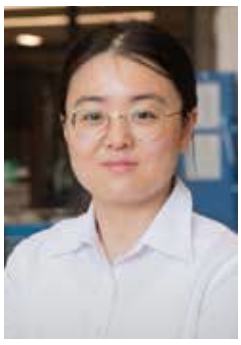
Transforming sawdust into a drop-in fuel has two main steps. First, the sawdust goes through an oxygen-free heating process called pyrolysis to produce crude bio-oil, biochar, and syngas. Raw materials with a higher moisture content, like kitchen or food waste, go through a wet process called hydrothermal treatment. Different reaction conditions and reactor configurations determine how much crude bio-oil, biochar, and syngas are produced. Dr. Hu works with biochar in some of her other research projects to produce functional biocarbon materials.

> **"The products we create add to a circular economy and reduce our reliance on fossil-fuels"**

The crude bio-oil has similar properties to newly mined crude oil. To improve its quality, the crude bio-oil undergoes a hydrodeoxygenation process, removing certain oxygen compounds. After going through this upgrading process, the bio-oil can then be used as a drop-in fuel.

Beyond creating sustainable fuels, Dr. Hu tries to keep her bio-oil refinement process similar to traditional oil refinement. *"If we retrofit the existing equipment and process instead of adding a lot of new infrastructure, I feel that industry will have a higher acceptance rate of the new process,"* said Dr. Hu.

This project was made possible through the support of the NSERC Discovery Grant program and RE-FUEL Renewable Fuels Inc. ▪



Dr. Yulin Hu,
Assistant Professor, Faculty of Sustainable Design Engineering

Using green chemistry to catalyse sustainability

Many industries, like chemical manufacturing, consume a large amount of energy and produce a lot of waste. This resource consumption and waste generation can have negative consequences on the environment as well as global communities. Dr. Marissa Clapson, Assistant Professor, Department of Chemistry, and her students are exploring methods in green chemistry to help make these industrial processes more sustainable.

Dr. Clapson and her team focus their work in three areas:

1) using catalysts, which are compounds added to a chemical reaction to lower the energy required for a reaction to proceed, to improve current industrial processes,
2) developing green catalysts by using cheap and abundant metals, and
3) transforming pollutants back into valuable materials.

Small molecules, like carbon dioxide, can be turned into many different products like fuels, plastics, or the base materials for pharmaceuticals. But for these small molecules to be useful, they need to be activated. Without a catalyst, these reactions typically take a long time or a lot of energy to perform. However, when a catalyst is added to the reaction, it attaches to the small molecule, weakening the molecule's bonds and thus using less energy to activate.

Dr. Clapson's catalysts are metal complexes, where molecular scaffolds called ligands surround a central metal atom. Her team uses ligands that contain Lewis acids. The Lewis acid acts like a fishing rod, pulling small molecules to the metal. Together, the Lewis acid and the metal break and reform the small molecule's bonds—a process called metal ligand cooperation.

The precious metals, like platinum or palladium, that are often used as industrial catalysts aren't the most sustainable material. They are expensive, toxic, and hard to find. By changing the metal atom, or the ligands, Dr. Clapson can create a greener catalyst. She is currently experimenting with base metals (nickel, iron, manganese) in her catalysts. She defines a base metal as having a lower toxicity for humans, being widely available, inexpensive, and ethically mined.

When creating the catalyst, Dr. Clapson also considers the number of steps in the process, sticking to a maximum of three to improve sustainability and affordability. She thinks about the reaction's ingredients, its temperature, and how much purification is needed before moving to the next step. She also considers the safety of the reaction, an important part of sustainable development.

Some of the ways she assesses a catalyst's *"greenness"* include measuring how much product is formed compared to byproducts, how much waste and carbon dioxide are produced, how much heat the reaction needs to work, and if the reaction could cause acid rain. She needs to balance these green chemistry principles with productivity and profit margins.

"I take a holistic view of sustainable chemistry," said Dr. Clapson. *"It is so important to consider the products, people, and environment involved in and impacted by every step of the chemical process."*

Dr. Marissa Clapson, Assistant Professor, Department of Chemistry, Faculty of Science and Green Division Chair of the Chemical Institute of Canada

Passing on L'nu knowledge from generation to generation

Photo by Patricia Bourque

Sixteen local Indigenous high school students participated in an eight-session program from April 2024 to March 2025 to learn more about climate change from a Mi'kmaq perspective.

The project, *Siawa'tmnej L'ney Kjijitaqn*, meaning *"pass on L'nu knowledge from generation to generation,"* was a collaboration between UPEI's Faculty of Indigenous Knowledge, Education, Research, and Applied Studies (IKERAS) and STEAM PEI, funded by the PEI Climate Challenge Fund. It was initiated by Dr. Patrick Augustine, Assistant Professor, Faculty of IKERAS; Margaret Augustine, former Assistant Professor, Faculty of IKERAS; and the late Amber Jadis, founder of STEAM PEI. Dr. Angelina Weenie, Dean of IKERAS, worked with STEAM PEI to complete the project.

Siawa'tmnej L'ney Kjijitaqn was an opportunity for Indigenous youth to connect with science, technology, engineering, arts, and math (STEAM) through culturally relevant programming that values their identities, perspectives, and traditional knowledge systems.

