

2017-18 / THE WATER INSTITUTE

# IMPACT REPORT




UNIVERSITY OF  
**WATERLOO**

the  
INSTITUTE





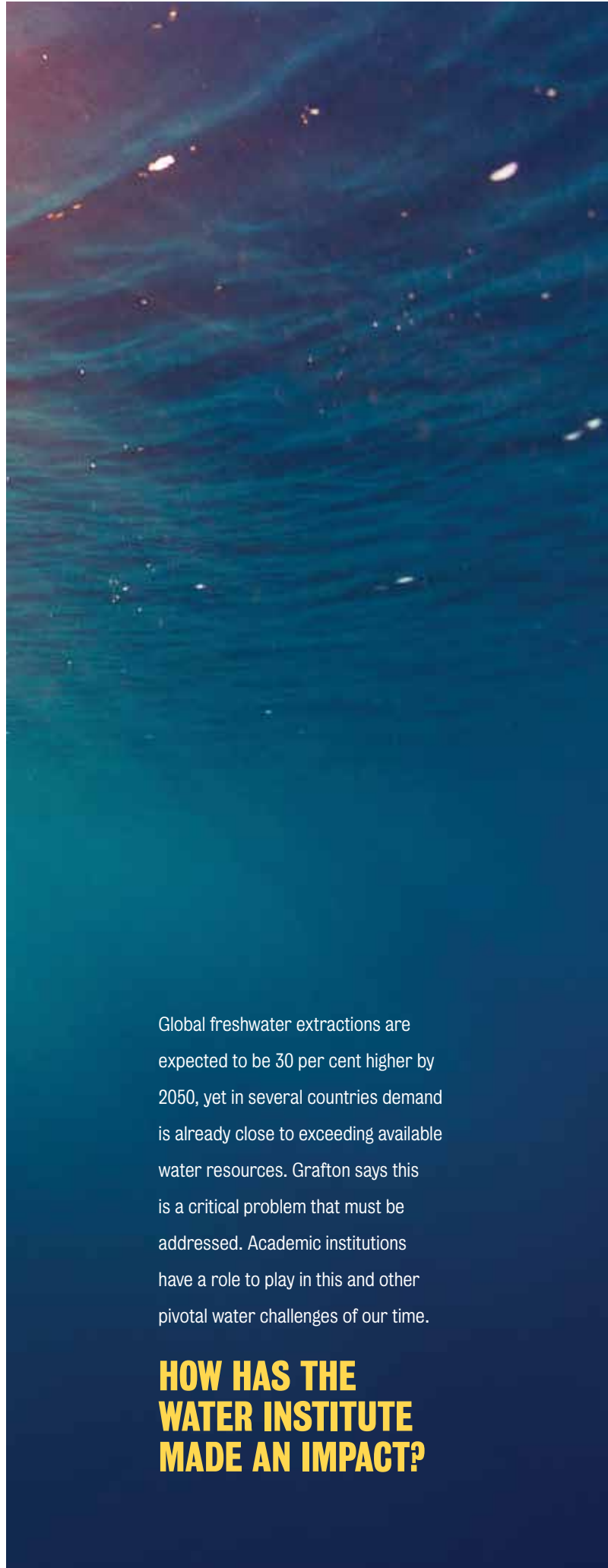


“The Water Institute is **crossing disciplinary divides** to develop the water research and policy agenda that is **critically needed** in the world today.”

**QUENTIN GRAFTON**

United Nations Educational,  
Scientific and Cultural  
Organization (UNESCO),  
Chair in Water Economics  
and Transboundary  
Water Governance

Professor, Australian  
National University



Global freshwater extractions are expected to be 30 per cent higher by 2050, yet in several countries demand is already close to exceeding available water resources. Grafton says this is a critical problem that must be addressed. Academic institutions have a role to play in this and other pivotal water challenges of our time.

**HOW HAS THE  
WATER INSTITUTE  
MADE AN IMPACT?**



# WATER DISREGARDS BOUNDARIES. AND SO MUST WE.

The Water Institute at the University of Waterloo is redefining what it means to research and study water at an academic institution. Our interdisciplinary approach is bridging divides that have historically kept academic disciplines apart. The resources we provide enable our 150-plus researchers and 300-plus graduate students to learn from and inspire one another. To devise innovative and sustainable water solutions, we encourage them to reach out beyond academia and co-create their research with interested stakeholders, industry and communities.

Together with our six partner faculties, we are making the discoveries and innovations of our researchers and their students accessible to anyone interested in them and able to act upon them. We are poised to make a difference, and ready to tackle the most complex water challenges of our time. In this report, you will see the impact we have made in 2017-18.

## **ROY BROUWER**

Executive Director  
the Water Institute

Professor, Faculty of Arts  
Department of Economics

**PROGRESS HIGHLIGHTS / PG 4**

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**RESEARCH IMPACT / PG 6**

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**GLOBAL IMPACT / PG 18**

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**EDUCATION IMPACT / PG 22**

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**FUTURE COMMITMENTS / PG 32**

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**ABOUT US / PG 34**



*“Water, and all of its complexities and global challenges, remains an issue close to the University of Waterloo. With its truly interdisciplinary approach, the Water Institute is at the forefront in tackling these challenges.”*

**FERIDUN  
HAMDULLAHPUR**

President and  
Vice-Chancellor

University of Waterloo

# PROGRESS HIGHLIGHTS

2017-18

**07.17**

## **HIRE KNOWLEDGE MOBILIZATION SPECIALIST**

Supporting the Global Water Futures program, our new staff member begins working to connect researchers with end-users such as community members, companies, government officials and NGOs.

**09.17**

## **WATERLOO TEAMS WIN AQUAHACKING CHALLENGE**

The AquaHacking 2017: United for Lake Erie challenge is held in Waterloo in an exciting partnership between the Water Institute and the de Gaspé Beaubien Foundation. Winning Waterloo teams are Blue Lion Labs (formerly SIM Labs), PolyGone and EMAGIN. See pg 28.

**09.17**

## **48 WATER STUDENTS BEGIN THEIR STUDIES**

A new incoming class of Collaborative Water Program graduate students begins their studies, joining their peers from all six Waterloo faculties.

**09.17**

## **DELEGATES JOIN US FROM 44 COUNTRIES**

We host Elsevier's 4th international water research conference "The Role of Water Technology Innovation in the Blue Economy."

**11.17**

## **PUBLISH *WATERRESEARCH* ISSUE 1**

Our new triannual scientific newsletter launches. It summarizes the cutting-edge research of our members and makes it accessible to researchers, practitioners and students.





## **01.18** **LAUNCH 9 NEW GLOBAL WATER FUTURES PROJECTS**

Nine of our members secure funding from the Global Water Futures program to lead interdisciplinary projects that will tackle environmental challenges facing cold regions in Canada.

## **02.18** **SECURE EUROPEAN UNION COLLABORATION**

We partner with Stockholm University, the University of Copenhagen and the University of Coimbra to design and secure the European Commission's Joint Programming Initiative, Legacies of Agricultural Pollutants (LEAP) project, to protect water resources under changing climate and land use.

## **03.18** **QES-AS OPENS DOOR FOR 30 YOUNG GLOBAL LEADERS**

We are selected to join the Canadian Queen Elizabeth II Diamond Jubilee Scholarships: Advanced Scholars (QES-AS) program. Students and researchers from low- and middle-income countries partner with us to develop solutions to complex national and global water challenges. See pg 20.

## **03.18** **NEW WATERCONNECTIONS SERIES BEGINS**

In coordination with University of Waterloo Corporate Research Partnerships, we begin hosting presentations by sought-after industry guests to link our researchers with exciting partnership and funding opportunities.

## **04.18** **AWARD \$141 THOUSAND IN SEED GRANTS**

Eight interdisciplinary projects led by Water Institute members receive our financial support. See pg 37.

## **05.18** **ATTEND WATER SECURITY WORKSHOP IN SÃO PAULO**

Invited by the Secretariat for the Environment of the State of São Paulo, Brazil, our executive director and Water Institute members participate in a workshop to address the major water challenges facing the state and a collaboration plan for future activities is forged. See pg 21.

## **05.18** **FORM NEW ADVISORY BOARD**

Our External Advisory Board is expanded and internationalized with six new members from leading water research organizations. See pg 39.



# RESEARCH

A hyperspectral camera flies toward Sunfish Lake in St. Agatha, Ontario, Canada to collect detailed water quality information. Read more about Claude Duguay's research on pg 12.

