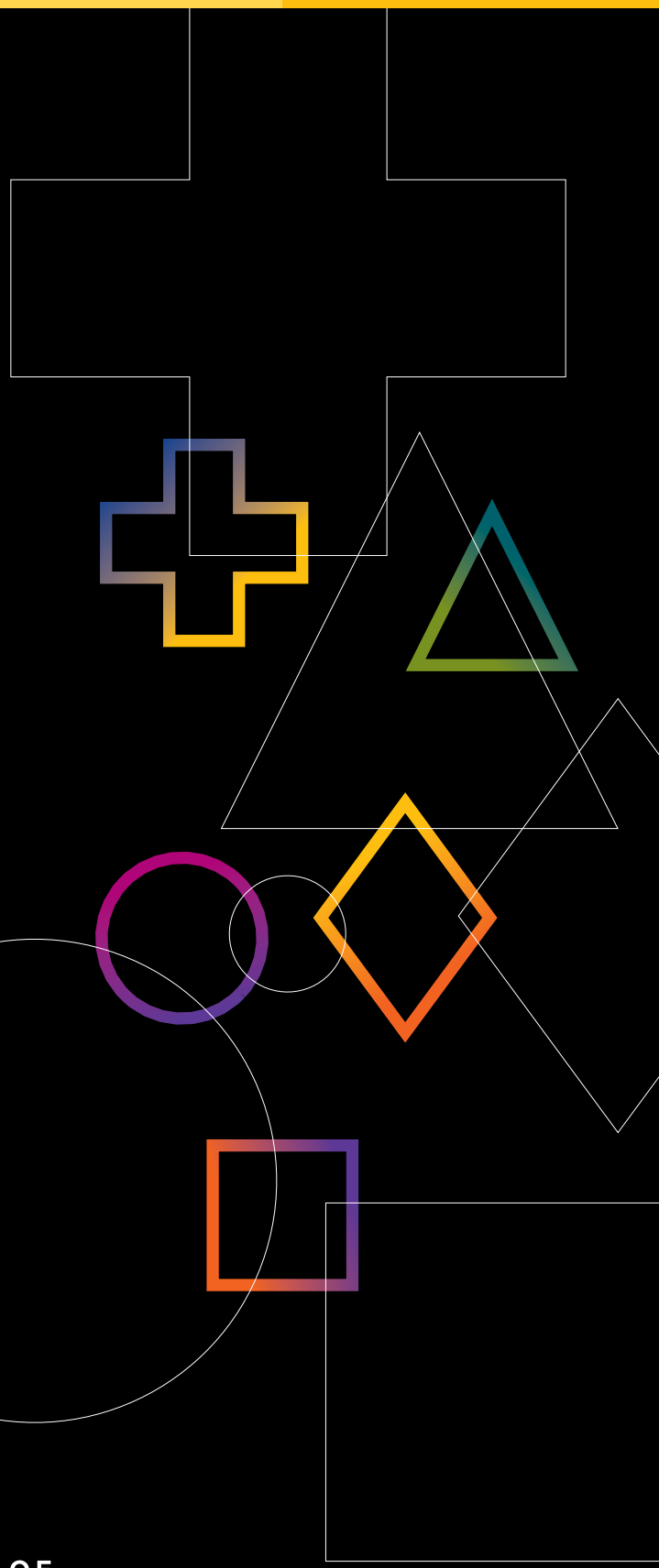


INNOVATION UPDATE 2025

Global Futures

UNIVERSITY OF
WATERLOO





Territorial Acknowledgement

The University of Waterloo acknowledges that much of our work takes place on the traditional territory of the Neutral, Anishinaabeg and Haudenosaunee peoples. Our main campus is situated on the Haldimand Tract, the land granted to the Six Nations that includes six miles on each side of the Grand River. Our active work toward reconciliation takes place across our campuses through research, learning, teaching and community building, and is co-ordinated within the Office of Indigenous Relations.

Stepping into a bold future



Vivek Goel

President and
Vice-Chancellor,
University of Waterloo

Humanity is in a transformational period in history resulting in challenges that have never before been faced. Bold and curious pioneers are needed to step forward with solutions that are workable and scalable. Those who are willing to think differently, ask questions and challenge the status quo.

I have seen this bold spirit of curiosity at Waterloo, and it propels students, alumni and researchers to be the leaders and problem-solvers we need for our global future. They act with purpose to collaborate on innovative and sustainable solutions for humans and the planet.

I'm inspired by Waterloo's unconventional students like Sarah Odinotski and Jack deGooyer who are pushing the boundaries of technology to advance what's possible in health diagnostics. Imagine a camera that doesn't miss anything, one sensitive enough to detect individual photons of light. It's a future being built here at Waterloo. These Vanier Scholars are combining their different fields of study in nanotechnology and biomedical imaging to design a quantum camera that can accurately and quickly detect cancerous cells.

This collaborative approach to tackling real-world challenges is where discoveries are born. In the intersections between our global futures, Waterloo is thinking differently and working across disciplines to transform societies, health, economies, technologies and the environment.

As we think about big challenges, like scaling electric vehicles for impact, solutions lie within transforming current technologies, society and the economy. It's a challenge that Dr. Linda Nazar from the Faculty of Science and Dr. Michael Pope from the Faculty of Engineering are working together to solve at Waterloo's new Ontario Battery and Electrochemistry Research Centre. Not only are they developing sustainable lithium battery alternatives, but they're also working to train the next generation of talent equipped to support this growing industry.

Waterloo was founded alongside business and community members to solve the most pressing local and global challenges of the time. I am filled with hope and pride that this tradition continues to attract and nurture a curious community of innovators working together to uncover solutions for the future. ♥

Humanity may be standing at the edge of the unknown, but it is also standing on the precipice of tomorrow's solutions. Who are the pioneers stepping toward those solutions?

Waterloo is on it.