The program utilized *Etuaptmumk*, meaning *"Two-Eyed Seeing,"* to engage with Indigenous and Western ways of knowing to care for and manage natural resources. IKERAS faculty members and local elders shared invaluable Indigenous knowledge and traditions. The Canadian Centre for Climate Change Adaptation contributed climate change insights, and the Institute of Island Studies highlighted the importance of *"islandness"* to understand *Epekwitk's* (PEI) geography, ecology, culture, political system, history, and society.

Students from Abegweit and Lennox Island First Nations participated in hands-on workshops, classroom sessions, tours of research facilities, and *Mawi'omis* (gatherings). Each participant received an external high school credit for successfully completing the program.

"Several students successfully graduated from high school with the credit they earned through the program. This was an achievement that was both academically meaningful and personally empowering," said Dr. Kimberly Wishart Chu Foon, Director of Partnership Development and Climate Change Specialist, STEAM PEI.

"The program gave students the opportunity to explore the post-secondary environment and see that they have a place at UPEI," added Dr. Weenie. ▪

A new solution for curbing complex air pollution

Air pollution isn't made up of one single compound. It is a mixture of pollutants that can often impact human health even more when combined. Dr. Justin Johnson Kakeu, Associate Professor of Economics, has designed a system that considers multiple pollutants, curbs their emission volumes, and makes emitters pay for their emissions.

Dr. Kakeu has developed a multipollutant cap-and-trade system*. It is like a single pollutant cap-and-trade system, where pollution volume is capped and companies buy permits to emit up to a predetermined volume. The regulator can adjust the pollution cap according to emission targets. The associated cost of permits can be diminished when a company reduces its emissions. This incentivises companies to invest in greener, cleaner methods and technologies. Companies who have reduced their emissions and will not use the full volume of their permit can sell the remaining permit volume back to the regulator. With a multipollutant system, permits cover multiple pollutants, varying by type of pollutant and pollution volume.

Cap-and-trade and carbon tax systems are often mentioned in the same sentence. A carbon tax limits carbon emissions, which are harming the environment. However, it doesn't consider other types of pollutants, many of which are damaging to human health. What sets this new system apart is its ability to bundle multiple pollutants into a single permit structure instead of regulating each one separately. Carbon monoxide, particulate matter, sulfur dioxide, and ozone are just a few examples of harmful pollutants to be included in a multipollutant cap-and-trade system. This integrated design reflects the reality that people are often exposed to mixtures of pollutants, not just one at a time. By capturing the combined effects of multiple emissions, the approach offers a more efficient, flexible, and health-focused way to manage air quality.

One of the difficulties with a multipollutant cap-and-trade system is permit allocation. Dr. Kakeu showed that optimal transport theory, which studies the most efficient ways to move, allocate, or match resources, can be successfully applied to this problem. For the multipollutant cap-and-trade system, optimal transport theory matches companies to permits. It considers the number of companies in the market, the company's pollutant types, and emission volumes. Then the tool matches these factors to permits for different pollutant combinations and volumes. Dr. Kakeu has so far applied this tool to a local model, where emissions can be linked back to emitters.

"I believe in a holistic approach to curbing air pollution," explained Dr. Kakeu, *"one that will mitigate both environmental and health impacts. We can only achieve that through interdisciplinary collaboration. For example, lots of chemistry and epidemiology informed this work."*

Dr. Kakeu hopes to increase the awareness of policymakers** about the health and environmental risks caused by combined pollutants. He wants this research to inspire creative policy designs that bridge public health and environmental regulations.

This research was completed during Dr. Kakeu's Gilbert F. White Research Fellowship with Resources for the Future, a U.S.-based environmental policy think tank based in Washington, D.C. ▪

Dr. Justin Johnson Kakeu, Associate Professor, Department of Economics, Faculty of Arts, and 2024–2025 Resources for the Future Gilbert F. White Fellow

*https://www.rff.org/publications/working-papers/multipollutant-cap-and-trade-systems-with-heterogeneous-firms-an-optimal-transport-approach/

**https://www.rff.org/publications/issue-briefs/transforming-cap-and-trade-aligning-pollution-markets-with-public-health-goals/

Species monitoring with environmental DNA

Photo by Annie Dysart

A UPEI research group that is part of the Canadian Rivers Institute is using environmental DNA (eDNA) to identify new species and to monitor endangered, rebounding, and invasive species.

Students mentored by Dr. Michael van den Heuvel, Professor of Biology and former Canada Research Chair in Watershed Ecological Integrity, are using this innovative technique in PEI waterways.

Environmental DNA (eDNA) is the genetic material shed by a species. This could be animal skin cells, feces, and hair, or plant leaves and branches. Dr. van den Heuvel and his students gather samples by filtering water and running the material left behind through a polymerase chain reaction (PCR). PCR analysis amplifies the DNA signal to detect species even when only a tiny amount of DNA is present. When analyzing eDNA, researchers can either look for one specific species using a method called barcoding or a group of species with metabarcoding.

"*Since eDNA can only survive in water for up to a week, it gives us an almost real-time look at the species in the waterway,*" said Dr. van den Heuvel.

This technique complements other monitoring techniques like electrofishing or cameras. It has the added benefits of being non-invasive and more accurate since it gathers data from a larger area.