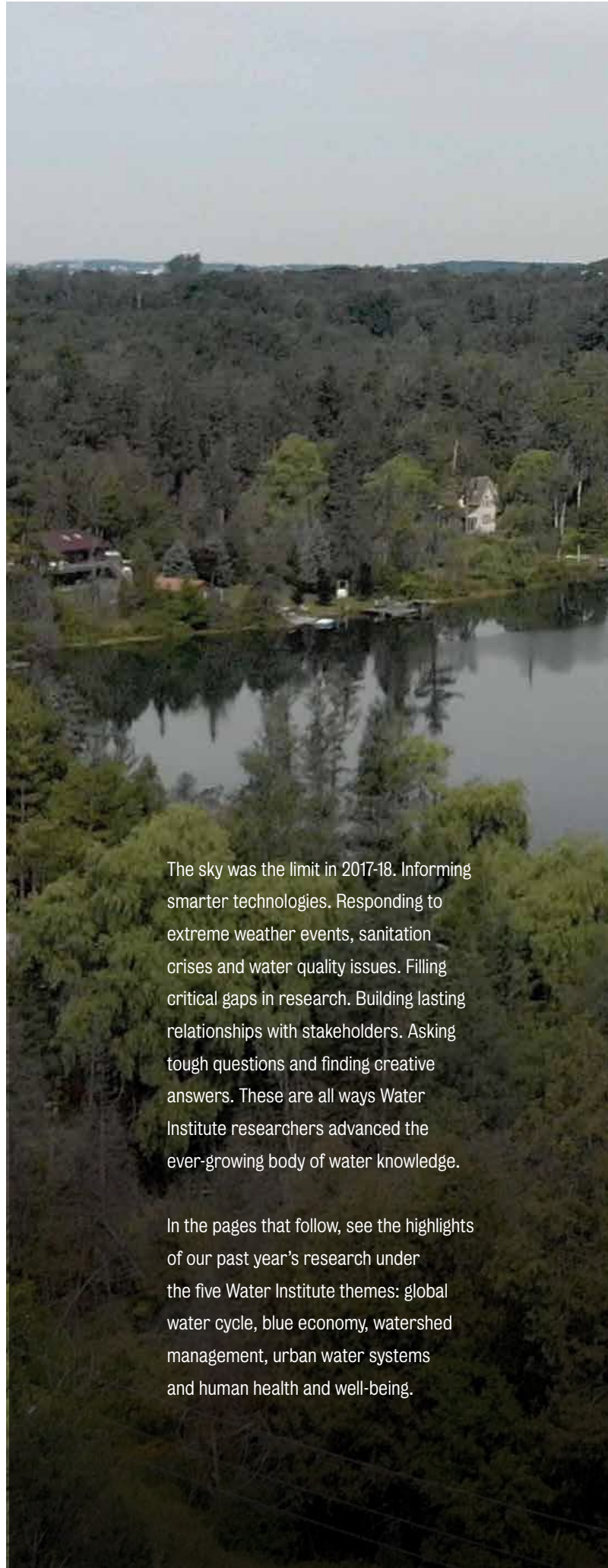
Watch a video about this project and read additional research impact stories at [uwaterloo.ca/water-institute-impact](http://uwaterloo.ca/water-institute-impact).





# IMPACT

**2017-18**



The sky was the limit in 2017-18. Informing smarter technologies. Responding to extreme weather events, sanitation crises and water quality issues. Filling critical gaps in research. Building lasting relationships with stakeholders. Asking tough questions and finding creative answers. These are all ways Water Institute researchers advanced the ever-growing body of water knowledge.

In the pages that follow, see the highlights of our past year's research under the five Water Institute themes: global water cycle, blue economy, watershed management, urban water systems and human health and well-being.

# GLOBAL WATER CYCLE

**With climate change, the water cycle is undergoing significant change. Our world will be impacted in both expected and unexpected ways. How will we prepare for and adapt to our new future?**

## **SHERRY SCHIFF**

Professor  
Faculty of Science

Department of  
Earth and Environmental  
Sciences



## **CANADIAN LAKES PROVIDE NEW INSIGHTS INTO ANCIENT OCEANS**

One way to investigate the mysteries of Earth's origins is to look for modern-day equivalents of ancient oceans and examine their chemical processes and biological diversity. The challenge, however, is that modern equivalents of ancient oceans are extremely rare. Until now, scientists have relied on only four lakes that share similarities with the Archean oceans of more than 2.5 billion years ago, most found in remote or ecologically sensitive locations. In a surprising discovery that used leading edge biological and isotopic tools, Sherry Schiff, Josh Neufeld and colleagues found that millions of lakes in Canada's Boreal Shield likely share similarities with the Archean oceans. Now, with so many potential lakes that serve as living laboratories for studying both current water issues and ancient life on Earth, a team of students are following up on a host of new research opportunities, including work on harmful algal blooms and greenhouse gas emissions.

*"Luckily," she says, "we had the flexibility to pursue some unexpected results with a multi-disciplinary team and cutting edge techniques."*



### KEVIN LAMB

Professor  
Faculty of Mathematics

Department of  
Applied Mathematics



## CHARTING THE MYSTERIOUS WAVES BENEATH THE SEA

The physics of waves on ocean surfaces have been broadly studied, but less is known about the internal waves that mix and brew beneath the surface. At times reaching five times the height of Niagara Falls, internal waves are fuelled by winds and gravitational forces.

Mathematician Kevin Lamb is conducting high-resolution numerical simulations to find patterns behind the often highly nonlinear behaviour of these waves. A better understanding of these waves will shed light on the role they play in large-scale ocean circulation and biological productivity.

*“The world is seeking insight into how the oceans work that will help us understand the impacts of climate change on the ocean,” he says. “My mathematical models could provide a piece of this puzzle.”*

### PHILIPPE VAN CAPPELLEN

Professor  
Faculty of Science

Department of Earth and  
Environmental Sciences

Canada Excellence  
Research Chair  
Laureate in Ecohydrology



## DAMS DRIVE GLOBAL ENVIRONMENTAL CHANGE

Within the next 15 years more than 90 per cent of the world’s rivers will become fragmented by at least one dam. It is known that human-constructed dams alter ecosystems on a local scale. However, it is less understood what impact they have on a global scale, particularly how they disrupt the movement of carbon between the land, water and atmosphere.

In a landmark study that appeared in *Nature Communications*, Philippe Van Cappellen and his graduate student Taylor Maavara found that reservoirs created by dams significantly impact the world’s carbon cycle, and consequently also the climate system, in ways that had not been previously accounted for. Using a novel modelling technique they discovered that nearly one-fifth of the organic carbon that moves from land to ocean is trapped by human-constructed dams. They also pinpointed Southeast Asia and South America, where many new dams are being built, as hotspots for the largest changes to be seen in the carbon export from continents to the ocean in the coming decades.

*“Dams don’t just have local environmental impacts. It’s clear they play a key role in the global carbon cycle and therefore Earth’s climate,” says Van Cappellen. “For more accurate climate predictions, we need to better understand the impact of reservoirs.”*  
– Science Daily, May 17, 2017



The Great  
Lakes contain

# 20%

of the world’s  
surface fresh water

ENVIRONMENT AND CLIMATE  
CHANGE CANADA

# BLUE ECONOMY

**There is vast potential for using water resources more sustainably for economic growth, improved livelihoods and ecosystem health. What technological innovations are needed? What behaviours need to change?**

**ELIZABETH ENGLISH**

Associate Professor  
Faculty of Engineering  
School of Architecture



## **BUOYANT HOUSES THAT RISE AND FALL WITH FLOOD WATERS**

When Elizabeth English first started telling people about her work, they laughed.

Imagine a house: it sits on the ground when it's dry, floats up in the event of a flood, and comes right back down when the water recedes. That's been English's vision for over a decade. And people aren't laughing anymore.

In the summer of 2017 alone, Hurricane Harvey in Texas, a monster monsoon in India and flash floods and landslides in the Sierra Leone drove people from their homes. The past year's events are not an anomaly, major storms are becoming more common and innovations like English's buoyant homes are just the kind of unconventional thinking that's needed in the blue economy.

As a leader in amphibious architecture, English brought some of the brightest minds in her field to the University of Waterloo in June 2017 as host of the second biennial International Conference on Amphibious Architecture, Design and Engineering.

*"With amphibious construction, water becomes your friend. The water gets to do what the water wants to do. It's not a confrontation with Mother Nature – it's an acceptance of Mother Nature."* The New Yorker, Jan. 3, 2018

**In the last 20 years, the 10 worst floods around the world have displaced over 1.1 billion people and resulted in damages of over**

**\$165 BILLION**



EM-DAT: THE INTERNATIONAL DISASTERS DATABASE



## ROB DE LOË

Professor  
Faculty of Environment  
School of Environment,  
Resources and  
Sustainability



## RE-THINKING THE BOUNDARIES OF WATER GOVERNANCE

In the water community, we often assume that people who aren't involved with water on a daily basis think it's important – like we do. We assume that non-water people understand what a “watershed” is. And we tend to think that we in the water community have the tools that are needed to solve water problems. But is this really true?

Rob de Loë thinks assumptions like these are getting in the way of our ability to deal with many long-standing water problems. He's seeing powerful new actors from sectors like energy and finance becoming involved in water governance, bringing with them quite different assumptions than the ones that water people hold. He and his team are rethinking the boundaries of water governance. They're challenging basic assumptions like the notion that the watershed is a useful boundary for organizing governance, or that we understand who the critical decision makers actually are.

*“Sometimes,” he says, “the most important decisions that affect water conditions inside a watershed are being made by people and organizations that are far removed from it – people who never come to water meetings or participate in water governance. My goal is to find practical ways to rethink how we organize water governance so we can make better progress on solving our water problems.”*

## HORATIU RUS

Associate Professor  
Faculty of Arts  
Departments of  
Economics and  
Political Sciences



## TIGHTER WATER REGULATIONS SPUR INNOVATION

Stricter water regulations have environmental benefits. Drinking water quality can be improved, water pollution reduced and resilience to extreme weather events bolstered. But those who must subsequently invest in technological upgrades in order to comply can often see these regulations through the narrow lens of short-term economic setback.

Horatiu Rus and his graduate student Hongxiu Li have found these regulations may actually benefit the economy in the long-term; stricter water regulations, in fact, stimulate technological innovation. New markets open up for better and cheaper water-related technologies, thus reducing the costs for those who must comply.

*“Induced technological innovation,” he says, “is an added benefit of regulating the quality and quantity of water, beyond the obvious environmental benefits. Such technological progress in turn has conservation and direct economic benefits.”*

# WATERSHED MANAGEMENT

**As rain falls and snow melts, water flows over land and seeps into the ground, taking nutrients and other potential pollutants along with it. How do we get the balance right between land use and water quality?**

## **CLAUDE DUGUAY**

Professor  
Faculty of Environment

Department of Geography  
and Environmental  
Management



## **DRONES AND SATELLITES: A SMART WATERSHED NETWORK TAKES TO THE SKY**

Canada's water resources span an enormous range in geography, climate and ecosystems. Increasing threats to water quantity and quality from climate change, urbanization and resource development require a transformation in how environmental data is collected, integrated, analyzed and communicated.

