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Splash Pad

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Guest Editorial

Water research should matter more than it does to big societal questions

Rob de Loë

Water matters at the University of Waterloo. With significant financial support from the University and an enthusiastic membership, we've create an Institute that is strengthening our research and teaching capacity. Our members share a passion for water, and strive to conduct world-leading research. But some of us also share a nagging doubt. If water really is as important as we think it is, if water research really matters as much as we think it does, why do politicians and policy makers so often ignore what researchers have to say?

This concern is echoed within the wider water community in Canada. Despite frequent calls over the decades for investments in water science, monitoring networks, water and sewage infrastructure, and legal reform, action is slow and halting. Bright spots certainly exist. For example, during the past decade water has received unprecedented attention from provincial and territorial governments. Significant federal government support has been provided to the Canadian Water Network. And Water Institute researchers are working closely with progressive, forward-looking communities and organizations.

Nonetheless, the fact remains that relative to other priorities – health care, employment, trade, defence, etc. – water simply does not matter nearly as much as we in the water community think it should.

What role will water researchers play in emerging conversations about the materiality of water?

Pointing the finger at politicians and policy makers for failing to show leadership is easy – but also simplistic. We need to look in the mirror: the water community often fails to make water "material" to the right people. Too often, we do a poor job of showing how water concerns are significant or relevant to politicians and policy makers on *their* terms. Academic researchers are particularly guilty. We often say we want our work to have "real world" impacts, but don't take the time to understand what motivates politicians, how policy is actually made, and what kinds of information people need to make decisions.

It's always been a struggle to find ways to make water research material to decision makers outside the traditional water world, in other words, to

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make it an important factor in their decisions. The challenge is about to get much bigger. The materiality of water is going to increase dramatically in the near future – not because the wars of the future will be fought over water (as some commentators have suggested), but because the economies of the future will increasingly be shaped by water-related risks and opportunities. Firms in key sectors have discovered that water is extremely material to them, and are emerging as major new players in the "water game". For instance, the global insurance sector is starting to view water-related risks as a significant threat to its profitability. Similarly, banks increasingly are viewing water simultaneously as an investment opportunity and as a risk that has to be accounted for in lending decisions. Companies that rely on access to large quantities of water in sectors as diverse as food production and energy have become concerned about access, and are taking steps to ensure that they will have the water they need.

These new players can bring enormous financial and political resources to the table – and they're extremely good at making what matters to them material to elected officials. This could be a positive development if water availability and quality become national priorities. However, there's also a risk that the materiality of water will become defined largely or entirely in their terms. That may not leave room for the kinds of considerations that have long been important to the water community (from ecosystem quality to public access). There's also a real danger that these powerful voices will completely overwhelm those of water researchers who are trying to offer science-based advice to decision makers.

What role will water researchers play in emerging conversations about the materiality of water? Are we going to be on the sidelines – watching others define the issues and lead the debates, while complaining that our research doesn't "matter"? Or are we going to be active participants? I think those of us who want to influence policy and practice can and should play important roles. Here are some examples of what we can do:

- We can use our research to help forge critical links between the priorities of the water community (e.g., sustainability, ecosystem quality, drinking water safety) and the priorities that matter most to politicians (energy, economic growth, employment, food and trade).
- Through our academic and scientific societies, our public speaking engagements and our professional networks, we can promote perspectives on the materiality of water that include the kinds of considerations we think matter (whatever they may be).
- Some of us have connections to leaders inside the companies and agencies that are shaping and re-shaping the materiality of water. Those relationships are an opportunity to translate knowledge produced through research into information that influences the thinking of these key decision makers.

This kind of engagement is certainly not for everyone. However, for those of us who want to influence policy and practice, engaging with big societal questions (such as the materiality of water) is a concrete way to make our research matter more beyond the halls of academia.

Rob de Loë is a Professor in the Department of Environment and Resource Studies. He holds the University Research Chair in Water Policy and Governance and directs the Water Policy and Governance Group (www.wpgg.ca). He came to uWaterloo in 2008 to help launch the Water Institute.

During 2008-12 Rob chaired the Advisory Panel for the RBC's Blue Water project, a $50 million, 10-year charitable grant program to support fresh water conservation, protection and accessibility.

Rob de Loë: http://uwaterloo.ca/environment-resource-studies/people-profiles/rob-de-loe

Water Researchers in the News

Josh Neufeld among Waterloo Region's 40 Under 40

Dr. Josh Neufeld, Associate Professor, Department of Biology, was among the 40 people recognized by The Waterloo Region Record newspaper in their annual *40 Under 40* special section. This section highlights the young leaders in our community. Josh was recognized for his research contributions and breakthroughs as well as for the training and inspiration he provides to youth, both in the university setting and in the broader community. http://www.therecord.com/news/local/article/893022---40-under-40-digital-edition-now-online

It was also announced in March that Dr. Neufeld will be the recipient of the *Jack Carlson Teaching Award*. Congratulations Josh!