Annie Dysart, an MSc student working with Dr. van den Heuvel, is using eDNA to monitor brook trout and Atlantic salmon populations in association with studies on the impact of irrigation on PEI watersheds. eDNA is also being used to observe river biodiversity. Former undergraduate student Gracee Gallant used eDNA to search for the Eastern Pearlshell mussel and other rare freshwater mussels. Early-life stage Eastern Pearlshell mussels attach to the gills of Atlantic salmon, but the Atlantic salmon population has been decreasing across PEI. By identifying rivers where both salmon and Eastern Pearlshell mussels still co-exist, the research team can determine what human activities influence the distribution of these species. This information could help improve land use practices around vulnerable watersheds, protecting both salmon and mussels.

Another species being monitored by eDNA on PEI is river otters. The species was locally extinct for many years until they recently reappeared in the Kensington area. Undergraduate student Prisha Halder is using eDNA to supplement provincial trail cameras set up to monitor otter movement to prevent the animals from accidentally getting caught in legal beaver traps.

"*We can also detect invasive species with eDNA when they first appear in a waterway. Early detection means we can react quickly to remove them and protect the ecosystem biodiversity,*" said Dr. van den Heuvel. "*Species are so interconnected. One lost species can impact many others, putting the entire watershed's health at risk. Biodiversity is the first and best indication of ecosystem health.*" ▪

Photo by Ashley Alberto

Dr. Michael van den Heuvel, Professor, Department of Biology, Faculty of Science, cross-appointed to the Department of Biomedical Sciences, Faculty of Veterinary Medicine

How rising ocean temperatures are impacting lobsters

The lobster fishery throughout Atlantic Canada accounted for over half of the region's $3.2 billion sea-fisheries landed value in 2023. It is a crucial part of PEI's economy and culture, employing and attracting many people.

Dr. Krishna Thakur, Associate Professor, Department of Health Management, Faculty of Veterinary Medicine, has been studying how rising water temperatures affect lobster population health.

Dr. Thakur uses data collected by the Fishermen and Scientists Research Society to study aquatic animal health. Some of the lobster data collected include sex, size, fishing location, water depth, and ocean floor temperature. This dataset includes over one million lobster observations.

The higher ocean water temperatures caused by climate change can have many impacts on lobster health, but Dr. Thakur is studying two main concerns—epizootic shell disease and lobster behaviour.

First identified in lobsters in the 1990s, epizootic shell disease is a bacterial infection that causes wounds, pitting, or other disfigurations on the lobster's shell. The disease makes it hard for the lobster to grow, molt, and protect itself. Currently less than 0.5 per cent of lobsters in Atlantic Canada are infected, which is very low. However, the infection rates rise to 2 per cent in Maine and are higher further south. The levels of disease-causing bacteria increase with warmer water temperatures. Up to 70 per cent of infected lobsters die from this disease. Additionally, female lobsters are more likely to be infected, making it harder for the stock to replenish itself.

Dr. Thakur also previously explored how water temperature impacts lobster behaviour. Up to a certain point, male lobsters prefer warm water. But the females do not tolerate warm water as well as males do. His modelling showed that the females are migrating to deeper, colder water before the males. With this behaviour difference, females and males are not overlapping as much geographically, impacting reproduction.

As global water temperatures rise, lobsters have been migrating to deeper waters and further north, searching for colder water. The lobsters from the American Eastern seaboard moved to Atlantic Canadian waters. Fishers in Newfoundland and Labrador have found the largest lobster populations they have ever seen. Right now, this migration has benefited the Atlantic Canadian fishing industry, but Dr. Thakur is cautious about celebrating too soon. Lobster stocks in southern New England rose dramatically during the 1990s before crashing in 2003. He worries that a stock crash could happen here as water temperatures continue to rise if nothing is done.

"We are still trying to understand lobster shell disease and looking for a way to prevent it or minimize the risk of this disease. We cannot change lobster behaviour. So, the best way for PEI to prevent a stock crash like New England's is to anticipate it happening," said Dr. Thakur. *"Adapting policies and practices, like reducing quotas and increasing protection for egg-bearing females, can protect the whole lobster population and the future of the region's lobster fishing industry."* ▪

Dr. Krishna Thakur,
Associate Professor,
Department of Health Management,
Faculty of Veterinary Medicine

[1] Department of Fisheries and Oceans

Understanding a gene mutation linked to Parkinson's disease

Dr. Jay Penney, Tier 2 Canada Research Chair in Biomedical Genetics and Associate Professor, Department of Biomedical Sciences, Faculty of Veterinary Medicine, has been awarded a three-year research grant by Parkinson Canada to study a newly discovered genetic mutation linked to Parkinson's disease.

The $135,000 grant supports research into a mutation of the RAB32 gene, a recently identified cause of Parkinson's disease. This specific mutation, discovered just last year, has been shown to almost always lead to Parkinson's disease when present, and Dr. Penney wants to know why.

Neurodegenerative diseases, like Parkinson's or Alzheimer's disease, occur when neurons, microglia, and other brain cells stop working properly or die. Microglia are specialized immune brain cells. They remove damaged neurons and other debris in the brain. However, microglia that aren't working properly are often ineffective at removing this debris, which can cause certain proteins to build up and clump in the brain. That buildup can cause the microglia to become inflamed, especially if they are already dysfunctional, which can make more cells stop working or die.