Water managers, decision makers and researchers are seeking more advanced tools to help them effectively diagnose, predict and adapt to change. Responding to this need, Claude Duguay and his team are working with industry and end-users to build and test emerging technologies such as drones and sensors which will withstand sub-zero temperatures, and a microsatellite to collect data on water quality and quantity. The data collected from these tools will collectively feed into a "smart" watershed network to deliver an enormous amount of near real-time data, allowing for a comprehensive picture of lake, river and watershed health to be created.

*"We have spent months in the field testing these technologies with input from our industry partners and will continue to do so until we get it right," he says. "These technologies will transform the way we collect data for water research and help us make informed decisions."*



### DAVID BLOWES

Professor  
Faculty of Science

Department of Earth and  
Environmental Sciences



## PHOSPHEX™ USES STEEL BY-PRODUCT TO CLEAN WATER

When phosphorus from land-based human activities, such as the application of fertilizers to farmers' fields, ends up in our waterways it can have detrimental effects. Algae grows faster than ecosystems can handle, reducing the quality of drinking water and depleting the oxygen that fish and aquatic life need to survive.

The Groundwater Geochemistry and Remediation Research Group, led by David Blowes and Carol Ptacek, has been perfecting its Phosphex™ technology over the past two decades. It is an adaptable water-treatment system that uniquely uses slag, a by-product of the steel industry, to effectively and inexpensively remove phosphorus.

Among the top technologies for phosphorous removal in the world, Phosphex™ was one of 10 teams from around the world selected to advance to the Pilot Stage of the George Barley Water Prize in 2017. Teams advancing to the Grand Challenge will be announced in late-2018.

*"Phosphex™ helps to solve a serious and complicated water pollution challenge," he says, "and it is sustainable because it recycles waste materials."*

### KIM VAN METER

Postdoctoral Fellow  
Faculty of Science

Department of Earth and  
Environmental Sciences



## LAND-USE LEGACIES CREATE TIME LAGS TO WATER QUALITY IMPROVEMENTS

Over the last century, it has become commonplace for farmers to apply nitrogen and phosphorus fertilizers to increase crop yields and feed a growing world population. The environmental effects of these fertilizers, however, have been severe, with high nitrate levels in groundwater threatening human health, and increased nutrient loading in lakes, streams and coastal waters leading to overgrowths of algae and disruption of aquatic ecosystems.

Kim Van Meter has found that even though we have tried for decades to reduce nutrient loading to streams and groundwater, with billions of dollars spent, we are not seeing the expected decreases in stream nutrient loads. Her work shows that improvements in water quality have been slow to come due to large amounts of nitrogen and phosphorus that have accumulated in soil and groundwater – legacy nutrients – that may continue to pollute our rivers even after farmers have reduced fertilizer use or improved management.

*"We hypothesize that it may take decades to achieve the desired improvements in water quality," she says. "These time lags caused by legacy nutrients must be taken into account when setting policy goals and when considering the long-term cost-benefits of implementing conservation measures."*

Globally, the number of lakes with harmful algal blooms will increase by at least

**20%**  
**BY 2050**



UNESCO

# URBAN WATER SYSTEMS

**Cities need clean water in sufficient amounts to thrive. In both high- and low-income countries, unique challenges persist. What new technologies and approaches are on the horizon? How can research inform them?**

## MICHAEL TAM

Professor  
Faculty of Engineering

Department of  
Chemical Engineering



## CELLULOSE NANOMATERIALS A PROMISING SUSTAINABLE OPTION FOR WATER AND WASTEWATER TREATMENT

Conventional water and wastewater treatment processes, no matter how efficient, have a large carbon footprint.

Michael Tam is breaking new ground and exploring how cellulose nanomaterials – those derived from wood, plants, algae and bacteria – can be used to make treatment facilities more sustainable. The most abundant biopolymers on the planet, these nanomaterials are widely available and offer many desirable properties over materials used in conventional water treatment systems. It is a challenge, he says, that materials scientists, chemists and chemical engineers need to work on together, and these multi-disciplinary efforts are reflected in the diversity of experts who work in his lab.

*“Current research,” he says, “almost exclusively focuses on the development of the nanomaterials, and not on their scalability of water treatment processes. We are working directly with industry and strategic countries around the world to develop innovative solutions that will impact society in a positive way.”*



# 82%

of Canadian households  
are serviced by municipal  
wastewater treatment

STATISTICS CANADA

## MARK SERVOS

Professor  
Faculty of Sciences

Department of Biology

Canada Research  
Chair in Water  
Quality Protection



## WASTEWATER UPGRADES MEAN FEWER INTERSEX FISH IN GRAND RIVER

The Region of Waterloo's Kitchener Wastewater Treatment Plant has undergone a series of major upgrades in the last few years to improve water quality in the Grand River. Studies by biologist Mark Servos have helped the Region inform and validate these investments. The upgrades, he found, dramatically improved both water quality and fish health across the watershed.

Servos had previously made the disturbing discovery that trace contaminants in poorly treated wastewater, such as the estrogen from birth control pills and chemicals that mimic natural hormones, caused severe feminization of male fish in the Grand River. Recent treatment plant upgrades have fortuitously diminished this problem.

*"Considering the massive costs to upgrade wastewater infrastructure across the country," he says, "it is reassuring to know that these investments are making a difference and having co-benefits that were not fully anticipated."*

## SIGRID PELDSZUS

Research Associate  
Professor  
Faculty of Engineering

Department of Civil  
and Environmental  
Engineering



## MODELLING SHOWS DRINKING WATER TREATMENT PLANTS CAN HANDLE CANNABIS

With cannabis becoming legal in Canada, municipalities are thinking ahead. They are asking if their drinking water treatment plants are equipped to handle cannabis' active ingredients that may enter rivers and lakes used for drinking water production via sewage discharge. To keep tetrahydrocannabinol (THC) and cannabidiol (CBD) from entering our drinking water, they have turned to Sigrid Peldszus for insight.

Using modelling software, Peldszus and graduate student Sabrina Bedjera, together with Walkerton Clean Water Centre scientist Xiaohui Jin, were able to share a good news story. They looked at drinking water treatment plants on the Grand River and Lake Ontario and found that ozonation, a widely used water treatment method, can in fact degrade THC and CBD very efficiently. When ozonation is used in the treatment process, she says it is unlikely that these active ingredients will reach treated drinking water.

*"Municipalities," she says, "are vigilant about the need to prevent contaminants such as pesticides and pharmaceuticals from ending up in our drinking water, so it is natural they are concerned about cannabis as well."*

# HUMAN HEALTH AND WELL-BEING

**Water is fundamental to human health and a key social justice issue. Developing countries and Indigenous communities face unique challenges that affect their health and livelihoods. How can researchers partner with affected communities to find viable and lasting solutions?**

## HEIDI SWANSON

Associate Professor  
Faculty of Science  
Department of Biology



## WORKING WITH INUIT TO UNDERSTAND AND REVIVE DWINDLING FISHERIES

Fish can become stranded in Nunavut rivers as climate change leads to record warming and slowing river flows.

Inuit who rely on Arctic char from the Coppermine River for subsistence asked Heidi Swanson why their supply was diminishing, and what could be done. Responding to their concerns, Swanson and her team are working side-by-side with local fishers, the Department of Fisheries and Oceans, and the Government of Nunavut to identify streams used by migrating fish that can be restored to increase fish passage.

A restoration plan will follow and locals will be trained in science monitoring techniques that, when combined with their traditional knowledge, can be used to ensure fish remain plentiful into the future.

*“Food security, as many people know, is really tough in the Canadian Arctic and fish is a major source of food. People are really worried about Arctic char. We really want to get a handle on what these char are doing so that we can better manage them as we go into future scenarios of climate change and resource development.”* CBC Radio International, May 12, 2018



**CRAIG JANES**

Professor  
Faculty of Applied  
Health Science

School of Public  
Health and  
Health Systems



**USING GIS AND SATELLITES TO IMPROVE HEALTH RESPONSES IN ZAMBIA**

Near-real-time flood mapping has the potential to empower public health officials to plan and co-ordinate essential health care and public health services more effectively and efficiently.

Medical anthropologist Craig Janes and his colleagues are using an open-access geographic information system and a satellite imaging system to better predict floods, identify and respond to malaria hotspots, and to generally improve the public health response in the Western Province of Zambia.

*“In the new global health environment,” he says, “we are faced with critical and contentious policy questions and decisions about how health services can best be expanded using these newly available resources.”*

**SUSAN ELLIOTT**

Professor  
Faculty of Environment

Department of Geography  
and Environmental  
Management



**EMPOWERING WOMEN AND GIRLS THROUGH SAFE WATER AND SANITATION**

Billions of people lack access to safely managed water supplies and sanitation facilities, according to a United Nations report on its Sustainable Development Goals (SDGs) that provides a global blueprint for dignity, peace and prosperity for people and the planet.

Working actively towards achieving SDG 6: “Ensure availability and sustainable management of water and sanitation for all,” is medical geographer Susan Elliott. Most recently, she has tackled an understudied area: the psychosocial relationship between poor access to water and sanitation and health and well-being in countries such as Kenya, Uganda and Ghana. The work confirmed that various stressors, such as unsafe or distant water sources, or inadequate or unsafe sanitation facilities, caused negative psychosocial outcomes such as distress.

*“As the global community begins to take stock of SDG interventions in the coming years,” she says, “policy-makers and practitioners must address some of the key social and cultural dimensions that influence access and use of water and sanitation facilities, particularly among women and girls.”*

**6 IN 10**

UNITED NATIONS

people lack access to safely managed sanitation facilities







Queen Elizabeth Scholar Sajida Awan in a Pakistani village conducting interviews with local farmers. Read more about the QES-AS program on pg. 20.