Our Global Futures



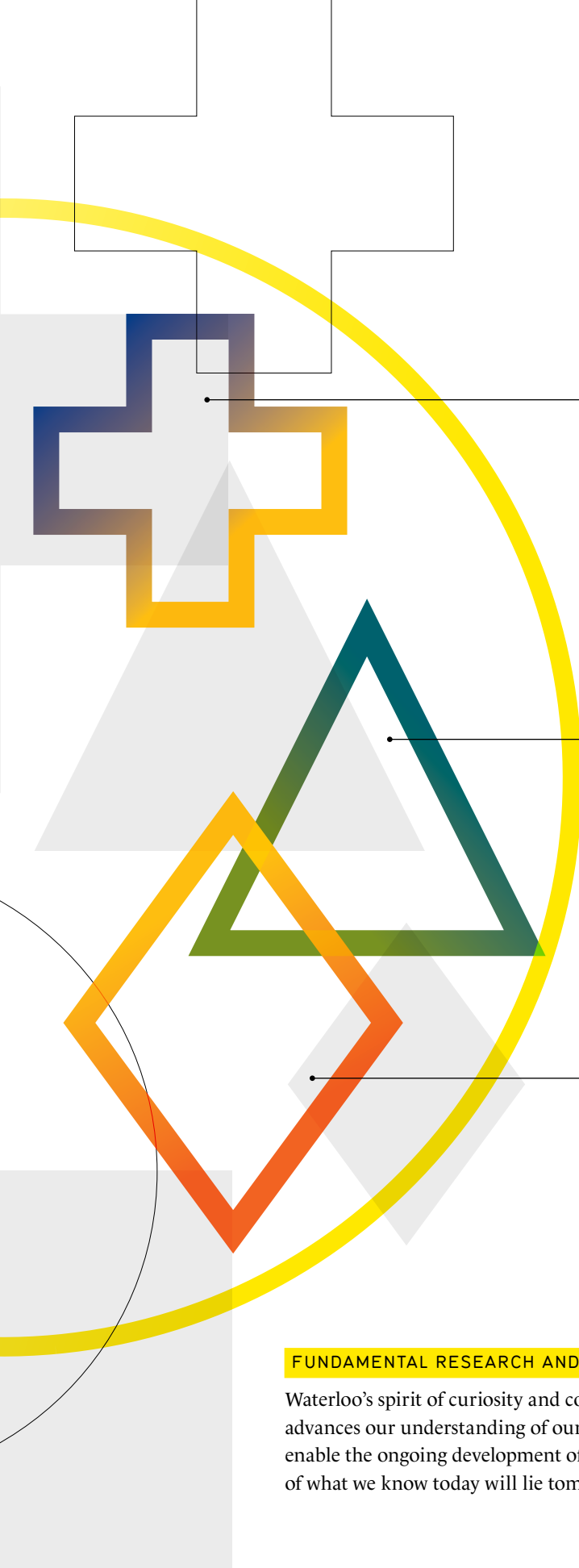
Since our founding in 1957, the University of Waterloo has sought to uncover solutions to the most pressing challenges facing humanity and our planet. As these challenges evolve, we are evolving too.

● SOCIETAL FUTURES

The way societies govern and care for their citizens continues to transform rapidly, driven by new technologies and greater social awareness. Waterloo innovators are developing new practices and policies that advance society by leveraging our strengths in technology and interdisciplinary research to ensure every member of our community belongs and thrives.

■ SUSTAINABLE FUTURES

Science and innovation play a critical role in moving humanity forward with sustainable solutions that preserve our social, health and environmental well-being. Waterloo researchers and entrepreneurs are creating sustainable technologies, designing policies that protect our environment and engaging in research that will contribute to a sustainable future for humanity and the planet.



+ HEALTH FUTURES

Those who are sick or injured navigate complex health systems that are unsustainable and under pressure. Whether it's engineers inventing new biomedical technologies, mathematicians advancing biostatistics or social scientists advising equitable global health policies, Waterloo's interdisciplinary approach to research and innovation enables us to unpack this complexity to create a stronger, more equitable landscape of care.

▲ TECHNOLOGICAL FUTURES

Building disruptive technologies is at the core of what we do, and since our inception, Waterloo has been pushing the boundaries of robotics, health innovation, green technology, software and cybersecurity. As Canada's leading university for comprehensive research and commercialization, we will continue to be a leader in shaping human-centred technology that serves society, rather than letting technology shape us.

◆ ECONOMIC FUTURES

Labour shortages, mounting inflation, and geopolitical and digital threats have shown us the vulnerabilities in our economy. Waterloo's strength in nurturing entrepreneurial-minded talent will lead the way in shaping innovative industries and growing resilient local and global economies for the public good.

FUNDAMENTAL RESEARCH AND SCHOLARSHIP

Waterloo's spirit of curiosity and commitment to excellence in fundamental research and scholarship advances our understanding of ourselves, our planet and the cosmos. These breakthrough discoveries will enable the ongoing development of future technologies, innovations and applications. Standing at the edge of what we know today will lie tomorrow's solutions to the most complex challenges facing humanity.

Robots supporting human-centric health care



Cobionix’s collaborative robot Codi automates routine tasks, empowering professionals to focus on critical patient care.

Waterloo alumni Nima Zamani (BASC ’14, MASC ’18), Tim Lasswell (BASC ’14, MASC ’17) and John Van Leeuwen (BSc ’81) co-founded Cobionix and are on a mission to optimize health care through autonomous collaborative robots, or cobots.

These robots aim to assist health-care professionals by automating routine and time-consuming tasks.

“Cobots, short for collaborative robots, are designed to work alongside humans in shared environments, enabling seamless collaboration and support,” Zamani says. “Health care is inherently human-centred, and our focus is on supporting professionals by handling repetitive tasks, allowing them to spend more time on critical patient care.”

Cobionix’s flagship cobot, Codi, is specifically designed for tele-assisted ultrasound procedures, helping to address labour shortages in the health-care system. “We want to ensure that even the smallest details enhance patient

experience while delivering high-quality medical care,” Zamani explains.

This innovative solution seeks to provide a much-needed resource for overburdened health-care providers, especially in rural, remote or underserved areas. Better access to health-care services through automation reduces the need for patients to travel long distances for essential care.