Parkinson Canada

The RAB32 gene mutation was identified by large-scale genetic studies but has barely been studied on a cellular level. Dr. Penney plans to create neurons and microglia from human stem cells to study how the gene mutation affects their function. *"By seeing and understanding how the mutation affects these cells, we can begin to piece together how it contributes to disease,"* he said.

Dr. Penney has used human stem cells in his past research on Alzheimer's disease. While the two diseases share several cellular mechanisms, Parkinson's disease is significantly less studied, which attracted him to the field.

"I saw an opportunity to explore something new," Dr. Penney said. *"Alzheimer's has dominated the field of neurodegeneration research, but Parkinson's deserves more attention than it has received. This project is a way to contribute to that."* While the project is in its early stages, Dr. Penney hopes the research will eventually identify potential targets for new Parkinson's disease therapies.

> **"...Parkinson's deserves more attention than it has received. This project is a way to contribute to that."**

As one of the first researchers in Canada to study this specific mutation, Dr. Penney is excited to be at this cross-section of stem cell biology, genetics, and neurodegeneration. His work represents not only a significant academic achievement but also a hopeful step toward unraveling the mysteries of Parkinson's disease.

We gratefully acknowledge the funding support for this research from Parkinson Canada. ▪

Dr. Jay Penney,
Canada Research Chair in Biomedical Genetics and Associate Professor, Department of Biomedical Sciences, Faculty of Veterinary Medicine

Studying accessibility of gender-affirming health care on PEI/Epekwitk

Dr. Margie Burns, Assistant Professor, UPEI Faculty of Nursing, is leading a research study about the experiences of Two-Spirit, transgender, and gender-diverse (2STGD+) people seeking and accessing gender-affirming health care on PEI/Epekwitk.

"*Transgender, gender-diverse, and Two-Spirit people are an equity-seeking group who have unique health-care needs,*" she said. "*Those needs relate to gender-affirming care that supports individuals in expressing their authentic gender identity socially and/or medically through hormone therapy, non-surgical medical procedures, and/or surgery. Despite efforts in Canada to legislate equal rights for those who are 2SLGBTQIA+, 2STGD+ people continue to experience inequities in adequate care, and many face significant delays in accessing life-saving gender-affirming care.*"

A 2018 research study by Dana Manzer, University of New Brunswick, has shown that there is a significant gap in the education of health-care providers about trans-specific needs, which undermines the practitioner's ability to provide appropriate and culturally sensitive care for this population.

2STGD+ people have unique trans-specific health-care needs. They face barriers when seeking and accessing this care on PEI. Dr. Burns' study aims to increase health-care providers' understanding on these issues and explore these experiences in greater depth.

"*With the rise in transphobic discrimination and evidence supporting the need for culturally competent, equitable, and accessible health care for 2STGD+ people, it is essential that their experiences in seeking and receiving gender-affirming care are acknowledged and understood, and that health-care providers deliver culturally competent care to improve wellness for this population and their families,*" she said.

The study's first phase involved 34 participants, aged 16 years and older, who did not identify with the sex they were assigned at birth and were living on PEI at the time of the study. Participants were asked to complete an online survey, which included an invitation for those interested, aged 18 years and over, to participate in phase two.

In phase two, ten participants completed one-on-one interviews with a researcher. These participants had all accessed or tried to access gender-affirming health care on PEI/Epekwitk on or after July 2022. During the interviews, participants shared their experiences of seeking and accessing gender-affirming care.

The project was developed in partnership with the PEI Transgender Network and is supported in part by funding from the Social Sciences and Humanities Research Council and the UPEI Health Research Network. ▪

Dr. Margie Burns,
Assistant Professor,
Faculty of Nursing

UPEI's Canada Research Chairs

The Canada Research Chairs Program invests hundreds of millions of dollars every year to position Canada as a global leader in research and development. Tier 2 Chairs are awarded to exceptional emerging researchers who demonstrate potential to lead in their field, while Tier 1 Chairs recognize outstanding researchers who are acknowledged as world leaders in their field. UPEI currently holds four Tier 2 Canada Research Chairs.

Dr. Joshua MacFadyen

Tier 2 Canada Research Chair in Geospatial Humanities

Associate Professor, Faculty of Arts

Dr. MacFadyen is investigating the significant social-ecological transitions in Canadian agriculture using innovative digital history and geospatial analysis of case study areas in the Maritime, Eastern Great Lakes, and Prairie regions. He is exploring how rural Canadians exchanged one energy system for another by mapping the transition from an extensive organic frontier to intensive food and energy systems. By increasing capacity to understand both the physical transformations of place and their social impacts, his research will help to inform better land use planning, resource co-management, and risk management in the future.

Dr. Caroline Ritter

Tier 2 Canada Research Chair in Social Epidemiology for Healthy Animals

Assistant Professor, Department of Health Management, Faculty of Veterinary Medicine

Dr. Ritter combines social science, veterinary epidemiology, and animal welfare research. She is exploring attitudes and beliefs held by animal owners and custodians to investigate what motivators and barriers contribute to their decision-making. She is investigating how veterinarians can become more successful at advising their clients by improving their communication skills to help put into practice the evidence-based knowledge that currently exists. Adopting a One Welfare framework, she is also conducting research to foster human mental well-being and understand its relationship to animal welfare.

Dr. Jay Penney

Tier 2 Canada Research Chair in Biomedical Genetics, is studying a gene mutation linked to Parkinson's disease (see page 12).

