



Western
Academy for
Advanced Research

The WAFAR Promise in Practice

RESEARCH, COLLABORATIONS
& IMPACT 2020 – 2025



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Honouring Our Beginnings and Accelerating Towards A Bold New Chapter

MESSAGE FROM THE DIRECTOR



Grace Parraga, PhD, FCAHS

Professor & Tier 1 Canada Research Chair,
 Department of Medical Biophysics
 Department of Medicine (Respirology)
 Schulich School of Medicine & Dentistry
 School of Biomedical Engineering

Western University
 London Canada

I am thrilled to introduce this reflection on the first five years of the Western Academy for Advanced Research (WAFAR).

WAFAR was created to spark collaboration, and bring brilliant minds together across disciplines to tackle the complex questions that shape our world. In five years, that spark has become a catalyst: five major research initiatives, dozens of partnerships, and new research solutions with global reach. As WAFAR begins its next five years, we have an opportunity to honour the work that brought us here and to lay the foundation for a bright future.

My own career path illuminated the power of interdisciplinary problem solving. Alongside my research and teaching at Western, it is now my privilege to lead WAFAR's mission to accelerate world-class interdisciplinary research with global impact.

Looking ahead, WAFAR will grow its ambition. We will engage undergraduate students as emerging research leaders through IGNITE, fast-track international partnerships through MOBILIZE, grow global collaborations through ACCELERATE and engage Western and international researchers to address the world's biggest challenges (IMPACT).

Now more than ever, bold solutions are needed, and with Western's support, WAFAR investments in interdisciplinary research will make a better future possible.



History of WAFAR

FIVE YEARS OF IMPACT

WAFAR speaks to the moment. Interdisciplinary research is difficult to see and measure, but its impact is undeniable. Western’s investment in WAFAR is aimed at accelerating our enormous interdisciplinary research strengths for global impact. The world needs more interdisciplinary research. The world needs more WAFAR.

VICE PRESIDENT (RESEARCH) | PENNY PEXMAN PHD

Research is more than discovery. It is the place where diverse ideas gain the space, support and visibility they need to grow, be tested, validated and mobilized for impact.

WAFAR Milestones



2020

- Fred Longstaffe CM, PhD installed as Director



2021

- WAFAR governance and programming established
- First request for proposal launched
- First round of WAFAR funding announced



2022

- Mathematics of neural networks: New theoretical methods, led by Lyle Muller (Mathematics)



2023

- Climate-resilient infrastructure and buildings, led by Keith Porter (Civil & Environmental Engineering)



2023

- Nature-inspired solutions for carbon transformation, led by Christopher DeGroot (Mechanical & Materials Engineering)



2024

- Smart Cities interdisciplinary research to address technical and social barriers, led by Ayan Sadhu (Civil & Environmental Engineering)
- Fred Longstaffe CM, PhD retires as WAFAR Director



2025

- Possibilities for Peace, led by Ryan Liss (Faculty of Law)
- Grace Parraga PhD FCAHS installed as Director (2025-2030)



2026

- Strategic plan launched
- Ignite, Mobilize, Accelerate and Impact programs created
- International Advisory Board and Community Advisory Council established

Mathematics of Neural Networks



HOW DO WE HARNESS THE STRENGTH OF MATHEMATICS TO CREATE NOVEL WAYS TO UNDERSTAND HUMAN AND MACHINE LEARNING?

" WAFAR support drove our ambitious research program which bridged mathematics and artificial intelligence. WAFAR seed funding resulted in a 10-fold amplification in our research funding and established an internationally partnered program, connecting artificial neural networks, human memory, and novel treatments for neurologic disease. "

LYLE MULLER & JÁN MINÁČ

Team:



Lyle Muller | Lead
(Mathematics,
Western University)



Ján Mináč
(Mathematics,
Western University)