Cobionix is now conducting trial deployments of Codi under careful supervision at Saskatoon’s Virtual Health Hub, which helps adopt and deliver health-care services to remote communities. “Instead of patients driving long distances to big cities, they can stay in their small towns and receive quality care,” Zamani says.

The University of Waterloo and Velocity played a significant role in helping the co-founders build their company. Velocity provided essential resources including space, mentorship and guidance on how to start a company and raise funds.



Nima Zamani with co-founder Tim Lasswell and the Cobionix team



SPOTLIGHT

Nima Zamani

(BASc '14, MASc '18)

Alum, Mechanical and Mechatronics Engineering
Co-founder and CTO, Cobionix

Velocity

Velocity has launched 400+ companies, creating

\$35 billion

in enterprise value



Velocity and the University helped shape Cobionix's focus on health-care robotics, leading to the creation of Codi. "Our vision is to empower health-care workers with technology that makes their jobs easier," Zamani says. "Robots like Codi should always be about helping people. Health care is about humans, and our mission is to ensure that robots remain a tool for improving human lives."

With Codi, Cobionix is taking important steps to enhance health-care delivery, making quality care more accessible across Canada and beyond. ♥

"Instead of patients driving long distances to big cities, they can stay in their small towns and receive quality care."

Nima Zamani

AI can advance health care but requires a human touch



Upskilling health professionals on AI's benefits improves efficiencies while maintaining the irreplaceable human connection in care settings.

Artificial intelligence (AI) is rapidly transforming health care, offering both promising benefits and significant risks. Dr. John Hirdes, a leading expert in Canada on health-care delivery, highlights the dual-edged nature of AI's integration into health care.

Hirdes emphasizes the potential for AI to improve efficiencies across the health-care system. "Every part of the health system is going to be affected," he says. "From the way doctors practise to how policymakers make decisions, AI is poised to change how we interact with health care."

Hirdes acknowledges, however, that the widespread implementation of AI must be done thoughtfully, without compromising the quality of patient care.

One initiative addressing this challenge is the University of Waterloo's professional education wing, WatSPEED, which provides upskilling to keep pace with technological,

SPOTLIGHT

Dr. John Hirdes

Professor, School of Public Health Sciences

WatSPEED

“One of the most important resources we will have in the future is trust. We need to know which AI systems we can trust, and which require careful examination.”

Dr. John Hirdes

economic and social disruption. Hirdes is the program director for WatSPEED’s Leveraging AI to Improve Health Care in Canada program, designed to prepare health-care professionals, policymakers and administrators to integrate AI in ways that enhance patient outcomes without losing sight of what matters most: the patient experience.

Hirdes highlights that although AI tools can improve efficiencies, streamline data collection and predict health outcomes, they should never replace the empathy and personal attention that health-care providers offer.

Hirdes warns against relying on technology for tasks that require a human touch.

“Would you want to go home today and have a robot feed you your dinner? I don’t think so. So why should we impose that on an elderly patient?” Hirdes asks.

“One of the most important resources we will have in the future is trust. We need to know which AI systems we can trust, and which require careful examination.”

Hirdes’ approach to AI reflects a broader conversation happening at Waterloo, where experts from various fields, including health, engineering and research ethics, collaborate to ensure AI developments align with human values.

As AI continues to evolve, Hirdes and his colleagues at Waterloo are committed to ensuring that human-centred care remains a fundamental pillar of health innovation. ♥

Tackling environmental health challenges in Indigenous communities



PhD student's research examines how industrial pollution may be affecting northern First Nations communities.

Driven by a commitment to empower Indigenous peoples to protect their health, Amy Nahwegahbow's PhD research in epidemiology is a deeply personal journey.

As a member of Whitefish River First Nation near Manitoulin Island, Nahwegahbow examines how exposure to environmental contaminants may affect the health of northern First Nations communities. Her research explores data on industrial pollution both in her home community and in Yellowknife, as well as the impacts on people's health and well-being among their populations.

"This topic resonates with me because First Nations are disproportionately affected by industrial pollution due to our deep connection to the land, reliance on traditional foods and proximity to industrial sites," Nahwegahbow says.

She adds that First Nations communities' cultural practices of hunting, fishing and berry harvesting combined with their reliance on the land for food, increased poverty levels and limited access to clean water or safe housing all make them more susceptible to environmental risks.



SPOTLIGHT

Amy Nahwegahbow

(PhD in progress)

PhD student, School of
Public Health Sciences

Vanier Scholar



“This topic resonates with me because First Nations are disproportionately affected by industrial pollution due to our deep connection to the land, reliance on traditional foods and proximity to industrial sites.”

Amy Nahwegahbow

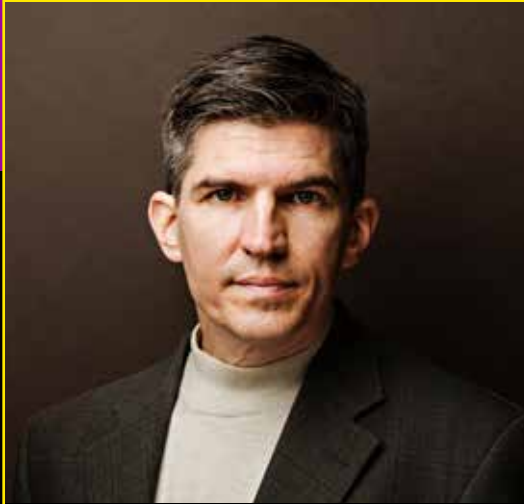
That’s why part of Nahwegahbow’s research methodology is her community, which she considers a leader in this work. She plans to form an advisory committee of community members to work with community-based researchers. Depending on local approval, she will then analyze the results from specific biological samples to look at the different levels of contaminants in people’s bodies.

She notes that high levels of contaminants in foods not only increase the risk of poor health, but also take a toll on the community’s peace of mind. Parents, in particular, fear their children may be consuming contaminated food or water that’s likely to make them sick.

“Understanding the impact of these contaminants is important because it empowers First Nations to advocate for environmental justice to protect their health and drive policy change that will include their voices and respect their rights,” Nahwegahbow explains.