Dr. Sara Sadri

Tier 2 Canada Research Chair in Remote Sensing and Water Security

Associate Professor, School of Climate Change and Adaptation, Faculty of Science, cross-appointed to the Faculty of Sustainable Design Engineering

Dr. Sadri uses advanced mapping tools, satellite data, and machine learning to study how climate events like agricultural droughts and floods impact food and water security. Her scalable, context sensitive methods combine environmental data with socio-economic data to monitor and assess food security dynamics and regional livelihood outcomes. Dr. Sadri also incorporates citizen science and public surveys to ensure her models reflect lived experiences. Her interdisciplinary approach helps predict and understand how climate changes affect communities, supporting better decisions and policies around food, water, and the environment.

The impacts of working remotely

During his days as a consultant, Dr. Scott Cassidy negotiated a special arrangement with his firm to work remotely. Now, an Assistant Professor of Management in UPEI's McDougall Faculty of Business, he studies the impact that remote arrangements have on workers.

As the world shifted to remote work in early 2020, Dr. Cassidy saw organizations struggle to adapt. Some tried to replicate their in-office practices online, while others attempted to excessively monitor employees. *"There was a tangible sense of clinging—of not losing the control or community of the in-office arrangement,"* he said.

But remote work presents unique challenges. Remote workers may not have a dedicated workspace at home. Additionally, using technology to communicate can strip some of the naturalness from a conversation. The lack of verbal inflection or non-verbal cues can negatively impact workers' ability to understand and connect with one another. These challenges tend to have different impacts depending on the worker.

> **"The very factors that draw some people to remote work could be the same things that keep others in the office."**

Perceived remoteness refers to how disconnected a remote worker feels from their coworkers and their job. The very factors that draw some people to remote work could be the same things that keep others in the office. For example, the solitude that comes with working remotely might help one person concentrate but cause another to feel so isolated or disconnected that their work suffers. Perceived remoteness depends on whether the worker sees each factor as a demand that adds strain to their work or a resource that adds richness.

Ultimately, if workers can make up for perceived deficits in the quality of their communication with their colleagues, their perceived remoteness may be lessened. However, perceived remoteness is not well-understood. Dr. Cassidy is studying the lived experiences of remote workers from multiple industries while also exploring

the specific experiences of Maritime health-care workers at IWK Health who saw major shifts towards remote work during the pandemic. He will use the themes from these experiences to predict outcomes such as engagement, burnout, and subjective health.

These projects are funded through a Mitacs Accelerate Grant in partnership with IWK Health, as well as a UPEI Social Sciences and Humanities Research Council Explore Research Grant (SERG). Mitacs programming on PEI is supported by Innovation PEI. Dr. Cassidy's findings so far have helped inform recommendations for remote work policy to leadership at IWK Health. ▪

Dr. Scott Cassidy,
Assistant Professor,
McDougall Faculty of Business

Survivance and resurgence in Indigenous film adaptations of legends

Dr. Marie Pascal, Assistant Professor in UPEI's Department of Modern Languages, believes that it is part of her duty as a settler from France to learn as much as possible about the Indigenous cultures of Canada. For her, that means taking a break from her specialty of Quebecois film adaptations to explore Indigenous film adaptations of legends. She wants to increase exposure for Indigenous works by giving them a platform in her research and teaching.

Dr. Pascal recently analyzed three animated short films. Petit Tonnere (2009), meaning *"Little Thunder,"* draws on the Mi'kmaq legend *"The White Stone Canoe." Lumaajuuq* (2010) is based on the Inuit legend *"The Blind Boy and the Loon." La montagne de SGaana* (2017), meaning *"The Mountain of SGaana,"* includes Haida characters like *Kugaan Jaad*, the Mouse Woman, and the hero *Naa-Naa-Simgat*. The films are free to watch in French and English on the National Film Board's website.

For her analysis, Dr. Pascal used an Indigenous futurism lens to explore how the films convey decolonial attitudes. Indigenous futurism explores how Indigenous cultures intersect with technology and imagines what Indigenous futures could be like. This includes releasing the trauma associated with colonialism and reestablishing ancestral traditions to adapt to the future.

Film adaptation studies not only examine the story but also the role that the visual elements like framing, layers, and movement; sound; and editing play in our interpretation of the film. Dr. Pascal explored how the films' animation styles and soundtracks adapted traditional legends to create *biskaabiiyang*, an element of Indigenous futurism meaning *"returning to ourselves,"* which functions as a way to re-energize Indigenous ways of being in the present.

Dr. Pascal sees these films as great examples of the themes of survivance and resurgence. Survivance combines survival and resistance in an active resistance to colonialism and rejecting narratives of Indigenous victimhood. Resurgence is the way of bringing Indigenous traditions and culture together in a modernized world.

Petit Tonnerre's cellulose acetate animation uses Mi'kmaq artist Alan Syliboy's drawings as the background throughout the film, translating elements of tradition to the present audience. *Lumaajuuq* uses both Inuit aesthetics and graphic novel techniques in its storytelling. Vibrant colours appear sparingly, but they draw the eye to important features of the story. *La montagne de SGaana's* soundtrack blends a traditional Haida acapella song with jazz music. These are just three ways that *biskaabiiyang* is evidenced in these films.