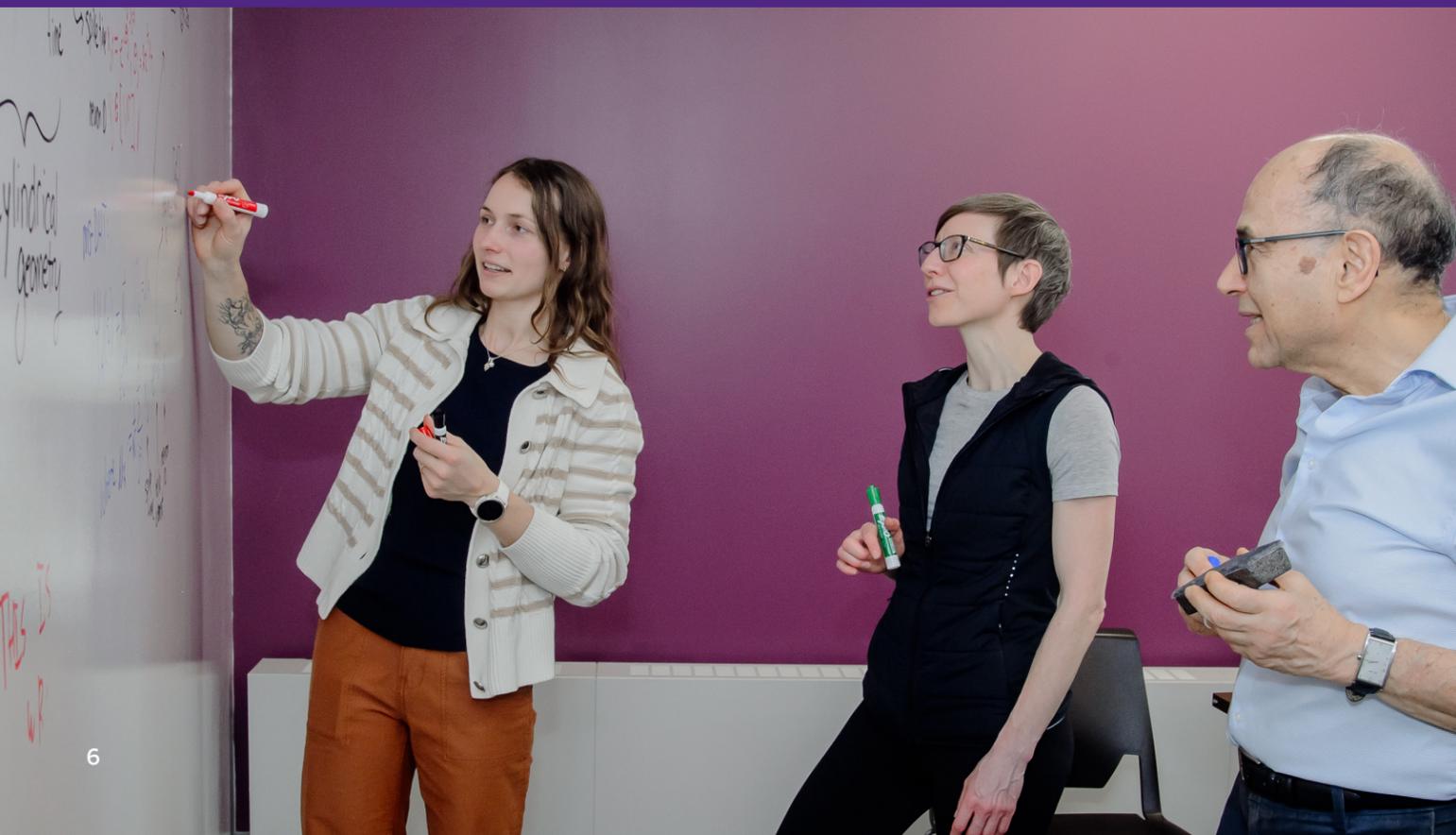
Marieke Mur
(Psychology, Computer
Science, Western University)

Maria Chudnovsky
(Princeton, USA)

Alex Lubotzky
(Weizmann Institute, Israel)

Frederic Chavane
(CNRS, France)

Christian Maire
(L'institut FEMTO-ST, France)



Challenge:

Deep learning or artificial intelligence (AI) has the potential to unravel the mysteries of the human brain. New mathematical ways to understand how AI neuronal networks function will help us explain brain activity in health and disease.

Impact:

- Explainable AI developed, allowing us to observe artificial neural networks in action
- Comprehensive understanding of memory in biological neural networks established, opening pathways for new disease interventions
- New AI-guided method developed to stop epileptic seizures
- World-leading stem cell research accelerated to bridge the knowledge gap between virtual (AI) and real (neural cell) memory systems