She believes this work will contribute to reconciliation.

“It’s building respectful relationships between First Nations and academia,” she says. “It fosters trust, and collaboration. It helps correct historical injustices by getting them the data that they need to then advocate for improved policies, programs and find a way that they might need to right any past wrongs.” ♥



SPOTLIGHT

Dr. Chris Bauch

Professor, Applied Mathematics

Waterloo Climate Institute

Waterloo Institute for Complexity
and Innovation

Math modelling shows how human behaviour and climate are interconnected

Dr. Chris Bauch is a mathematical biologist connecting human actions and climate change to drive effective environmental solutions.



Scan to read how climate models can help society prepare and respond for a sustainable future.

A champion for transit equity

“It feels great not only to see your work actually mean something, but also the effect on the community.”

Rodney Chan

Planning co-op student’s journey from concerned rider to a key voice in Ontario’s transit conversation is a testament to community organizing.

For Rodney Chan, transit is not just a service. It’s a lifeline.

“Growing up in Toronto, it took me an hour to get to school on public transit,” Chan explains. “The route I used was frequented by predominantly lower-income and racialized people who have been left behind in the city. That led me down the urban planning rabbit hole of learning about transit service planning, political funding issues and North American urban sprawl.”

Chan’s journey has featured many stops. He volunteered with TTCriders, a Toronto-based transit advocacy group, began his studies in the Faculty of Environment’s School of Planning, and this past year was a key organizer in reinstating Waterloo region’s late-night transit route.

8K+ employers

from 75 countries actively recruit Waterloo co-op students



Now Chan is taking his academic and professional experiences and translating them into the workplace through his first co-op work term. Waterloo has the largest co-op program at a research-intensive university in the world, with more than 70 per cent of students gaining up to two years of employment experience during their studies.

During his placement with York Region's Transportation Planning team, Chan worked on integrating an equity lens into future transit plans. His task was to map out how proposed bus rapid transit lanes could be phased in, considering the needs of low-income and racialized communities. This work allowed him to apply his knowledge of transit justice in the workplace, reinforcing his commitment to making public transportation more equitable.

"Transit is a lifeline for a lot of people who depend on it," he says. "It feels great not only to see your work actually mean something, but also the effect on the community – that there's an affordable, climate-friendly way for people to get home."

Looking ahead, Chan hopes to revive the Tri-Cities Transport Action Group, which is dedicated to improving transit and active transportation in Waterloo region. He also hopes to continue working in public transportation after graduation, aiming to scale up his passion for equitable transit solutions.

Chan's journey from a concerned student to a key voice in regional transit conversations is a testament to the power of persistence, community organizing and a clear vision of what the future of public services should be about. ♥



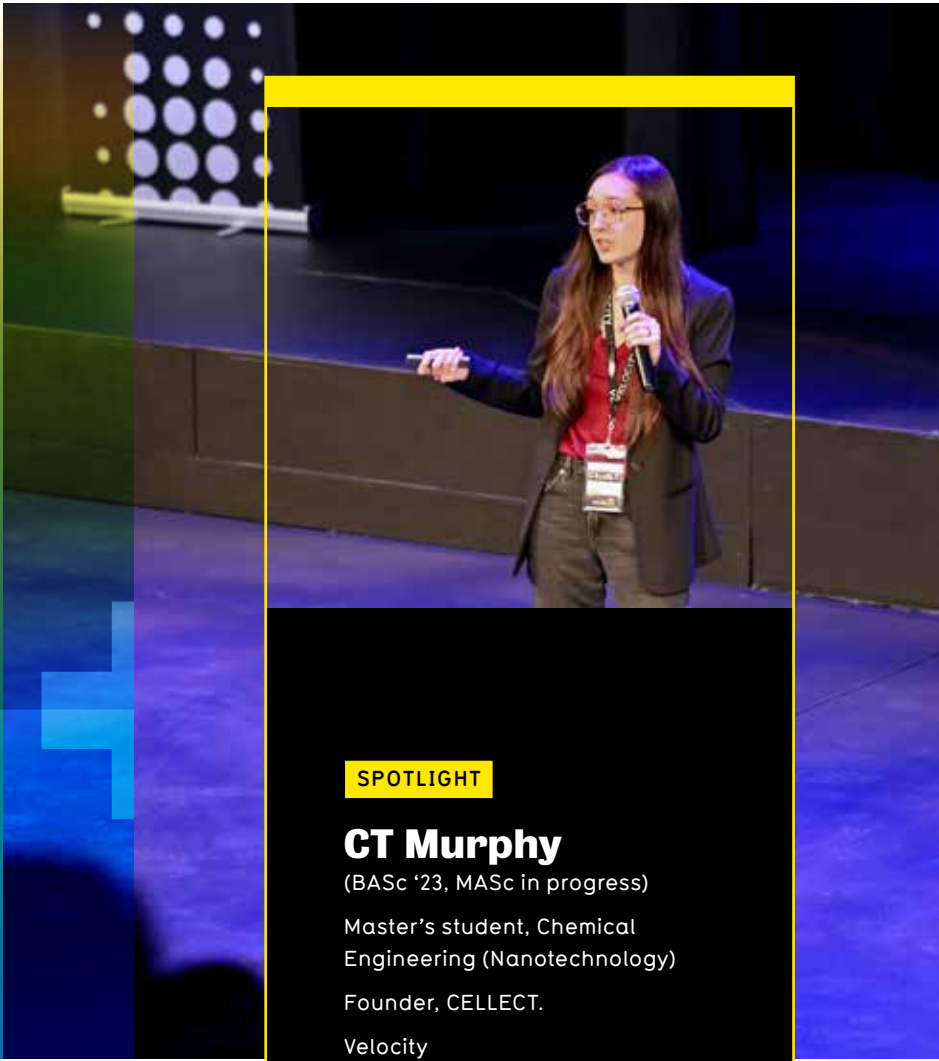
SPOTLIGHT

Rodney Chan

(BES in progress)

Undergraduate student,
School of Planning

Co-operative and
Experiential Education



SPOTLIGHT

CT Murphy

(BASc '23, MASc in progress)

Master's student, Chemical Engineering (Nanotechnology)

Founder, CELLECT.