# IMPACT

**2017-18**

We visit our partners in their home countries and create opportunities for them to join us here at the Water Institute. In the pages that follow, watch our water drop make its way across the map.



# BUILDING BRIDGES WITH LEADING INTERNATIONAL WATER PARTNERS

**UNIVERSITY OF WATERLOO**

**USA**

Michigan State University

**NETHERLANDS**

IHE Delft Institute for Water Education  
Delft University of Technology

**FRANCE**

Université de Bordeaux

**ISRAEL**

Technion – Israel  
Institute of Technology

**UGANDA**

Uganda Christian University

**BRAZIL**

University of São Paulo

## FRANCE

### University of Bordeaux

The Water Institute and the University of Bordeaux have been collaborating since 2014, when the Water Institute convened a workshop in Waterloo with Bordeaux researchers to explore potential areas of collaboration. In 2016, 10 Water Institute researchers, led by the Institute’s executive director, visited the LabEx COTE Center of Excellence at the University of Bordeaux to participate in a follow-up workshop and explore the possibility of setting up joint interdisciplinary research programs. An important outcome of the workshop was the identification of specific joint Water Institute-LabEx COTE research clusters, each of which anticipated applying for project funding to initiate new activities. In 2017, Water Institute graduate students participated in LabEx COTE’s interdisciplinary summer school on weak signals and emerging issues in ecological transition. In early 2018, a group of Bordeaux faculty visited Waterloo again to work on a water research proposal, which will be submitted for funding. Furthermore, Water Institute member and associate professor in the Department of Economics, Alain Nimubona, was appointed as a visiting Bordeaux professor.

## COMMONWEALTH

### Queen Elizabeth Scholars – Advanced Scholars

The Canadian Queen Elizabeth II Diamond Jubilee Scholarships: Advanced Scholars (QES-AS) program is a Canadian initiative that supports doctoral researchers, post-doctoral fellows, and early career researchers from Canada and low- and middle-income countries in developing solutions to complex national and global challenges. In 2018, the Water Institute secured the QES-AS Water Security as a Foundation for Healthy Communities and Sustainable Livelihoods project in partnership with McMaster University, the Kenya Medical Research Institute, Uganda Christian University, University of Zambia, and the United Nations Development Programme (UNDP), Small Grants Programme in Pakistan. The objective of the project, which will train some 30 young researchers, is to increase local water resources management capacity in support of 1) climate-smart agricultural for food security, 2) climate-proof public health services under increasingly severe drought and flood conditions, and 3) safe water supply and sanitation facilities to improve the health status of mothers and infants.

*“There are some amazingly bright people in the world, with tremendous capacity, who simply lack the resources to pursue education. The QES-AS program is an amazing opportunity to build on this capacity,” said Susan Elliott, co-investigator and University of Waterloo professor in the Department of Geography and Environmental Management. “This program is their chance to make a difference in their home country and beyond.”*



**GERMANY**  
Helmholtz Centre for  
Environmental Research – UFZ

**SWITZERLAND**  
Swiss Federal Institute of  
Aquatic Science and Technology

**PAKISTAN**  
United Nations Development  
Programme (UNDP), Global  
Environment Facility, Small  
Grants Programme

**CHINA**  
Capital Normal University  
China University of Geosciences  
Chinese Research Academy of Environmental Sciences  
Hohai University  
Wuhan University  
Southwest University

**KENYA**  
Kenya Medical Research Institute

**SINGAPORE**  
National University of Singapore  
Nanyang Technological University

**ZAMBIA**  
University of Zambia

**AUSTRALIA**  
University of New South Wales

## **BRAZIL**

### **Water Security in the State of São Paulo**

In 2014, the city of São Paulo nearly ran out of water, while drought, deforestation, and urbanization continue to pressure the state’s water supplies. In 2018, a Water Institute delegation was invited by the Secretariat for the Environment of the State of São Paulo and its research institutes to participate in a three day workshop to address and discuss the major water challenges facing the state, and the metropolitan area where more than 20 million people live. In 2018-19, the Water Institute will work with the Secretariat to develop a comprehensive, collaborative work plan to investigate priority water security issues to inform water policy and decision-making. A delegation from the University of São Paulo and the State research institutes will visit the Water Institute in late-2018 to continue collaboration and action.

## **CHINA**

### **Collaboration for Water Security**

The Water Institute and its faculty members are collaborating with partners in China in education and research activities to address various water security issues. Since 2014, the Water Institute has partnered with the Chinese Research Academy of Environmental Sciences (CRAES), China’s largest environmental research institute, in several joint activities. In 2017-18, the Water Institute executive director was appointed to their International Scientific Advisory Committee, two Water Institute delegations visited them to further joint research programs, and a Waterloo student interned there. In addition, the Water Institute partnered with Hohai University on a new “global change and water cycle” international laboratory, and partnered with Southwest University on a new “watershed and lake management” international laboratory and the second China-Canada workshop on plateau lakes.





# EDUCATION

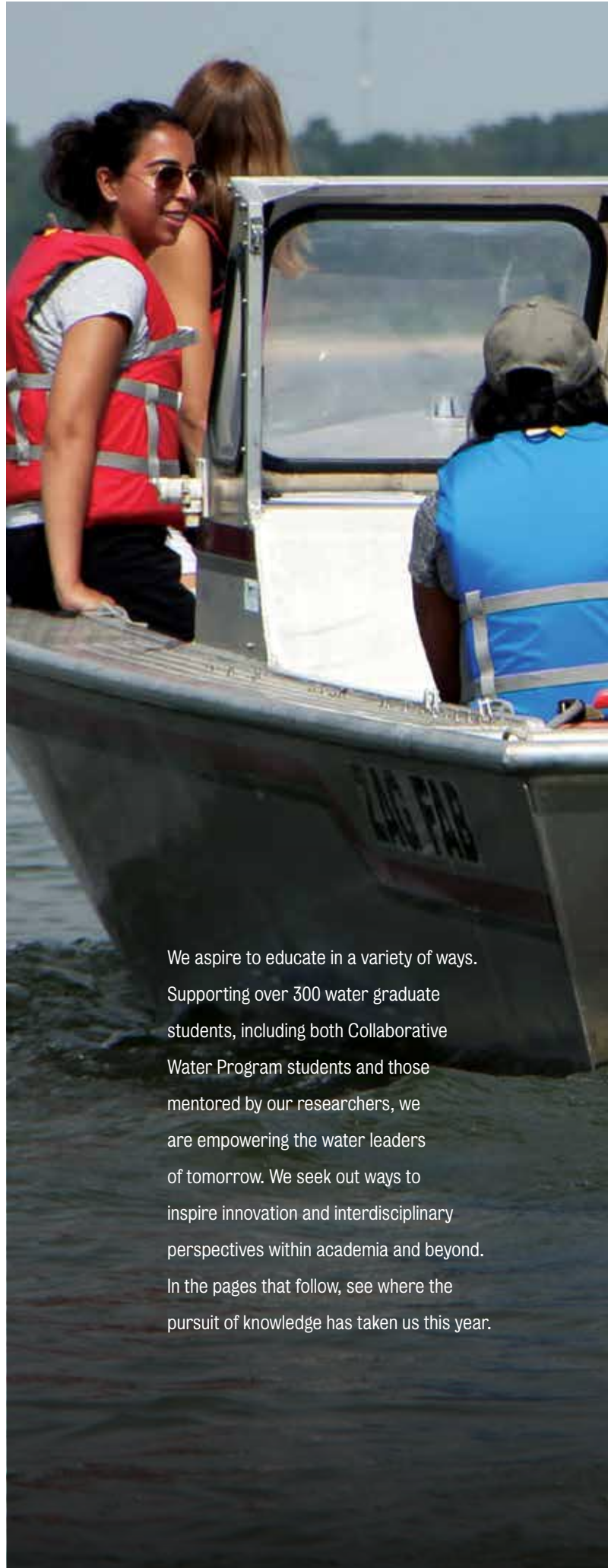
Collaborative Water Program students on Belwood Lake in Fergus, Ontario during their annual interdisciplinary field course. Read how this course and other aspects of the program have helped catalyze their careers on pg 24.





# IMPACT

2017-18



We aspire to educate in a variety of ways. Supporting over 300 water graduate students, including both Collaborative Water Program students and those mentored by our researchers, we are empowering the water leaders of tomorrow. We seek out ways to inspire innovation and interdisciplinary perspectives within academia and beyond. In the pages that follow, see where the pursuit of knowledge has taken us this year.

# LEARNING TO BREAK BOUNDARIES

**The Collaborative Water Program takes you outside your comfort zone, where anything is possible.**

Students are trained as experts in their respective fields, but they also learn to break beyond the confines of traditional academic silos. They learn to think broadly and communicate across disciplines – essential skills for addressing the complex water challenges of our time. Supported by the Water Institute, this program is jointly offered by 11 departments and schools from all six Waterloo faculties.

*The Collaborative Water Program is a flagship example in Canada, and around the world, of a truly interdisciplinary water graduate program.*

**ROB DE LOË**

Director, Collaborative Water Program

Professor, Faculty of Environment, School of Environment, Resources and Sustainability







**DANIELLE  
LINDAMOOD**

At left in photo above

MES candidate  
in Sustainability  
Management (Water)

Faculty of Environment

*The Collaborative Water Program not only helped me form a deeper appreciation for the importance of my own expertise, but it also enabled me to broaden my water knowledge, refine my ability to communicate across disciplines, and ultimately understand the dire need for collaborative work on water issues.*

As a graduate student, Danielle Lindamood spent eight months in India – first for her thesis, then for a collaborative learning experience with Waterlution, and finally to capture stories about the ways water connects humans and the environment for a documentary project. Her time in India, matched with the interdisciplinary lens provided by the Collaborative Water Program, inspired her to launch Girls Gone Water – an online platform that combines storytelling and visual media to elevate the powerful work of women around the world to better understand, support, appreciate and protect our water resources.