These film adaptations revitalize their Indigenous legends through a medium that offers many ways to update and enhance the original legend. They enable more people to connect with the legends and encourage a view of Indigenous cultures as vibrant, resilient, and forward-looking. ▪

Dr. Marie Pascal,
Assistant Professor,
Department of Modern Languages,
Faculty of Arts

Evaluating the pyramid model used in PEI's early learning and child-care sector

In 2023, Dr. Gabriela Arias de Sánchez, Associate Professor, Faculty of Education, was awarded an Early Childhood Development Association grant to evaluate the implementation of the pyramid model into the early learning and child-care sector on PEI.

Dr. Ling Li, a postdoctoral fellow working with Dr. Arias de Sánchez, also received a 2024 Mitacs Elevate Postdoctoral Fellowship, funded in part by Innovation PEI, for the longitudinal study.

The pyramid model serves as a roadmap for Early Childhood Educators to help young children develop healthy social and emotional skills. At the bottom of the pyramid, there is a focus on building warm, nurturing relationships between educators and children. The next layer creates supportive learning environments. The third layer provides specific teaching strategies for social-emotional skills, and the top layer offers intensive, individualized support for children who need extra help.

"Early social and emotional skills are building blocks for life," said Dr. Arias de Sánchez. *"When children learn these skills early on, they develop better self-awareness and regulation, form healthier relationships, perform better in school, and have better mental health outcomes later in life."*

Eighteen Early Childhood Educators and 10 Educational Coaches using the pyramid model are participating in the study. The participants work with infants and young children up to the age of five. They come urban and rural areas, covering both English- and French-speaking communities across the province.

The project aims to evaluate the effectiveness of the pyramid model in PEI's early childhood settings and use the data to improve and facilitate the program's progress. Other goals are to help children develop strong social and emotional skills during their crucial early years and to support Early Childhood Educators by providing them with effective tools and training.

Drs. Arias de Sánchez and Li are finding the implementation of the pyramid model particularly impactful in the areas of child engagement, teacher collaboration, and supportive interactions. Other areas, such as emotional responsiveness and problem-solving instruction, indicate room for improvement. Although limited by sample size, the overall findings offer encouraging evidence to support implementing the pyramid model framework into more early childhood educational environments. They also highlight areas that could benefit from future targeted professional development.

The project is having a big impact on the professional landscape of early childhood education in PEI by establishing promising practices for supporting educators and children. It recognizes and builds upon the existing strengths of PEI's Early Childhood Educators. These professionals are doing remarkable work in supporting children's development and have the potential to strengthen the Island's early years system by developing evidence-based, locally adapted approaches.

"Our project is unique because we adapted an evidence-based model for PEI's specific needs," said Dr. Arias de Sánchez. *"PEI is one of the leading provinces in Canada with this innovative approach, and our findings could help guide other provinces."* ▪

Dr. Gabriela Arias de Sánchez,
Associate Professor,
Faculty of Education

Dr. Ling Li,
Post-doctoral Fellow,
Faculty of Education

Improving psychological safety in nursing simulations

Clinical simulations are one learning tool used to prepare health-care professionals for complex and stressful demands in the workplace. UPEI's Faculty of Nursing uses actors to simulate certain scenarios. When an actor was triggered during a mental health simulation, the instructional staff sprang into action to implement changes.

Protecting the psychological safety of the students and the actor was the primary concern for Assistant Professor Ashton Dougan, Simulation Coordinator Kerie Murphy, and Clinical Nursing Instructor Valerie Reddin. Psychological safety is feeling comfortable to express oneself, including concerns or mistakes, without fearing negative consequences.

> **"Simulations are always changing... ...and [we] continue to shape the best, safest learning experience for our students"**

After meeting with the students involved, Dougan, Murphy, and Reddin spent time reviewing current literature on best practices in health-care simulation education. They saw the students' input echoed in the literature and developed a plan. They changed the simulation format, clarified communication, and added a new standardized psychological safety briefing. They also emphasized mental health skills for nursing students.

"We improved the simulation briefing, emphasizing that anyone could pause the simulation at any time," explained Murphy. *"Now, the students feel comfortable to pause the simulation, whether it is to sort out their planned response or review a protocol. Sometimes the instructors will pause to highlight important information."*

"Simulations are always changing," added Dougan. *"We make changes, check with the students to see what works, and continue to shape the best, safest learning experience for our students."*

These changes to the nursing simulations are a good example of action research, that is, research woven into learning settings to improve student experiences. *"The new measures made us all feel safer,"* said then-student Adedamola Adedeji, who graduated in May of 2025 with her Bachelor of Science in Nursing degree. *"The staff stepped in and started making changes before our next simulation."*

These safeguards are protecting students and actors while equipping future nurses to best serve their community. ▪

Left to right: **Valerie Reddin**, Clinical Nursing Instructor; **Adedamola Adedeji**, former UPEI student; **Ashton Dougan**, Assistant Professor; and **Kerie Murphy**, Simulation Coordinator; Faculty of Nursing

Course-based research as an ingredient for student success

"Can we adjust an existing lab to give our students research experience earlier in their university careers?" That is the question Dr. Sarah Finch, Assistant Professor, in the Department of Applied Human Sciences, asked herself.

Typically, undergraduate students in the Foods and Nutrition program do not get any research experience until their fourth year. Even then, these experiences often go to the top students. However, course-based undergraduate research experiences are a more inclusive entry point to scientific research.