Velocity

CELLECT. transforms cervical cancer diagnosis with nanotechnology



Scan for more on Waterloo's Innovation Arena.

The Innovation Arena is where visionaries come together for global impact. More than a new space, the Arena connects entrepreneurs with specialized resources to advance health and innovation across sectors.

uwaterloo.ca/innovation-arena



Using menstrual products as a diagnostic tool could replace invasive Pap smears with a non-invasive alternative.

CT Murphy, founder of CELLECT., is on a mission to transform health screenings by using nanotechnology in menstrual products to detect HPV and cervical cancer. The innovation could potentially eliminate the need for invasive Pap smears, offering a less stressful, non-invasive alternative.

“Our goal is to make health care more inclusive and less intimidating,” Murphy says. “By integrating screening into a product that people are already familiar with, we’re removing a barrier to care, making it simpler and more accessible.”

Menstrual blood contains important health indicators. Using this insight and a degree in nanotechnology engineering, Murphy developed a nanomaterial that can be inserted into tampons or pads. This material passively captures and preserves DNA and cells of interest from menstrual blood, which can then be tested for HPV, cervical cancer and other DNA-based diseases – including sexually transmitted infections.

Murphy, now pursuing graduate studies in chemical engineering at Waterloo, continues refining the nanomaterials to improve stability and scalability. “Innovation is messy and never straightforward,” Murphy says. “We had to rethink and re-engineer multiple times, but each iteration brought us closer to a practical, effective and scalable solution.”

CELLECT. has garnered attention from health-care professionals and potential users, who are excited about the possibility of a non-invasive alternative to Pap smears. The startup is positioned to make a meaningful change, not only for women but also for anyone who menstruates, offering an inclusive, accessible screening method for communities often overlooked by traditional gynecological care models.

With early successes in prototype development, and supported by Waterloo’s Velocity incubator and funding programs, CELLECT. is poised to transform health care. Murphy’s drive to make menstrual blood a vital diagnostic fluid could change the way we approach health screenings worldwide. ♥

Building the perfect quantum camera

Vanier scholars collaborate to reach new levels of precision and reveal a new world of possibilities.

Imagine a camera that doesn't miss anything, one sensitive enough to detect individual photons of light. That's the goal of Sarah Odinotski and Jack DeGooyer, two PhD researchers from the Institute for Quantum Computing and Department of Electrical and Computer Engineering. The potential of their ambitious project was underlined when both were awarded prestigious Vanier Canada Graduate Scholarships for their distinct but complementary research.

Odinotski is part of the Quantum Photonic Devices Laboratory team, led by Dr. Michael Reimer. Her work focuses on designing sensors capable of detecting single photons, the smallest unit of light. By designing intricately patterned "metamaterials," Odinotski aims to capture individual photons and convert them into detectable electronic signals.

"If you throw a snowball off the side of a cliff, it'll start rolling and will create an avalanche," she explains. "The structures within our metamaterial are capable of efficiently generating one electron from the single absorbed photon. It can then take that electron and multiply it into millions of electrons to create an 'avalanche' of current."

Working in the same laboratory, deGooyer hopes to build a fully functioning camera made up of these precise sensors. To achieve this, he is developing microcircuits that can process and monitor the weak signals generated by the sensors. "What I'm doing is making scales the width of a human hair," deGooyer says. "The scales count electrons as they're passing by." This process is key to scaling up individual sensors into a system that can generate detailed images with near-perfect sensitivity.

From quantum computing to astronomy, the applications of this technology are incredibly diverse and consequential. One of the team's motivations is to use their cameras for medical imaging. They hope their system will allow more accurate detection of cancerous cells for faster diagnosis and treatment.

The exciting possibilities of this technology were recognized by the two Vanier awards, which highlight the value of collaboration across research disciplines to enable new discoveries. "It's an affirmation of the research and the different philosophies that both Sarah and I bring to the project," deGooyer says. ♥



SPOTLIGHT

Sarah Odinotski

(PhD in progress)

PhD student, Electrical
and Computer Engineering

Institute for Quantum Computing

Vanier Scholar

Jack deGooyer

(PhD in progress)

PhD student, Electrical
and Computer Engineering

Institute for Quantum Computing

Vanier Scholar



Scan to see inside Waterloo's cleanroom and quantum lab where students are designing sensors capable of detecting single photons.

Unveiling new horizons in environmental and health research

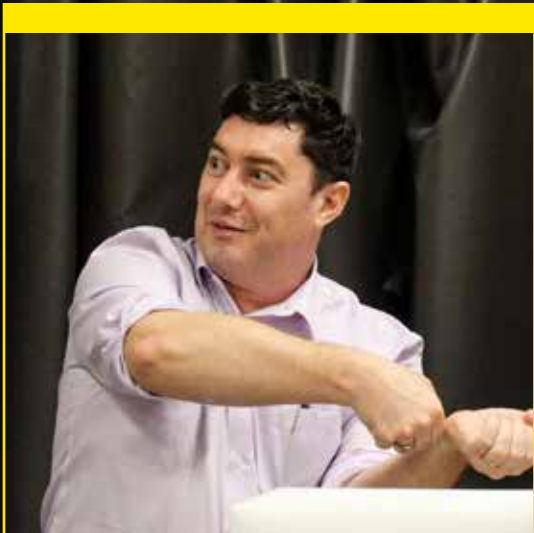
Waterloo's new Free Electron Laser will reveal hidden details in biological samples, enhancing our understanding of treatments and therapies.

The University of Waterloo's game-changing Free Electron Laser (FEL) facility is set to transform environmental and health research with its capabilities to unlock new frontiers in understanding and treating complex health conditions.

The FEL project led by Dr. Scott Hopkins was inspired by Nobel laureate and Waterloo professor Donna Strickland, whose groundbreaking fundamental research in laser physics helped shape his vision for advancing laser technology. The FEL will have broad applications from environmental diagnostics to health research. It will enable researchers to analyze the molecular structure of substances, monitor chemical transformations in wastewater and identify biomarkers for diseases such as cancer.