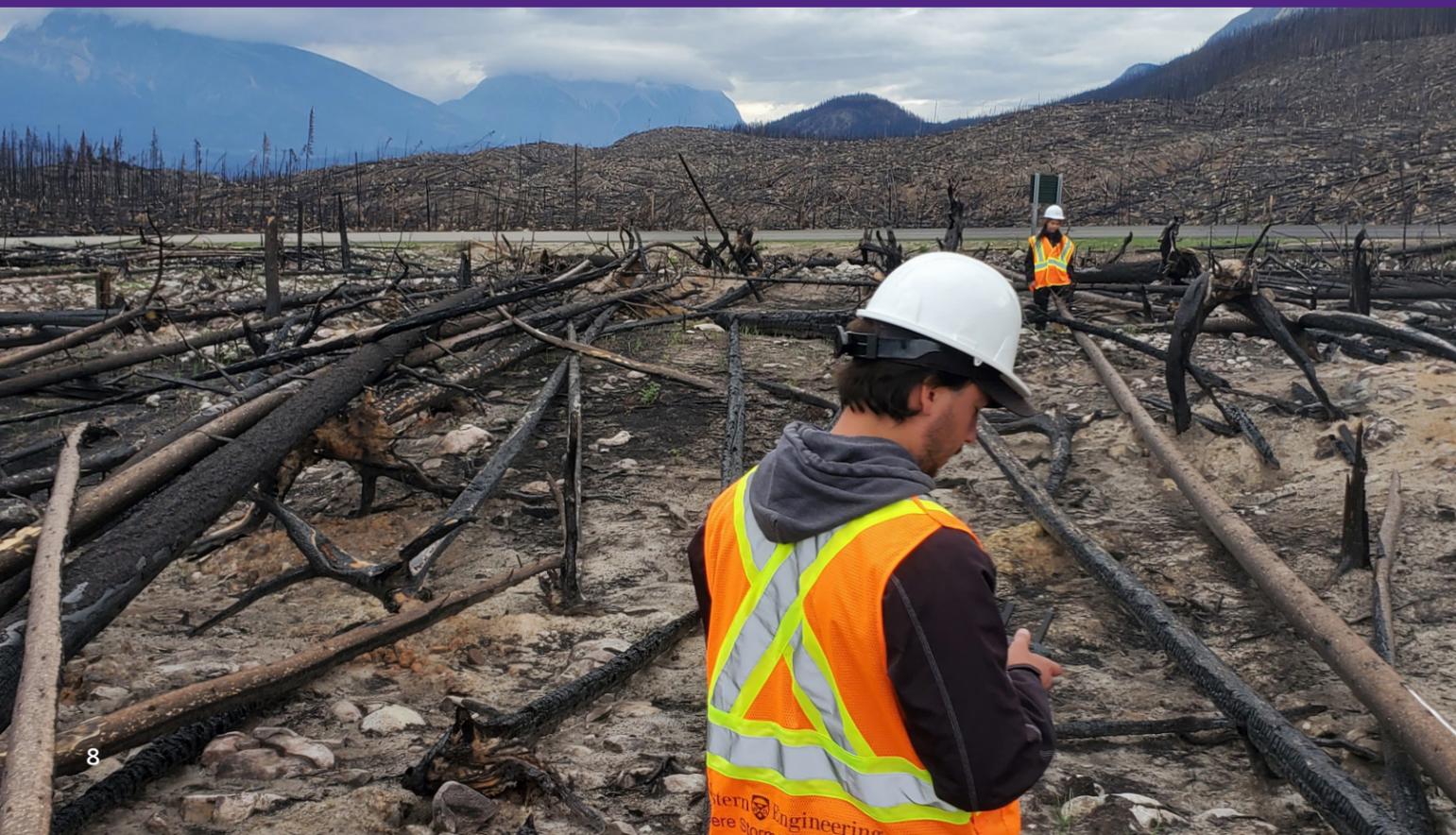
Climate-Resilient Infrastructure and Buildings



HOW DO WE ENSURE THE PROTECTION OF INFRASTRUCTURE IN THE FACE OF FLOODS, WILDFIRES AND THE CONSEQUENCES OF CLIMATE CHANGE USING STATE-OF-THE ART ENGINEERING SOLUTIONS?

" WAFAR provided tangible seed funding that supercharged the process of building partnerships and research impact. By working together, side-by-side as an interdisciplinary team, we transformed our research towards creating a blueprint for communities to create resilient infrastructure and mitigate the risks of catastrophic loss. "

KEITH PORTER & GREGORY KOPP



Team:



Keith Porter | Lead
(Civil & Environmental Engineering, Western University)



Katsu Goda
(Earth Sciences, Western University)



Gregory Kopp
(Civil & Environmental Engineering, Western University)

Paul Kovacs
(Institute for Catastrophic Loss Reduction, Western University)

Lucille Jones
(US Geological Survey, USA)

Rebecca Denlinger
(Deputy Minister (ret.) Province of BC)

Challenge:

Canada has a large and growing infrastructure liability related to natural disasters. Engineering options can be harnessed, including stronger and stiffer buildings, fire-proof cladding, and large-capacity wastewater systems. New approaches are required to accelerate how these engineering innovations can be used everywhere.