# INTERDISCIPLINARY WATER LEADERS

**ELAINE HO**

PhD candidate in  
Social and Ecological  
Sustainability (Water)

Faculty of  
Environment



*I cannot stress enough how important this program is and I often take pride in letting others everywhere know about it. Working with students from many other disciplines has challenged many of my perspectives and has been a big contributor to my growth as an individual, professional and academic.*

*It is often difficult to change your mindset from the perspectives of your undergraduate degree, particularly coming from engineering. However, by working so closely with other disciplines and problem solving together, I really began to open my eyes to other points of views and value systems.*

**CHRIS  
MUIRHEAD**

MASc candidate in Civil  
Engineering (Water)

Faculty of Engineering







**LAURA CHANDLER**

MMath candidate in Applied Mathematics (Water)

Faculty of Mathematics

*In my research, I had often struggled to see how my work relates to the real world and what sort of impacts I can make from within my field. In this program I made valuable connections with students and professors from a wide variety of disciplines and got a closer look at the way each of our research areas are connected.*

*The Water 602 course gave me the opportunity to travel through the Grand River watershed, talking with professors, water resource managers, water practitioners and NGOs about the different chemical, physical, biological and social aspects of the watershed.*

**MITCHELL KAY**

PhD candidate in Biology (Water)

Faculty of Science



**OVER 70**

faculty have supervised CWP students

**11** participating departments/schools

**48 STUDENTS**

enrolled in 2017-18: 13 more than the historical incoming average

**183** students enrolled since 2013

**9** RBC Fellowships since 2014

76 RBC scholarships since 2013 worth

**\$465K**

See pg 39 for list of this years' RBC scholarship recipients.



RBC Foundation

# EMPOWERING THE NEXT GENERATION OF WATER INNOVATORS

**Our student entrepreneurs may often pitch alone, but their leagues of supporters are the unseen platform on which they boldly stand.**

Thriving in Waterloo’s unique entrepreneurial ecosystem, water students don’t just have big ideas, they learn what it takes to put them into action. They talk to the right people and uncover the right resources. They develop and even commercialize the products that we may one day say helped solve some of the key water challenges of our time.

**JASON  
DEGLINT**

Co-founder,  
Blue Lion Labs

PhD candidate,  
Faculty of  
Engineering

Velocity  
Science

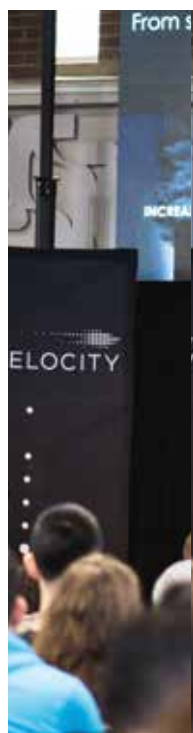
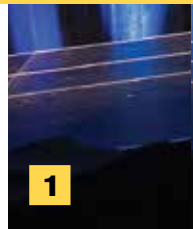
## 1. REVOLUTIONIZING TOXIC ALGAE IDENTIFICATION

Quick and accurate identification of potentially toxic cyanobacteria that cause algae blooms is key to effectively manage drinking water and recreational lakes. The current methods for identifying these bacteria are manual, tedious and time-consuming. Jason Deglint is harnessing the power of digital imaging and artificial intelligence by creating a device with the goal of testing for cyanobacteria on-site. Along with founding members Chao Jin and Alexander Wong, the vision of Blue Lion Labs is to allow treatment plants, governments and private organizations, as well as local communities, to be proactive instead of reactive at the onset of a bloom by providing valuable data to key decision makers.

*“I want to solve real-world problems – not theoretical ones – and toxic algae in our water is a big problem,” says Deglint. “Water quality affects everyone and it’s something we need to tackle.”*



The young entrepreneurs featured here took three of the five winning spots in the AquaHacking 2017: United for Lake Erie challenge. The competition was held in Waterloo as a result of an exciting three-year partnership between the Water Institute and the de Gaspé Beaubien Foundation.







**LAUREN SMITH**  
MES '17

Co-founder,  
PolyGone  
Technologies

Alumnus, Faculty  
of Environment

Collaborative  
Water Program

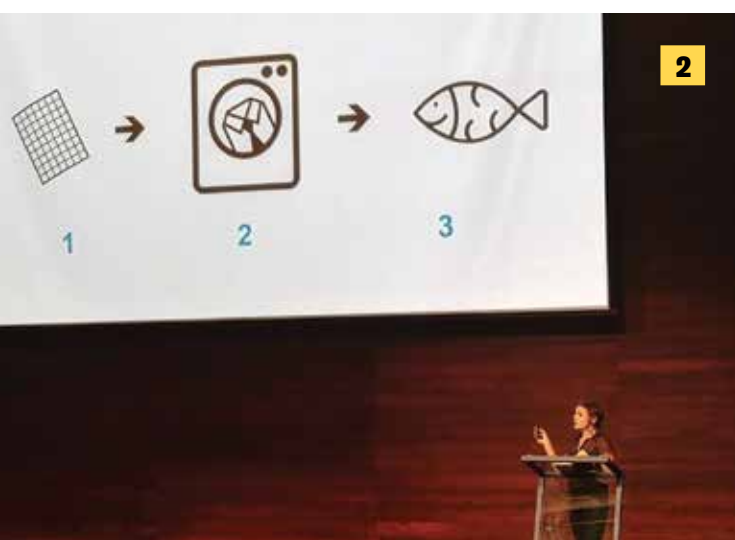
Velocity Science

## 2. TRAPPING MICROFIBRES IN YOUR WASHING MACHINE

One hundred times finer than a human hair, microfibrils from synthetic textiles are an invisible menace lurking in our water systems. Accounting for 94 per cent of microplastic pollution, they slip through washing machines and treatment systems and end up in waterways, accumulating toxins and carcinogens along the way. Fish consume them, and ultimately, so do we.

Lauren Smith's startup PolyGone Technologies, with the tag line "stop eating your dirty laundry," is quickly becoming one of the most talked about student water startups in Canada. Backed by multiple enthusiastic funding platforms, she's developing filtration technologies to keep microfibrils out of our water and food – starting with our washing machines.

She is also a strong advocate for female entrepreneurs: "Don't be scared to get your feet wet in tech or science of any kind," she says. "You can't win every pitch competition, not every meeting will go well, and you won't get along with everybody. You have to be determined to keep going."



**THOUHEED ABDUL GAFFOOR**  
MAsc '17

Co-founder  
EMAGIN

Alumnus  
Faculty of  
Engineering

Velocity Garage

## 3. USING ARTIFICIAL INTELLIGENCE TO PRESERVE WATER AND SAVE MONEY

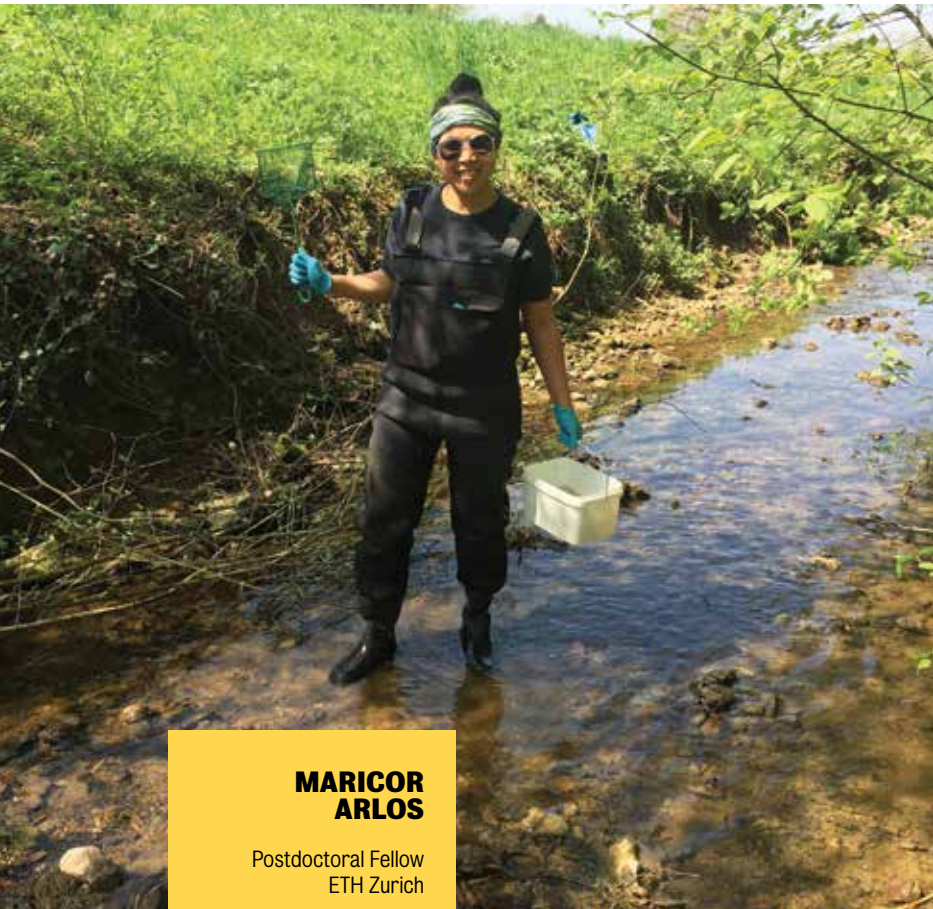
Humans make most of their decisions around how a city's water supply is managed, but now artificial intelligence-supported software can do it better – preserving water resources and saving money.