"The FEL will offer an unprecedented level of detail in analyzing molecular and material structures," Hopkins explains. "The potential impact of the FEL is enormous. It opens new possibilities for developing innovative treatments and improving personalized medicine."

Hopkins's research team specializes in detecting trace molecules, which are vital for applications such as monitoring water and wastewater. The team aims to identify contaminants, including hazardous PFAS species known as "forever chemicals." Despite the sophisticated tools available, many molecules remain unidentified, which poses challenges to effective management or treatment.



SPOTLIGHT

Dr. Scott Hopkins

Professor, Chemistry

Canadian Free Electron
Laser project



“Our research aims to push the boundaries of detection and analysis.”

Dr. Scott Hopkins

“Our research aims to push the boundaries of detection and analysis,” Hopkins says. “With FEL’s advanced technologies, we will be able to identify and understand these puzzling molecules.”

The FEL facility will be adjacent to the new Waterloo hospital announced in summer of 2024, which will create an environment for collaboration between research and health-care professionals. This proximity will facilitate the rapid application of fundamental research findings to clinical practice.

“Being close to the hospital will foster invaluable partnerships, accelerating the translation of

fundamental research into real-world medical solutions,” Hopkins says.

Waterloo’s interdisciplinary expertise in physical sciences, engineering, computer science and artificial intelligence positions it as a leader in this groundbreaking research. The FEL facility will also play a vital role in training future scientists and equipping them with skills applicable across various fields.

By working together, academia, industry and government can translate applied research and new discoveries into tangible solutions for pressing global challenges, from environmental sustainability to human health. ♡



Scan for more on the region’s newest hospital.

In 2024, the University of Waterloo was selected as the site for a new acute care hospital to serve Waterloo-Wellington and beyond. The University is committed to working with Grand River Hospital and St. Mary’s Hospital to support the Building the Future of Care Together initiative.

Turning food waste into a new bioplastic

SPOTLIGHT

Eugenia Dadzie

(BSc '21, PhD in progress)

PhD student, Biology

Co-founder, MetaCycler BioInnovations

Velocity

Co-founders of MetaCycler BioInnovations leverage the Entrepreneurial PhD Fellowship program to scale their research solution for plastic pollution.

Current plastic waste management methods are costly and harmful to the environment – and common biodegradable alternatives, like soggy paper straws, fall short as a replacement.

MetaCycler BioInnovations has changed that by creating a better bio-based plastic alternative that combines the flexible properties of traditional plastic and is 100 per cent biodegradable. The Velocity startup produces polyhydroxyalkanoates (PHA), a biodegradable polymer, by engineering bacteria to convert waste from milk and cheese production. It's a solution that upcycles waste from the dairy industry into cost-effective, sustainable bio-based plastics.

“There's a shift towards sustainable materials like seaweed and sugarcane, but their material properties often fall short compared to conventional plastics,” says Eugenia Dadzie, co-founder and director of communications at MetaCycler. “At MetaCycler, we extract the PHA that can be formed into pellets for plastic manufacturers to use. Our startup tackles the problem of food waste and plastic pollution in one solution.”



Eugenia Dadzie with her MetaCycler co-founders
Nicole LeBlanc and Jonathan Parkes

Dadzie met her co-founders Nicole LeBlanc and Aranksha Thakor as PhD students under the supervision of Dr. Trevor Charles, a biology professor at Waterloo.

MetaCycler started as a research project by Thakor, collaborating with dairy processing company, Fairlife. The company approached Dr. Charles' lab, seeking innovative ways to repurpose their waste production.

Dr. Charles saw the potential of commercializing Thakor's work and brought the team together due to their similar research on molecular biology. Together with Jonathan Parkes, a PhD student from the University of Guelph, they established MetaCycler.



In just two years, the startup has secured funding from United College's GreenHouse Social Impact incubator, Waterloo's Velocity incubator and other Waterloo programs. In September 2024, Dadzie and LeBlanc joined the inaugural Entrepreneurial PhD Fellowship program at the Conrad School of Entrepreneurship and Business, where they are commercializing this sustainable plastic solutions while continuing their doctoral studies.

"Waterloo's strength in research and innovation has become very central to my academic journey," Dadzie says. "Although I'm on a different career path than I originally envisioned, I enjoy being in an environment that encourages you to think outside the box, and it changed the way I saw entrepreneurship." ♥

“Although I’m on a different career path than I originally envisioned, I enjoy being in an environment that encourages you to think outside the box, and it changed the way I saw entrepreneurship.”

Eugenia Dadzie



Scan to go inside MetaCycler's lab to see how it's turning food waste into a new bioplastic.



Ria Menon mentoring undergrad students in the Velocity Science lab

Getting more undergrad students into the lab

Real Research co-founders are creating opportunities for the next generation of students to gain hands-on research and lab experience.

SPOTLIGHT

Ria Menon (BSc '24)

Alum, Biomedical Sciences

Co-founder, Real Research

GreenHouse

Velocity Science

Centre for Work-Integrated Learning



Scan to read how this unique initiative helps students gain professional lab skills and explore career options.

- ◆ ECONOMIC FUTURES
- SOCIETAL FUTURES



SPOTLIGHT

**Dr. Mikal
Skuterud**

Professor, Economics

Director, Canadian Labour
Economics Forum

Boosting Canada's economic potential with international talent



Mikal Skuterud discusses his research with Waterloo Chancellor Dr. Jagdeep Singh Bachher

Waterloo’s international students gain earnings advantage over their Canadian-born peers.

Dr. Mikal Skuterud became interested in labour markets in high school while working in a large warehouse alongside many recent migrants to Canada. During his undergraduate degree in labour studies, Skuterud took several economic theory courses, which confirmed he was on the right career path.

For more than two decades, Skuterud’s research has focused on the economics of Canadian immigration. Today, he is considered one of the country’s leading subject matter experts.