Impact:

- **Community and Infrastructure Resilience to Climate-geological Long-term Effects (CIRCLE)** with centres in the UK, Indonesia, Cuba and Canada
- Centre for Multi-hazard Risk and Resilience established
- Canadian Severe Storms Lab created
- "Climate Ready Homes" incentives created with Cities of Calgary and Edmonton
- New building code models created for weather and climate-resilient buildings

Nature-Inspired Solutions for Carbon Transformation



HOW DO WE ACCELERATE THE DISCOVERY AND DEVELOPMENT OF NEW ENGINEERING SOLUTIONS FOR DIRECTLY CAPTURING CARBON DIOXIDE EMISSIONS FROM HUMAN SOURCES?

" For millennia, humans have relied upon a linear approach - something is used and then thrown out. While it seems novel to engineer a circular approach, in fact, that's how nature works. There's no such thing as waste in nature. WAFAR provided the funding needed to expand our research to real-world examples that change how carbon is used and recycled. "

NAOMI KLINGHOFFER



Team:



Christopher DeGroot | Lead
(Mechanical & Materials Engineering, Western University)



Naomi Klinghoffer
(Chemical & Biochemical Engineering, Western University)



Elizabeth Webb
(Earth Sciences, Western University)

Damien Batstone
(Australian Centre for Water & Environmental Biotechnology, Australia)

Paola Giudicianni
(Consiglio Nazionale delle Ricerche, Italy)

Mojtaba Jarrahi
(Université Paris-Saclay, France)

Challenge:

Direct capture of carbon dioxide from the atmosphere is a potential engineering solution, but current technologies are costly and capacity limited. New scalable and cost-effective ways to recycle carbon are needed that mimic nature's cyclical approach.

Impact:

- The "sustainable circular carbon economy" created and developed
- Government stakeholders engaged to connect social, economic, environmental factors required to implement carbon capture technologies
- New engineering breakthrough advanced how recycled carbon (biochar) can be used to enhance soil quality, remove pollutants from stormwater and for catalysis
- International **Carbon Solutions Consortium** established

Smart Cities and Communities



HOW DO WE ADVANCE DATA-DRIVEN TECHNOLOGIES IN CITIES AND COMMUNITIES WHILE PROTECTING PRIVACY, DATA AND CITIZENS' RIGHTS?

" WAFAR provided a unique opportunity to create new knowledge and funded, at-scale, community deployment of this know-how. WAFAR funding accelerated our plans to bridge proof-of-concept engineering to community validation while massively augmenting our outreach and impact. "

AYAN SADHU

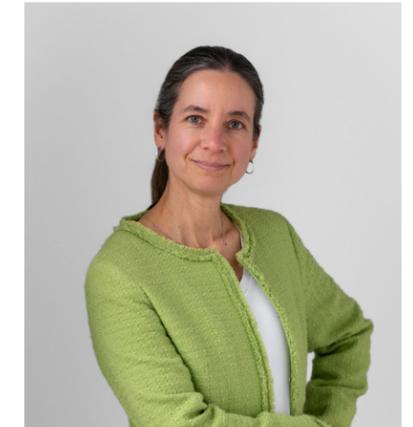
Team:



Ayan Sadhu | Lead
(Civil & Environmental Engineering, Western University)