Thouheed Abdul Gaffoor is co-founder of EMAGIN, a startup that is helping water utilities become more efficient and resilient. EMAGIN's software works with sensors to offer facility operators more accurate and timely information and recommendations. During a storm, for instance, EMAGIN's software can allow operators to more effectively treat incoming wastewater and prevent overflows.

Water is the one of the last utilities to be digitized, says Gaffoor, likely because in Canada "we have the luxury of abundance." The company works with several U.S.-based companies and a few Canadian municipalities. By late 2018, EMAGIN expects to double in size and expand its work with utilities in Canada. Gaffoor says, "I'd like to see us grow in our own backyard."



# INSPIRING DIALOGUE



**MARICOR ARLOS**

Postdoctoral Fellow  
ETH Zurich

PhD Alumnus in  
Biology (Water),  
Faculty of Science,  
University of Waterloo

## WATERTALKS

Our WaterTalks not only provide an opportunity for students and professors to broaden their knowledge in water research, but they also provide an opportunity for international connections to be made. During one of our WaterTalks, graduate student Maricor Arlos connected with WaterTalk speaker professor Christian Stamm from the Swiss Federal Institute of Aquatic Science and Technology (Eawag).

“My PhD supervisor, Mark Servos, encouraged me to network with the Water Institute’s RBC Visiting Fellow and WaterTalk speaker Christian Stamm,” said Arlos. “Through discussions with Christian, I learned about ETH Zurich and Eawag, the quality of research produced at these institutions, their commitment to serve the public’s best interest, and their overall level of expertise. It wasn’t long after our discussions that I knew I wanted to study there.”

Arlos secured the Postdoctoral Fellowship at ETH Zurich where she currently works with Stamm on estimating the concentrations of micropollutants in Swiss rivers and predicting their effects on aquatic life.

## INTERNATIONAL WATER CONFERENCE

The Water Institute hosted Elsevier’s 4th international research conference: “The Role of Water Technology Innovation in the Blue Economy.” The renowned research conference brought delegates from 44 countries to Kitchener, Ontario, Canada. Water Institute members chaired sessions on water governance, technology innovation and resource recovery in wastewater.

## WORLD WATER DAY

The ninth annual World Water Day celebration at the University of Waterloo brought students, faculty and members of the public together to discuss and celebrate water research and action. Under the theme “Nature for Water,” participants explored nature-based solutions to the water challenges we face in the 21st century. The event was organized by the Water Institute and the Students of the Water Institute Graduate Section (SWIGS), in partnership with the Laurier Institute for Water Science.



# MAKING COMMUNITY CONNECTIONS

## CLIMATE CHANGE AND YOU

Middle school students in Toronto and Kitchener were invited to submit a poem, painting, essay, video or another chosen creative medium to express what climate change meant to them personally. The submissions were displayed on the Waterloo campus at the World Water Day event in March 2018. The Climate Change and You community outreach program was initiated by Students of the Water Institute Graduate Section (SWIGS), led by Civil Engineering (Water) PhD candidate and current SWIGS chair, Mark Ranjram.

*“Art can foster an emotional connection,” he says, “especially by the person doing the creating. It is one thing to write about the consequences of climate change, but it is wholly another thing to draw a picture which captures the consequences of it.”*

## SWIGS WATER BAR

A favourite among local event-goers is the Students of the Water Institute Graduate Section (SWIGS) water bar. The pop-up water education stand dubbed “WATER You Drinking?” helped encourage local youth to choose tap water over bottled water or sugary drinks. People were invited to taste-test water from unmarked jugs and choose which they preferred. The result? Tap water was often chosen, changing the common perception that bottled water always tastes better. The initiative also helped to amplify the Region of Waterloo’s Healthy Kids Community Challenge.

**800+**  
people attended  
the 2017-18  
WaterTalks



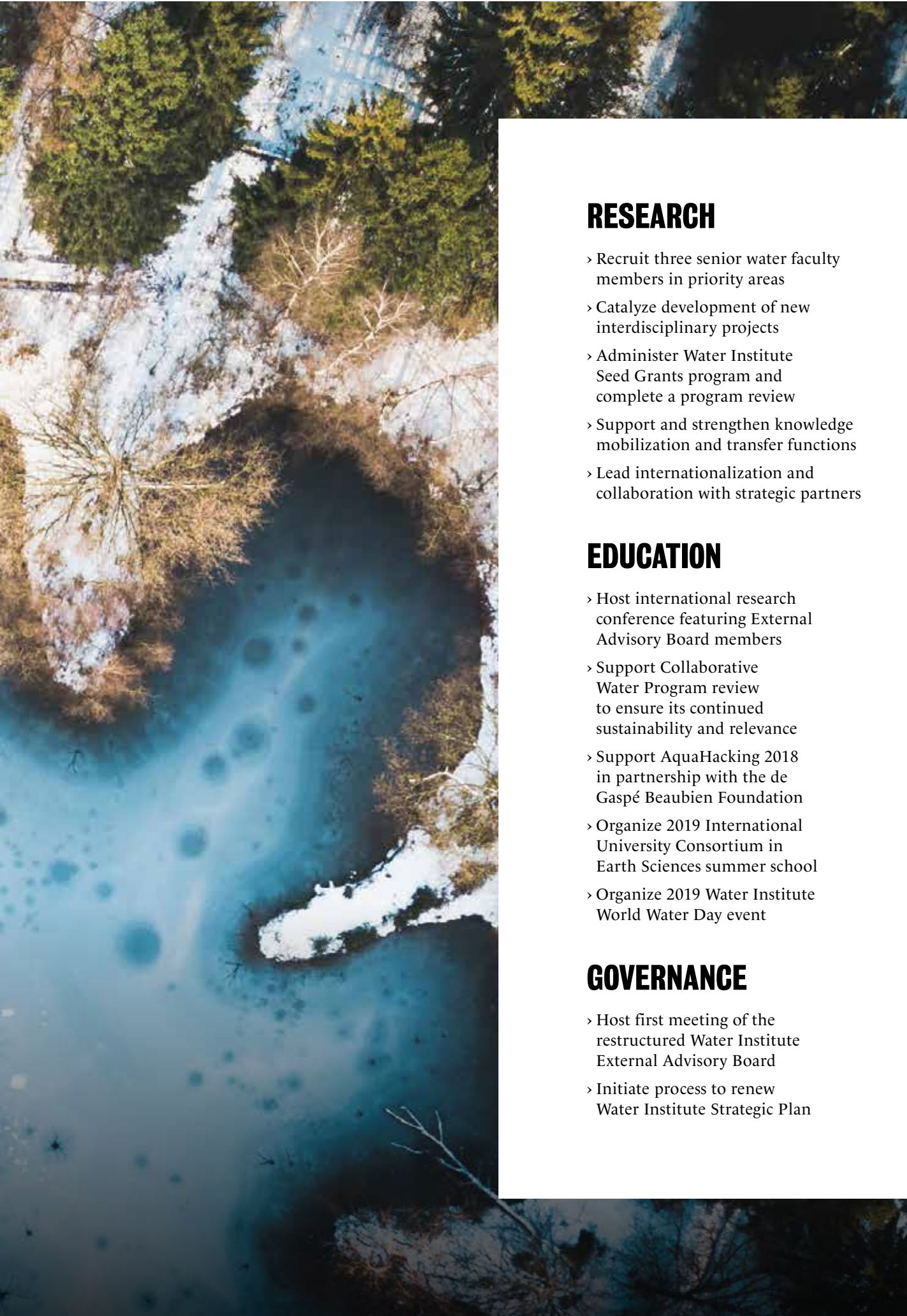


# FUTURE COMMITMENTS

The highlights of our priorities for 2018-19 as we continue moving ahead with our current 2014-19 Water Institute Strategic Plan.

**2017-18**





## RESEARCH

- › Recruit three senior water faculty members in priority areas
- › Catalyze development of new interdisciplinary projects
- › Administer Water Institute Seed Grants program and complete a program review
- › Support and strengthen knowledge mobilization and transfer functions
- › Lead internationalization and collaboration with strategic partners

## EDUCATION

- › Host international research conference featuring External Advisory Board members
- › Support Collaborative Water Program review to ensure its continued sustainability and relevance
- › Support AquaHacking 2018 in partnership with the de Gaspé Beaubien Foundation
- › Organize 2019 International University Consortium in Earth Sciences summer school
- › Organize 2019 Water Institute World Water Day event

## GOVERNANCE

- › Host first meeting of the restructured Water Institute External Advisory Board
- › Initiate process to renew Water Institute Strategic Plan

# ABOUT US

## WHO WE ARE

A primary objective of the Water Institute is to facilitate interdisciplinary research and education to address increasingly complex water issues.