In a recent study tracing the economic impact of University of Waterloo students across two decades, Skuterud and his collaborators found that contrary to unsubstantiated theory, international students who study in Canada don’t see their skills underutilized once they join the Canadian labour market.

“This is a sign that signals the potential of the country’s International Student Strategy to help boost economic growth,” Skuterud says. Notably, the study found Waterloo’s international student graduates of technology and engineering programs enjoy a 37 per cent earnings advantage over their peers compared with the national average.

“Waterloo’s international students exceed not only Canadian-born graduates of the University of Waterloo but also Canadian-born university graduates nationally,” he says. They are also more likely to stay in Canada and become permanent residents as well as earn more than their Canadian counterparts.”

The study forms the bedrock of a list of recommendations for policymakers to revise Canada’s decades-old International Education Strategy to help refine admittance requirements. One recommendation suggests that Immigration, Refugees and Citizenship Canada should provide a transparent pathway for international students who seek economic-class immigration to Canada by selecting candidates with the highest expected future Canadian earnings.

Skuterud and his co-authors also emphasize that the success of Canada’s Compressive Ranking System tool in predicting migrants’ future Canadian earnings can be enhanced significantly by adding applicants’ fields of study, school identities and post-graduation Canadian earnings to the set of criteria used.

The study analyzed immigration data from Immigration, Refugees and Citizenship Canada and income tax returns from the Canada Revenue Agency and was done with Statistics Canada in their secure Social Data Linkage Environment. ♥

Waterloo-led unicorn, 1Password, is a leader in human-centric security

1Password's global cybersecurity leadership protects more than 150,000 businesses and millions of consumers, enabling safe online experiences around the world.

From its beginnings as a small startup of just 20 employees, 1Password has grown under the leadership of CEO Jeff Shiner (BMath '92) into a global powerhouse.

During his co-op terms at IBM, Shiner discovered his passion for solving real-world problems. "The co-op program was by far the most rewarding part of my time at Waterloo," he recalls. "It not only provided me with a world-class education but also allowed me to work at a global technology innovator like IBM on projects that had a tangible impact."

This hands-on experience was crucial in shaping Shiner's career, providing him with both technical and business expertise. Today, he leads 1Password, a cybersecurity company that has grown to more than 1,400 employees, with a valuation of \$9 billion. The company's human-centric approach to cybersecurity helps more than 150,000 businesses and millions of individuals navigate the online world safely and with confidence.

"At 1Password, we're committed to making security simple and accessible for everyone," Shiner says. "Our goal is to remove the fear and friction often associated with online safety, enabling people to focus on what matters without worrying about their personal or professional information being compromised."

A key part of 1Password's success has been its dedication to remote work culture and innovative security solutions. The company earned a spot on the Forbes Cloud 100 list for three consecutive years and Quartz's Best Companies for Remote Workers list.



SPOTLIGHT

Jeff Shiner (BMath '92)

Alum, Mathematics
CEO, 1Password



In May 2024, 1Password launched its latest innovation: 1Password Extended Access Management (XAM). This new offering is designed to help businesses secure every sign-in to every application from every device – even unmanaged devices such as employee-owned phones and computers, which are not typically set up or managed by IT and security teams.

XAM works alongside 1Password's flagship enterprise password manager solution, offering real-time device trust detection and contextual access management to help users resolve security issues.

Shiner's journey from a Waterloo student to the head of a tech unicorn highlights the strength of the University's co-operative education program. Waterloo's emphasis on blending education with industry experience has helped produce top tech leaders like Shiner, who are making significant impacts globally. ♥

“The co-op program was by far the most rewarding part of my time at Waterloo ... It not only provided me with a world-class education but also allowed me to work at a global technology innovator like IBM on projects that had a tangible impact.”

Jeff Shiner

- ▲ TECHNOLOGICAL FUTURES
- SOCIETAL FUTURES



Uncovering the invisible side of tech

SPOTLIGHT

Dr. Lai-Tze Fan

Professor, Sociology and Legal Studies
 Canada Research Chair in Technology and Social Change
 U&AI Lab

Waterloo researchers are decoding new technologies by asking why they were made and who they are made (or not made) for.

Lai-Tze Fan discusses AI on a Perimeter Institute panel with NASA researcher Makhan Virdi and Radical Ventures' Leah Morris



#1 comprehensive research university for 17 consecutive years (Research Infosource 2024)

Digital technologies play an integral role in our everyday lives, and since the rapid growth shows no signs of slowing down, Dr. Lai-Tze Fan cautions about the many invisible aspects to the technologies we use.

These invisible components have negative social and environmental impacts, which is why Fan believes greater tech literacy is important for people to feel more confident with technology.

Initially driven to the tech space by a curiosity about the future of storytelling in a digital era, Fan's teaching and research now focus on the social implications, benefits and risks of AI technologies.

Through interdisciplinary work in her one-of-a-kind U&AI Lab, which refers to "unseen-artificial intelligence", she examines how AI reinforces

systemic oppression and how inequity continues to be dangerously perpetuated through rapidly developing AI technologies.

With regulations unable to keep up with the race of technological advancements, Fan explains that the U&AI Lab aims to contribute novel, multidisciplinary approaches to disrupting inequitable AI at critical stages of design and production.

"I approach this work by asking questions of invisibility," she says. "Why are these technologies made, for whom are they made, and for whom are they not made?"

Having experienced racialized discrimination and facial recognition bias with technology, Fan believes pairing technical questions with a non-technical,



“If you think about the way we talk about the internet, describing it as ‘the cloud’ makes it seem like it’s immaterial when it is not because it requires real natural resources to function.”

Dr. Lai-Tze Fan

sociocultural standpoint helps us think about technology differently – and ultimately helps inform tech literacy.

“A lot of what we could and should know about technology is often invisible and not even necessarily in a malicious way,” she explains. “If you think about the way we talk about the internet, describing it as ‘the cloud’ makes it seem like it’s immaterial when it is not because it requires real natural resources to function.”

Work in the U&AI Lab currently focuses on three areas. The first is gendered, racialized and classist representations of labour in AI; the second explores the racist history of facial recognition technologies, while the third investigates the environmental impact of AI hardware.