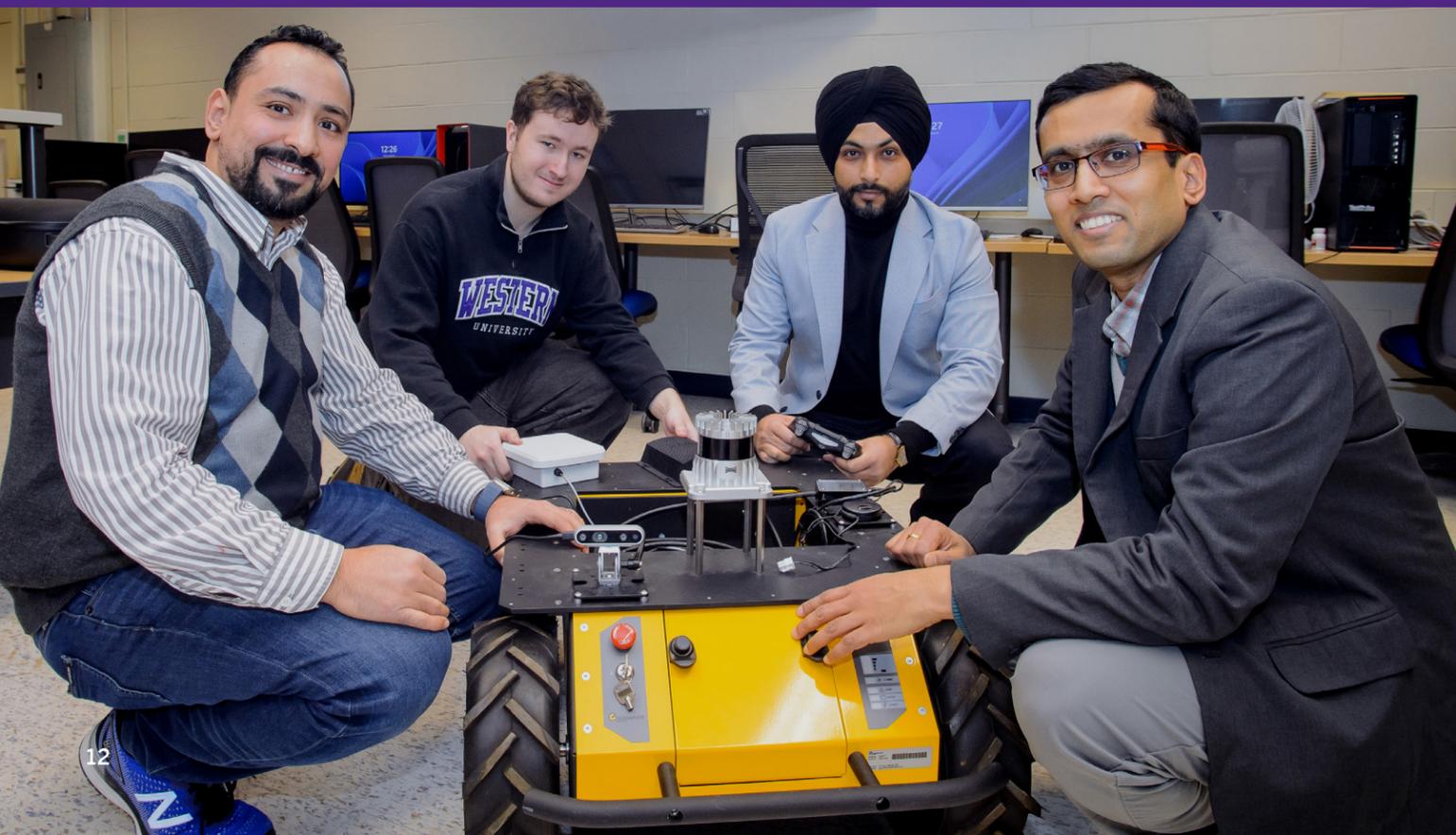
Abdallah Shami
(Electrical & Computer Engineering, Western University)



Anabel Quan-Haase
(Faculty of Information & Media Studies, Western University)

Jalel Ben-Othman
(Université Sorbonne Paris Nord, France)

Katharine Willis
(University of Plymouth, UK)



Challenge:

Smart Cities provide a sensor-embedded way for city planners and policy-makers to collect and make data-based decisions with up-to-date, accurate information. While cities like New York and Seoul implement data-sharing, sensors, cameras and connected devices, this presents risks and challenges to people, that require novel mitigation strategies.

Impact:

- State-of-the art data-to-decision tool created to change the future of cities
- Self-automation & sensing technologies discovered for urban environments
- "Smart City Engineering" undergraduate program established with partners in industry, government, engineering, ethics, information studies and law
- Nationally recognized, community-informed blueprint developed for ethical, technologically-driven Smart Cities
- Key partnerships established with the City of London, Ministry of Transportation, Conservation Authorities, Canada Masonry Design Centre and industry

Exploring Possibilities for Peace



HOW CAN THE INTERNATIONAL LEGAL SYSTEM RESPOND TO MODERN WAR AND CONFLICT AND MITIGATE EXPEDITED DECISION-MAKING IN WAR'S WAKE?