Dr. Finch worked with Dr. Hiwot Haileslassie, former Assistant Professor in the Department of Applied Human Sciences, to integrate a course-based undergraduate research experience into Dr. Haileslassie's third-year food product development lab. Students designed food products fulfilling specific criteria, including nutrition, taste, and appeal. Drs. Finch and Haileslassie expanded the existing project to help students experience the full research arc—from developing a hypothesis, through iterative testing, to presenting their findings in poster or pitch competitions.

> **"When all our students get the chance to do research, some may discover an unknown passion for it"**

In 2023, Dr. Finch was awarded an Internal Scholarship of Teaching and Learning Research grant from UPEI's Teaching and Learning Centre to measure the success of the course-based undergraduate research experience over multiple years. She used the grant to hire a fourth-year student as a research assistant. The research assistant analyzed the data of multiple cohorts from the years since the course-based undergraduate research experience was implemented.

"The third-year students also witnessed an upper-year peer conducting surveys and interviews and analyzing data from multiple class cohorts. It was another exposure to students being involved in research," said Finch.

The course-based undergraduate research experience had three main goals: to give students equitable exposure to research, help them find career-choice clarity, and build a deeper connection between students and the University.

"We exposed students to a different side of the foods and nutrition industry," explained Dr. Finch. *"They applied their knowledge and developed many transferable skills that they could then use in job interviews or future research at UPEI or beyond. When all our students get the chance to do research, some may discover an unknown passion for it and become the next generation of foods and nutrition researchers."* ▪

Dr. Sarah Finch,
Assistant Professor, Department of Applied Human Sciences, Faculty of Science

A librarian's role in research

Libraries play a crucial role in supporting research. Few people are better witnesses to the services that libraries provide than academic librarians. They assist researchers, manage library resources, and often conduct research of their own.

UPEI's academic librarians each support designated topic areas. For example, Rosie Le Faive, Metadata Librarian in the Robertson Library, is responsible for Diversity and Social Justice Studies, Sustainable Design Engineering, Mathematics and Computational Sciences, Modern Languages, Physics, and Theatre Studies.

> **"Research is interwoven into many aspects of a librarian's work"**

The librarians help both students and faculty develop effective search strategies. In some fields, like Diversity and Social Justice Studies, for example, a precise search for a specific book may be necessary. In others, such as Mathematical and Computational Sciences, it is more important for the researcher to find a current resource at the right knowledge level to learn the desired skill. Le Faive can workshop search-term combinations for Modern Languages research or delve into patent research for Engineering. Librarians also work with course instructors to teach students how to use the full range of library resources.

As Metadata Librarian, Le Faive collects, catalogues, and organizes the data associated with a book or article. This information can include the author publisher, publication date, applicable subjects, and table of contents. They ensure that the library resources are easily discoverable and accessible to users. Le Faive's metadata work is especially applicable to UPEI's University Archives and Special Collections.

"We do our best to collect all the books published by an Islander or written about PEI," said Le Faive. *"Our Prince Edward Island and L.M. Montgomery Collections are important resources to researchers of many disciplines like Island Studies, English, and History."*

Le Faive also works on UPEI's digital collections, which include the familial and community histories that are part of the Island Lives project.

While these duties take up the majority of Le Faive's time, they also do research work. Le Faive's work centres around Islandora. This open-source software is used to manage digital assets, which can be anything that exists in digital form, like photos or manuscripts. The metadata associated with these digital assets means they can be organized in many ways. Because Islandora is an open-sourced software, people from around the world collaborate to develop the software functions. Islandora is the software that runs the IslandScholar database.

"Whether we are working with researchers, overseeing our collections, or completing our own scholarly work, research is interwoven into many aspects of a librarian's work," said Le Faive. ▪

Rosie Le Faive,
Metadata Librarian,
Robertson Library

Celebrating student researchers

UPEI's Student Program for Research Engagement and Excellence (SPREE) presented by the Office of the Associate Vice-President, Research, and the Faculty of Graduate Studies, is supporting undergraduate and graduate student-researchers.

During the summer of 2024, 31 undergraduate and 29 graduate students from 16 programs across five faculties participated in 10 weekly Lunch and Learns. These sessions included research skill-based workshops and presentations from UPEI and non-academic researchers about their career paths and research programs. The students had the opportunity to network and connect with their peers during two dedicated sessions and throughout the program.

Additionally, 36 of the 60 student researchers chose to enter the optional end-of-program poster competition. The participants were divided into undergraduate and graduate categories.

Biology student Briana Creed won first place among undergraduate students for her project, *"Investigating blueberry phytochemical protein targets and bioactivity."* Her supervisor was Dr. J. Patrick Murphy, Assistant Professor, Department of Biology, Faculty of Science.

Second place went to Sustainable Design Engineering student Abby Chapman for her project, *"Evaluating the resource potential of biomass to support PEI's net-zero goals."* Her supervisor was Dr. Stephanie Shaw, Assistant Professor, Faculty of Sustainable Design Engineering.

Biology student Payton Alexander won third place for *"Testing the effects of polyamines on cancer cell biology."* Dr. J. Patrick Murphy was her supervisor.

In the graduate category, first place went to Shelby Squires, MSc in Molecular and Macromolecular Sciences student, for her project, *"Modelling neurodevelopment in a dish to study the movement disorder gene Pde10a."* Her supervisor was Dr. Joel Ross, Associate Professor, Department of Biology, Faculty of Science.