*“Under the Water Institute’s leadership, water binds all University of Waterloo faculties together. Just as water underlies many of the United Nations Sustainable Development Goals, so too does Water Institute research transcend traditional academic silos. With its capacity to examine water issues from all angles, it stands at the forefront of research excellence and innovation.”*

**CHARMAINE DEAN**

Vice-President  
University Research  
University of Waterloo



### OUR PEOPLE

**150+** **6** faculties  
**FACULTY MEMBERS** **23** departments or schools

**300+**  
**GRADUATE STUDENTS**

**25**  
**RESEARCH CHAIRS**

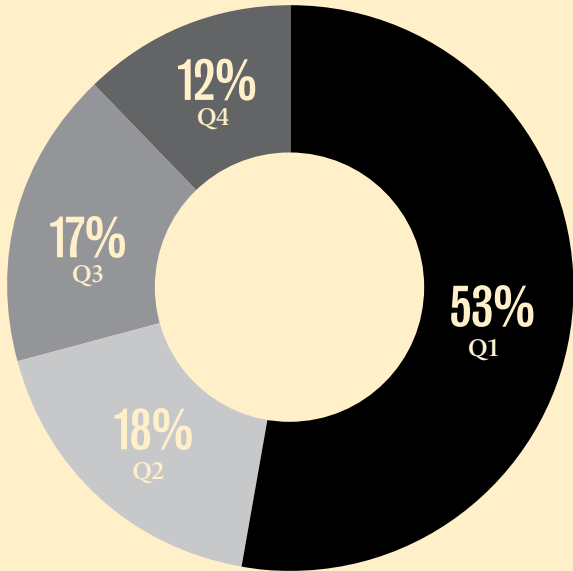
### SCHOLARLY OUTPUT

**1,500+**  
**PAPERS PUBLISHED**  
since 2009

**19,000+**  
**PAPERS CITED**  
since 2009



53% of papers by Water Institute researchers are in the top (Q1) journal quartile



SOURCE: TOTAL WATER INSTITUTE PUBLICATIONS FROM WEB OF SCIENCE, WATER RESOURCES JOURNALS FOR THE PERIOD 2010-17. QUANTILES BASED ON JOURNAL FIVE-YEAR IMPACT FACTORS.

RESEARCH FUNDING

**\$165+ MILLION**

since 2009

**800+ PEOPLE ATTENDED**

the 2017-18 WaterTalks

**SCHOLARLY TALKS**

**69 WATERTALKS** since 2010

**6 DISTINGUISHED LECTURES** since 2011

# INTERNATIONAL RANKINGS

**10th BEST**

water research institution in the world

LUX RESEARCH INC. TOP ACADEMICS AND INSTITUTIONS IN WATER RESEARCH, 2013

**20th MOST PROLIFIC**

water research institution in the world

STOCKHOLM INTERNATIONAL WATER INSTITUTE AND ELSEVIER, THE WATER AND FOOD NEXUS: TRENDS AND DEVELOPMENT OF THE RESEARCH LANDSCAPE, 2012

**26th IN THE WORLD**

for water research

SHANGHAIRANKING'S 2017 GLOBAL RANKING OF ACADEMIC SUBJECTS – WATER RESOURCES



# WHAT WE DO

The Water Institute provides the following support to its members:

## RESEARCH

- › Identify funding opportunities and secure incremental funding
- › Identify, introduce and support researchers with common areas of interest
- › Provide review and advice on research proposals
- › Identify partners and solicit letters of support for research projects
- › Provide in-kind support to research projects
- › Lead, manage and support new interdisciplinary research projects

## EDUCATION

- › Coordinate and support the Collaborative Water Program
- › Support and enable the Water Institute's graduate student chapter (SWIGS)

## PARTNERSHIPS

- › Cultivate industrial, governmental, civil society and other partnerships
- › Facilitate and support international collaborations and partnerships
- › Lead faculty delegations to other countries
- › Host academic delegations at Waterloo
- › Serve as a central point of contact

## KNOWLEDGE TRANSFER

- › Support and organize workshops, research symposia, WaterTalks and distinguished lectures
- › Promote and profile researchers and research impact through various communications activities
- › Facilitate and support media relations

# RESEARCH EXCELLENCE

During 2017-18, two Water Institute members received significant national honours, two members were awarded Canada Research Chairs and two received Lifetime Achievement Awards.

### PROFESSOR KEITH HIPEL

from the Department of Systems Design Engineering was named to the Order of Canada, Canada's highest civilian honour. He has a global reputation for pioneering contributions to environmental systems engineering and was specifically cited for "his extensive contributions to the field of environmental engineering and for his leadership within multiple academic and professional institutions."

### PROFESSOR DAVID BLOWES

from the Department of Earth and Environmental Sciences was elected as a Fellow of The Royal Society of Canada for his important contributions to the development of management practices for mine wastes and to the development of novel groundwater remediation technologies.

### PROFESSOR CHRISTINE DOW

from the Department of Geography and Environmental Management was awarded a Canada Research Chair in Glacier Hydrology and Ice Dynamics. Her research interests are focused on the development of subglacial hydrological networks and their impact on ice dynamics on a variety of spatial and temporal scales.

### PROFESSOR NORMAN ZHOU

from the Department of Mechanical and Mechatronics Engineering was awarded a Canada Research Chair for his work in developing advanced materials for novel joining and processing technologies. His research goal is to develop practical interconnection and assembly technologies of nano-devices.

### PROFESSOR DON COWAN

from the Cheriton School of Computer Science was honoured by CS-Can/Info-Can, the national organization of Canadian computer science departments, schools and faculties, with the 2017 Lifetime Achievement Award in Computer Science. This prestigious award recognizes outstanding and sustained achievement in research, teaching and service.

### PROFESSOR WILLIAM TAYLOR

from the Department of Biology was honoured by the International Association for Great Lakes Research (IAGLR) with its 2018 Lifetime Achievement Award. The award recognizes important and continued contributions to the field of Great Lakes research over a period of 20 years or more.





## CANADA RESEARCH CHAIRS

### DAVID BLOWES

Groundwater Remediation

### ZHONGWEI CHEN

Advanced Materials for Clean Energy

### JAMES CRAIG

Hydrologic Modelling and Analysis

### BRIAN DIXON

Fish and Environmental Immunology

### CHRISTINE DOW

Glacier Hydrology and Ice Dynamics

### FRANK GU

Nanotechnology Engineering

### LAURA HUG

Environmental Microbiology

### JANUSZ PAWLISZYN

New Analytical Methods and Technologies

### CAROLYN REN

Droplet Microfluidics and Lab-on-a-Chip Technology

### MARK SERVOS

Water Quality Protection

### MARIA STRACK

Ecosystems and Climate

### ALEXANDER WONG

Artificial Intelligence and Medical Imaging Systems

### JOHN YEOW

Micro and Nanodevices

### NORMAN ZHOU

Advanced Materials Joining and Processing

## NSERC INDUSTRIAL RESEARCH CHAIRS

### PETER HUCK

Water Treatment

### JANUSZ PAWLISZYN

New Analytical Methods and Technologies

## UNIVERSITY RESEARCH CHAIRS

### ROY BROUWER

Water Resources Economics

### PU CHEN

Nano-Biomaterials

### CLAUDE DUGUAY

Cryosphere and  
Hydrosphere from Space

### XIANSHE FENG

Membrane Science and Technology

### SHESHA JAYARAM

High Voltage Engineering

### JUEWEN LIU

Bionanotechnology and Interfaces

### DANIEL SCOTT

Global Change and Tourism

### HEIDI SWANSON

Freshwater Ecology

### MICHAEL TAM

Functional Colloids and Nanomaterials

### OLAF WEBER

Sustainable Finance

### NORMAN ZHOU

Microjoining

## CANADA EXCELLENCE RESEARCH CHAIR LAUREATE

### PHILIPPE VAN CAPPELLEN

Ecohydrology

# SEED GRANTS

Water Institute seed grants facilitate interaction with national and international authorities, and stimulate new interdisciplinary collaborations. Outputs and outcomes from Water Institute seed grants include new collaborations, major presentations, workshops and symposia, research proposals, journal publications, books and newly funded research projects.

## 2017-18 WATER INSTITUTE SEED GRANT RECIPIENTS

### ROY BROUWER, Economics

- › Informing investment decisions in Canada in drinking water and wastewater treatment technology to reduce environmental and human health risks of micropollutants

### SUSAN ELLIOTT, Geography and Environmental Management

- › WASH for resilient health systems in the Horn of Africa

### CHRIS FLETCHER, Geography and Environmental Management

- › Toward actionable science to predict snow and water availability in a changing climate

### LAURA HUG, Biology

- › Towards statistical tools to assess microbial communities in contaminated water systems

### HOMA KHEYROLLAH POUR, Earth and Environmental Sciences

- › Seasonal patterns of chlorophyll and temperature in lakes: Detection and attribution of climate change signal

### GEERTJE PRONK, Earth and Environmental Sciences

- › Upscaling approaches in watershed biogeochemical modelling

### CHRISTINA SMEATON, Earth and Environmental Sciences

- › Linking microbial bioenergetics and water resources: Turning theoretical advances into practical solutions

### MICHAEL WOOD, Environment, Enterprise and Development

- › Fostering Canada's blue economy through provincial and national bulk water pricing strategies

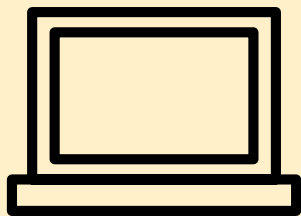


# WATERTALKS

The Water Institute  
WaterTalks lecture series  
provides an opportunity  
for students, faculty and  
the public to learn from,  
and to interact with,  
leading water experts  
from around the world.



Most WaterTalks are available  
for viewing on the Water  
Institute YouTube channel.