" We are witnessing a key moment in time when devastating global conflict and instability are expanding. WAFAR funding was the stimulus that compelled an elite, international team to craft novel solutions to the apparently intractable challenges facing peace in our century. WAFAR catalysed a global conversation among academics, artists, policy-makers and seasoned diplomats, to tackle this very human challenge. "

RYAN LISS

Team:



Ryan Liss | Lead
(Faculty of Law,
Western University)



Valerie Oosterveld
(Faculty of Law,
Western University)



Bipasha Baruah
(Faculty of Arts & Humanities,
Western University)

John T. Holmes
(Canada Ambassador to Philippines (ret.))

Sabine Nölke
(Canada Ambassador to Netherlands (ret.))

Masud Husain
(Canada Ambassador to United Arab
Emirates (ret.))

Uzma Rashid
(University for Peace, Costa Rica)



Challenge:

The world now sees threats to peace between countries on a scale not observed since WWII. Why has international law failed to secure the peace it promised? How can international law and communities secure modern peace?

Impact:

- Policies created to guide government response to conflict
- Academic-Ambassadorial exchange spearheaded
- Ground-breaking findings published about the role of technology, human rights and climate change, in peace and war



The WAFAR Promise in Action

Driving bold research, meaningful collaboration and solutions that spark global impact.

WAFAR's mission is to: **Catalyse world-class interdisciplinary research with global impact and deliver the WAFAR promise.**

- Provide the space, time and seed-funding required for globally partnered, interdisciplinary research, guided by the world's greatest minds and aimed at solving the world's biggest problems
- Prioritize challenges identified by local, national and international community for WAFAR solutions
- Publicize and communicate WAFAR research solutions to citizen stakeholders to accelerate national and international uptake
- Engage outstanding trainees, innovators and scholars in research who will advance Western's reputation as a world-leading research institution with global impact

The Next Five Years Start Now

A MESSAGE FROM OUR CHAIR



Mark Vandebosch
HBA, PhD

Professor Emeritus, Marketing
Ivey Business School
Western University

I have the distinct pleasure of chairing the International Advisory Board in this historic year for WAFAR. We launched new funding awards to stimulate interdisciplinary research including: IGNITE -connecting Western undergraduate students across campus as research leaders and innovators, MOBILIZE -boosting international collaborations, ACCELERATE -building global partnerships and IMPACT -partnered seed-funding for interdisciplinary, international programs aimed at tackling the world's most significant problems.

This suite of competitive awards are aimed at promoting thinking out-of-the-box and thinking across diverse expertise and experience. But thinking is not enough. WAFAR wants to ensure that thought-leaders have the tools to make change happen. The WAFAR interdisciplinary approach is intended to smash through echo chambers and bridge the large knowledge gaps in our local, national and international communities.

Our Board's overarching goal is to ensure that the space, time and collegial culture are created to ensure WAFAR encourages international voices across disciplines to achieve new, practicable solutions.

Big challenges, bold solutions, global impact is not just our tag-line, it is our promise to harness our strengths and make a better future possible for everyone.

External Advisory Board

Patricia Arocena, PhD, Toronto Canada

Kerry Buck, BA, Ottawa Canada

Gregory Downey, MD, FRCPC, Denver Colorado USA

Anita Gaffney, BA, MBA, Stratford Canada

Diane Goodman, LLB, Toronto Canada

Charles Irvin, PhD, Burlington Vermont USA

Derek Newton, PhD, Toronto Canada

Andrew Rae, BSc, MBA, Vancouver Canada

Mark Vandebosch, HBA, PhD, Stratford Canada

Carly Weeks, BA, Hamilton Canada

Community Advisory Council

Joel Aalbers, Partner, MNP LLP, Strathroy Canada

Ericka Ayala Ronson, CEO, Mission Services London, London Canada

Shaun Boe, Dean, Health Sciences, Western University

Kenneth Coley, Dean, Engineering, Western University

Mark J Daley, Chief AI Officer, Western University

Matt Davison, Dean, Science, Western University

Ali Earle, VP, CARFAX Canada, London Canada

Mohamed Khimji, Dean, Law, Western University

Lance Howard, LH Group Financial Services, London Canada

Alex Irving, Executive Director, Government Relations, Western University

Sophie Roland, Acting Dean, Music, Western University

Miriam Turnbull, President, Pro-Resp, London Canada



Accelerating Research for Impact

2020-2025 IMPACT REPORT



Western
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Advanced Research

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