Nauman Yaqoob, MSc in Sustainable Design Engineering student, took second place with his project, *"Topography-driven variability in greenhouse gas emissions during potato growth season."* He was supervised by Dr. Aitazaz Farooque, Professor and Associate Dean, School of Climate Change and and Adaptation, Faculty of Science.

Lauren Reid, MSc in Human Biology student, won third place with her project, *"Use of in vitro models for the study of inflammatory bowel disease."* Her supervisor was Dr. Marva Sweeney-Nixon, Professor, Department of Biology, Faculty of Science; Associate Vice-President, Research; and Dean, Faculty of Graduate Studies.

SPREE participants enjoyed learning about the variety of research happening at UPEI and benefitted from another opportunity to share their research.

"Hearing from diverse members of the UPEI community encourages me to think beyond the borders of my own discipline and enriches how I approach my research. The program is also a fantastic opportunity to meet students from other departments, who you might not have the chance to meet otherwise," said Chapman.

"The final poster presentation was a highlight, helping me build confidence in communicating my research to a wider audience," said Mukhayyo Sultonova, MSc Molecular and Macromolecular Sciences alumnus, and current PhD in Molecular and Macromolecular Sciences student.

"Through their involvement with faculty members and their research, student researchers gain first-hand experience with inquiry, engage in self-directed learning, and explore potential career pathways in research," said Dr. Sweeney-Nixon, whose office runs this program. ▪

Undergraduate Student Research Awards

NSERC's prestigious Undergraduate Student Research Awards (USRA) program gives students the opportunity to gain valuable research experience complementary to their program of study. These awards provide financial support for students to work on faculty-based research projects during the summer. The program aims to encourage students to consider graduate studies or a research career. In 2024, 13 UPEI students received a USRA.

Payton Alexander, *"Dialysis-enabled protein-metabolite interaction profiling,"* mentored by **Dr. J. Patrick Murphy**

Pierre Aucoin, *"Heaps' Law minimum sample size estimation for energy-efficient large language models,"* mentored by **Dr. Paul Sheridan**

Maria Campeanu, *"Effects of a high-fat diet on the endocrine system,"* mentored by **Dr. Désirée Seib**

Abby Chapman, *"Understanding and evaluating biomass as a component of PEI's net-zero strategy,"* mentored by **Dr. Stephanie Shaw**

Briana Creed, *"Defining plant phytochemical bioactivity on mammalian cells,"* mentored by **Dr. J. Patrick Murphy**

Marcus Gauthier, *"Exploring the space of colour changes in Jamaican click beetle luciferase,"* mentored by **Dr. Stevan Springer**

Mel Gibbons, *"Extending cordgrass beds to stabilize coastal areas,"* mentored by **Dr. Christian Lacroix**

Debby Ige, *"Effects of maternal diet on the placenta,"* mentored by **Dr. Kathy Gottschall-Pass**

Brian MacDonald, *"Machine learning-based zoning archetype development and characterization,"* mentored by **Dr. Kuljeet Grewal**

Ethan Nabuurs, "*Sensitivity analysis of factors affecting pulsed field ablation efficacy in treating arrhythmias,"* mentored by **Dr. Sundeep Singh**

Ella Nicholson, "*Effects of a high-fat diet on the brain,"* mentored by **Dr. Désirée Seib**

Eliana Seburn, *"Experimental validation of a statistical test of adaptation in whale myoglobin,"* mentored by **Dr. Stevan Springer**

Alex Trainor, *"Examination of POLG mutations and mitochondrial dysfunction in stem-cell derived microglia,"* mentored by **Dr. Jay Penney**

Graduate Student Awards

UPEI administers a variety of graduate scholarships and awards. Among the most prestigious is the Canada Graduate Scholarship program. Canada Graduate Scholarships provide financial support to students who have demonstrated a high standard of achievement in undergraduate and early graduate studies. The tri-council (NSERC, SSHRC, and CIHR) allots the specific number of Canada Graduate Scholarship—Master's program (CGS-M) awards each university may offer to its students. In 2024, five CGS-M scholarships were awarded to UPEI graduate students.

Canada Graduate Scholarship—Master's program:

Funded by SSHRC:

Emily Coates, Master of Arts in Island Studies, supervised by Dr. Nick Mercer

Leanne Hudson, Master of Education in Leadership and Learning, supervised by Dr. Kathy Snow

Funded by CIHR:

Tayah Sommer, Master of Science in Human Biology, supervised by Dr. J. Patrick Murphy

Funded by NSERC:

So Yeon Shim, Master of Science in Environmental Sciences, supervised by Dr. Aitazaz Farooque

Emily Wainwright, Master of Science in Veterinary Medicine, supervised by Dr. Lisanework Ayalew

The Governor General's Medal for Graduate Studies
is awarded to the graduating master's or PhD student who has achieved the highest academic standing in a combination of course work and thesis.

2023–2024: **Kassandra Devon Lynn**, Doctor of Philosophy, Faculty of Science

2024–2025: **Fatima Imtiaz**, Doctor of Philosophy, Faculty of Science

In View

HIGHLIGHTING UPEI RESEARCH

UNIVERSITY of Prince Edward ISLAND

University of Prince Edward Island
550 University Ave
Charlottetown, PE C1A 4P3