# 1,000+

people viewed

the 2016-18

WaterTalks online

## 2017-18 WATERTALKS

**NI-BAN CHANG**, Professor,  
University of Central Florida, U.S.A.

- > Machine learning in support of satellite remote sensing for water quality monitoring in eutrofied lakes

**JANET HERING**, Director, Eawag,  
Swiss Federal Institute of Aquatic  
Science and Technology, Switzerland

- > Linking Eawag's research to policy and practice

**SASCHA OSWALD**, Professor,  
University of Potsdam, Germany

- > Detailed monitoring of microplastic particles in an urban water course facilitated by a novel, powerful detection method – an approach for identifying dynamic inputs of microplastics

**STÅLE NAVRUD**, Professor,  
Norwegian University of Life  
Sciences, Norway

- > How to value marine and coastal ecosystem services for policy use

**MAX MAUER**, Head of Urban Water  
Management, Eawag and Professor,  
ETH Zurich, Switzerland

- > Data instead of concrete? Exploring the potential of digitization in urban drainage

**QUENTIN GRAFTON**, Professor,  
Australian National University,  
Australia (Water Institute RBC  
Distinguished Lecture)

- > Innovation, incentives and infrastructure in the blue economy

**GÜNTER BLÖSCHL**, Professor,  
TU Wien, Austria

- > Emerging outcomes from a cross-disciplinary doctoral programme on water resource systems

**ARNOLD HEEMINK**, Professor,  
Delft University of Technology,  
The Netherlands

- > Storm surge forecasting using data assimilation

**DIANE ORIHHEL**, Assistant Professor  
and **ALANA GREAVES**, Post-Doctoral  
Fellow, Queen's University

- > The importance of ecosystem-based ecotoxicology for advancing environmental policy, with special reference to Canadian Oil Sands development

**KEVIN BOYLE**, Professor,  
Virginia Tech, U.S.A.

- > From the Exxon Valdez oil spill to the BP Deep Horizon oil spill: A story of economic damages from major environmental contamination events

**JOHN HARTIG**, Refuge Manager,  
Detroit River International Refuge;  
Fullbright Canada Research Chair in  
Global Governance, Balsillie School  
of International Affairs

- > Bringing conservation to cities: lessons from building the Detroit River International Wildlife Refuge

**BARBARA SHERWOOD LOLLAR**,  
University Professor, University of  
Toronto

- > Exploration of the Earth's deep hydrogeosphere and subsurface microbial life

**PIET KLOPP**, Senior Investment  
Advisor, PGGM, The Netherlands

- > Water-related risks and opportunities: An institutional investor's perspective

**EMILY STANLEY**, Professor,  
University of Wisconsin, Madison, U.S.A.

- > Aquatic methane at small and large scales

**DANIEL MCLAUGHLIN**, Assistant  
Professor, Virginia Tech, U.S.A.

- > Wetland water storage: Drivers and functions at varying spatial scales

**JAY AUSTIN**, Professor,  
University of Minnesota, Duluth, U.S.A.

- > Winter conditions, ice, and climate change on Lake Superior

**SHARON MEGDAL**, Professor,  
University of Arizona, U.S.A.

- > Groundwater governance and management research: Connecting researchers and practitioners





# WATER SCHOLARSHIPS AND FELLOWSHIPS

Each year the Water Institute awards scholarships to graduate students studying in the Collaborative Water Program, and supports fellows who visit campus to contribute to the program. The scholarships and fellowships are generously supported through a gift from the RBC Foundation.

## 2017-18 RBC VISITING FELLOWS

**GÜNTER BLÖSCHL**, Professor, TU Wien, Austria

## 2017-18 RBC WATER SCHOLARSHIP RECIPIENTS

**XUANYE BAI**, PhD candidate, Civil and Environmental Engineering

**EMILY BARBER**, MSc candidate, Earth and Environmental Sciences

**MARIA BATTAGLIA**, MA candidate, Economics

**GENEVIEVE BROWN**, MASc candidate, Civil and Environmental Engineering

**MICHELLE BULLOUGH**, MArch candidate, Architecture

**PATRICK KING**, MASc candidate, Civil and Environmental Engineering

**RUOGU LIU**, MA candidate, Economics

**JASON McMILLAN**, MArch candidate, Architecture

**MWIMANENWA NJUNGU**, PhD candidate, Public Health and Health Systems

**MARK RANJRAM**, PhD candidate, Civil and Environmental Engineering

**GUNEET SANDHU**, MES candidate, Environment, Enterprise and Development

**HAMEET SINGH**, MES candidate, Environment, Enterprise and Development

**NIVETHA SRIKANTHAN**, MSc candidate, Biology

**TERESA TRAN**, MArch candidate, Architecture

**TAMARA VAN STADEN**, MSc candidate, Earth and Environmental Sciences

## STAFF AND GOVERNANCE

### WATER INSTITUTE MANAGEMENT AND ADMINISTRATION

**ROY BROUWER**, Executive Director

**KEVIN BOEHMER**, Managing Director

**ALLIE DUSOME**, Communications Officer

**AMY GEDDES**, Communications Officer

**NANCY GOUCHER**, Knowledge Mobilization Specialist

**MARY ANNE HARDY**, Administrative Officer

### GOVERNANCE

#### STRATEGIC PLANNING COMMITTEE

**ROY BROUWER**, Executive Director, Water Institute (Chair)

**CHARMAINE DEAN**, Vice President, University Research

**CRAIG JANES**, Faculty of Applied Health Sciences

**MARGARET INSLEY**, Faculty of Arts

**JAMES CRAIG**, Faculty of Engineering

**SUSAN ELLIOTT**, Faculty of Environment

**KEVIN LAMB**, Faculty of Mathematics

**HEIDI SWANSON**, Faculty of Science

**MARK RANJRAM**, Students of the Water Institute, Graduate Section Chair

**ROB DE LOË**, Collaborative Water Program Director

**PHILIPPE VAN CAPPELLEN**, Faculty member-at-large

**PETER HUCK**, Faculty member-at-large

#### SENIOR MANAGEMENT COMMITTEE

**CHARMAINE DEAN**, Vice President, University Research (Chair)

**JEAN ANDREY**, Dean, Faculty of Environment

**BOB LEMIEUX**, Dean, Faculty of Science

**DOUGLAS PEERS**, Dean, Faculty of Arts

**PAUL STOLEE**, Interim Dean, Faculty of Applied Health Sciences

**PEARL SULLIVAN**, Dean, Faculty of Engineering

**STEPHEN WATT**, Dean, Faculty of Mathematics

Department Members-At-Large

**TONY MAAS**, Director, Forum for Leadership on Water (FLOW), Chair of External Advisory Board

**ROY BROUWER**, Executive Director, Water Institute

#### EXTERNAL ADVISORY BOARD

**TONY MAAS** (Chair), Director, Forum for Leadership on Water (FLOW), Kitchener, Ontario

**ANA DELETIC**, Pro Vice-Chancellor (Research), University of New South Wales, Australia

**ROBYN KURTES**, Director, Environmental Policy Branch, Ontario Ministry of Environment and Climate Change, Toronto, Ontario

**TOVE LARSEN**, Urban Water Management, Eawag, Swiss Federal Institute for Environmental Science and Technology, Switzerland

**MICHAEL MURRAY**, Chief Administrative Officer, Region of Waterloo, Kitchener, Ontario

**WU JERN NG**, Professor, Nanyang Technological University, Singapore

**MERRELL-ANN PHARE**, Executive Director and Legal Counsel, Centre for Indigenous Environmental Resources, Winnipeg, Manitoba

**JOAN ROSE**, Homer Nowlin Chair in Water Research, Michigan State University, U.S.A.

**GEORG TEUTSCH**, Scientific Director, Helmholtz Centre for Environmental Research – UFZ, Germany

**MARK VAN LOOSDRECHT**, Chair in Environmental Biotechnology, Delft University of Technology, The Netherlands



# FACULTY MEMBERS

Thank you to our members and their students whose tireless work and dedication forms the backbone of the Water Institute.

## FACULTY OF APPLIED HEALTH SCIENCES

**BRYAN GRIMWOOD**, Recreation and Leisure Studies  
**CRAIG JANES**, Public Health and Health Systems  
**JANE LAW**, Public Health and Health Systems  
**SHANNON MAJOWICZ**, Public Health and Health Systems

## FACULTY OF ARTS

**NEIL BRISLEY**, Accounting and Finance  
**ROY BROUWER**, Economics  
**HEATHER DOUGLAS**, Philosophy  
**DANIEL HENSTRA**, Political Science  
**MARGARET INSLEY**, Economics  
**ALAIN-DÉSIRÉ NIMUBONA**, Economics  
**HORATIU RUS**, Economics; Political Science

## FACULTY OF ENGINEERING

**WILLIAM A. ANDERSON**, Chemical Engineering  
**WILLIAM B. ANDERSON**, Civil and Environmental Engineering  
**WILLIAM ANNABLE**, Civil and Environmental Engineering  
**NANDITA BASU**, Civil and Environmental Engineering  
**DONALD BURN**, Civil and Environmental Engineering  
**GIOVANNI CASCANTE**, Civil and Environmental Engineering  
**JOHN CHATZIS**, Chemical Engineering  
**PU CHEN**, Chemical Engineering  
**ZHONGWEI CHEN**, Chemical Engineering  
**DAVID CLAUSI**, Systems Design Engineering  
**JAMES CRAIG**, Civil and Environmental Engineering  
**MONICA EMELKO**, Civil and Environmental Engineering  
**ELIZABETH ENGLISH**, Architecture  
**XIANSHE FENG**, Chemical Engineering  
**ROBERT GRACIE**, Civil and Environmental Engineering  
**FRANK GU**, Chemical Engineering  
**KEITH HIPEL**, Systems Design Engineering  
**PETER HUCK**, Civil and Environmental Engineering  
**MARIOS IOANNIDIS**, Chemical Engineering  
**SHESHA JAYARAM**, Electrical and Computer Engineering  
**CHAO JIN**, Systems Design Engineering  
**MARK KNIGHT**, Civil and Environmental Engineering

**HYUNG-SOOL LEE**, Civil and Environmental Engineering  
**RAYMOND LEGGE**, Chemical Engineering  
**DONGQING LI**, Mechanical and Mechatronics Engineering  
**BRUCE MACVICAR**, Civil and Environmental Engineering  
**ROBERT MCKILLOP**, Civil and Environmental Engineering  
**CHRISTINE MORESOLI**, Chemical Engineering  
**STEFANO NORMANI**, Civil and Environmental Engineering  
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