Fan’s work will help equip digital technology users with the knowledge of how these technologies originate and what their affordances and limitations are. ♥



Lai-Tze Fan in discussion with Vivek Goel, Waterloo President and Vice-Chancellor, and Mary Wells, Dean of Engineering



SPOTLIGHT

Dr. Leia Minaker

Professor, School of Planning

Future Cities Institute

New institute helps local governments build better cities

The Future Cities Institute, founded by CAIVAN, brings together global thinkers from across disciplines to identify equitable, sustainable solutions for the future of our cities.



As the need to address challenges like housing, climate and infrastructure grows, scan to read how FCI is driving solutions.

Tentewatenikonhra'khánion

How a Waterloo Canada Research Chair is decolonizing research methods and co-creating a path forward through community collaboration.

Dr. Talena Atfield's work to restore and regenerate Hodinohso:ni cultural knowledges starts with the title of her Canada Research Chair: Tentewatenikonhra'khánion, which translates to "we will put our minds together."

Based in Ohswé:ken (Six Nations of the Grand River,) Atfield's project works to indigenize research methodologies through community inclusion, focusing on the strengths of each participant and how they work together. "My work acknowledges that there are no 'experts,' rather we all have knowledge we can share, and in this way, we are decentring colonial interpretation," she says.

In line with this approach, all research activities are driven by the wants and needs identified by members of the community.

"It's important to be up front and honest about who I am and what we are doing," says Atfield about her relational approach. "Although I am a member of the community, I am also entering the space as a researcher so it's important to prioritize making space for community members. There is still a lingering distrust

because of the kind of academic extraction that's happened in the past – so building trust is important."

Trust is built by inviting community members to co-lead all stages of the project. "My intention is to help everyone occupy the space so that we're all able to use our strengths."

The research happens through community storytelling circles and crafting workshops, such as hide tanning and basket making. Importantly, these engagements also constitute the research outputs, recorded specifically for community use.

Atfield explains that early 20th-century anthropologists, such as F.W. Waugh at Six Nations, extracted material and cultural information under the "salvage ethnography" paradigm – believing they were preserving the culture. "But part of their research was to interpret as though there is a singular and accessible truth about our culture."

This is the authoritative narrative Atfield seeks to decolonize. "My goal isn't to interpret. My goal is to look together as a community at the way that we did and do things in Hodinohso:ni communities. It's very much a group discussion about how our history interacts with the present, and how we might take it into the future. A lot of different and surprising perspectives emerge that you wouldn't get using colonial expert-based approaches." ♥

SPOTLIGHT

Dr. Talena Atfield

Professor, History
Canada Research Chair,
Tentewatenikonhra'khánion



**“My intention is
to help everyone
occupy the space
so that we’re all
able to use our
strengths.”**

Dr. Talena Atfield

Safi brings profits back to local farmers while ensuring consumer safety

Portable milk pasteurization device aims to revolutionize East Africa's dairy industry with efficiency and economic benefits.



SPOTLIGHT

Miraal Kabir (BCS '24)

Alum, Computer Science

Co-founder, Safi

GreenHouse

Velocity

Miraal Kabir meeting with African dairy farmers



Scan to read how Safi's pilot project in Rwanda is spreading demand for the milk pasteurization device across the continent.

**SPOTLIGHT****Dr. Oliver Schneider**

Professor, Management
Science and Engineering

The Games Institute

**Dr. Michael
Barnett-Cowan**

Professor, Kinesiology and
Health Sciences

The Games Institute

Dr. Kristina Llewellyn

Professor, History

The Games Institute

Championing reconciliation with the help of virtual reality

Interdisciplinary researchers at the Games Institute leverage immersive technologies to power a social justice project.



**Scan to watch how the
Digital Oral Histories for
Reconciliation project is
championing reconciliation
through VR technology.**

Scaling the electric vehicle economy

OBEC paves the way for Canada to build a green economy and maximize its impact on technological and economic development.

As electric vehicle (EV) adoption speeds up, Canada's capacity to produce batteries is struggling to keep pace with the growing demand.

The Ontario Battery and Electrochemistry-research Centre (OBEC) is at the forefront of Canada's efforts to scale the EV economy. Co-led by Dr. Linda Nazar and Dr. Michael Pope, the centre brings together an interdisciplinary team focused on addressing key challenges in battery technologies.

"Lithium is becoming increasingly scarce, and our current infrastructure is not equipped to meet the rising number of EV drivers," Pope says. This scarcity, coupled with limited charging infrastructure highlight the pressing need for next-generation battery technology and a scalable energy ecosystem.

OBEC researchers are exploring alternative elements to lithium-based batteries, such as zinc and sodium, to reduce reliance on scarce materials and improve battery performance.

"Next-generation batteries present enormous challenges because they require integrating complex chemistry

and material science to create lower-cost, safer and longer-lasting energy storage solutions," Nazar explains. "We are pushing the boundaries of battery chemistry to create sustainable and efficient solutions for the future of transportation and beyond."

The centre's work aims to innovate and train the next generation of talent equipped to support the growing EV battery industry. OBEC's efforts extend beyond the lab through strong industry partnerships, including automakers and energy companies.

"Our goal is to work hand in hand with industry leaders to ensure that Canada remains competitive in the global EV market," Pope adds. By leveraging these partnerships, OBEC is positioning Canada as a leader in EV research and development, poised to meet both the technological and economic demands of a green economy.

"Canada could have tremendous technologies in this field. It's not a matter of capability but of ramping up our efforts and creating a supportive environment for innovation and industry growth," Nazar says. ♥



34%

of research partnership funding comes from government and private sector contracts (2022/23)

“Our goal is to work hand in hand with industry leaders to ensure that Canada remains competitive in the global EV market.”

Dr. Michael Pope



SPOTLIGHT

Dr. Michael Pope

Professor, Chemical Engineering
Ontario Battery and Electrochemistry-research Centre

Dr. Linda Nazar

Canada Research Chair,
Solid State Energy Materials
Ontario Battery and Electrochemistry-research Centre

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