Norman Zhou and Mark Servos Awarded NSERC Strategic Grant

Co-Investigators Dr. Norman Zhou, mechanical and mechatronics engineering, and Dr. Mark Servos, biology, were successful in the 2012 NSERC Strategic Grant Competition. The co-investigators will receive $491,800 for the project titled: *Removal of drinking water contaminants with innovative TiO2 nanowire membranes.* The researchers and their partners (Trojan Technologies, the Region of Peel and Peterborough Utilities Group) will be developing a new method using TiO2 nanowire membranes to treat drinking water. They will be investigating the breakdown of a variety of compounds found in wastewater using nanowire membranes that are activated by visible and ultraviolet light.

Susan Elliott Initiates *Bricks for Water* Campaign for Kenyan Village

Dr. Susan Elliott, Dean of Applied Health Sciences, started a campaign this spring to raise funds to build a brick shelter around a sanitation facility in Usoma, Kenya. Dr. Elliott has been undertaking research in this community on the topic of cultural attitudes towards water and water-related practices. The Rotary Club, along with private funding, has started a project in the community for a sanitation station to provide villagers with safe, accessible drinking water, latrines, showers and a place to do laundry. Construction of the station began in January 2013. Dr. Elliott started a fundraising campaign with the goal of raising the $10,000 needed to build a brick structure around the new facility. In the campaign, called Bricks for Water, supporters can purchase a brick for $10. The goal is to sell 1000 bricks.

http://www.bricks4water.com/

Photo: Susan Elliott

AGU Outstanding Student Paper Award to Earth and Environmental Sciences Student

Myung Kim, PhD candidate, Department of Earth and Environmental Sciences, was awarded the Outstanding Student Paper Award at the American Geophysical Union (AGU) Annual Meeting held in December 2012. His poster was entitled: *Assessing CO_2 emissions from Canada's oil sands developments—an inversion approach combined with stable isotope data.* Mr. Kim is supervised by Dr. John Lin, formerly of Earth and Environmental Sciences, and Dr. Tom Edwards and Dr. Jon Paul Jones, both of Earth and Environmental Sciences.

Technology and Innovation

The Fluorescence-based Fouling Prediction and Optimization of Membrane Filtration for Drinking Water Treatment

This technology, co-invented by Drs. Hector Budman, Raymond Legge, Christine Moresoli, and Ramila Peiris, Department of Chemical Engineering, is in the protype stage with a US patent application filed in 2011. The potential applications for this technology are in the areas of drinking water treatment, modelling membrane fouling and real-time optimization, and process control with fluorescence spectroscopy.

Background

Membranes are widely used in drinking water applications to achieve different treatment objectives such as improved removal of colloidal/particulate matter, pathogenic organisms, natural organic matter (NOM) and salinity in water. However, membrane fouling, which is the result of the accumulation of materials (foulants) on the surface and/or in the pores of the membranes, is a major constraint when considering both the adoption and performance consistency of membrane-based treatment operations. In practice, membrane fouling is controlled by implementing cleaning operation schemes that include membrane backwashing and chemical cleaning of fouled membranes. However, fouling increases operational costs as a result of permeate flux decline and/or increased energy consumption due to higher trans-membrane pressure (TMP) requirements needed as the driving force for the production of drinking water. In addition, frequent chemical cleaning of fouled membranes leads to rapid deterioration of membrane performance, shortened service life and increased costs. The efficient use of fouling controlling strategies can reduce the energy demand and other operational costs associated with fouling and improve the sustainability of membrane-based drinking water treatment operations to ensure high production of water.

Description

This technology uses a novel fluorescence-based approach for modelling and predicting different fouling dynamics in an ultrafiltration process in drinking water treatment. Mathematical tools are used to extract and simplify the information contained in the large number of fluorescence data points collected during the ultrafiltration of natural river water for the production of drinking water. The extracted information, captured as principal components (PC), is related to major foulant constituents, humic substances, proteins and colloidal particulates. The evolution of the PC scores over the filtration time is then related to membrane fouling by using PC score balanced-based differential equations. This approach is suitable for forecasting fouling behaviours with good accuracy based solely on fluorescence data collected 15 minutes into the filtration process. The approach was tested experimentally as a basis for optimization by modifying the ultrafiltration back-washing times with the objective of minimizing energy consumption and maximizing water production. This technology is also useful for identifying the fouling groups contributing to reversible and irreversible membrane fouling.

Advantages

Process optimization leads to energy savings and increased drinking water production. In addition, the ability to ensure robustness of membranes with minimum operating costs, including costs related to energy and chemicals for membrane cleaning, would provide membrane manufacturers a competitive market advantage.

Hector Budman: https://uwaterloo.ca/chemical-engineering/people-profiles/hector-budman

Ray Legge: https://uwaterloo.ca/chemical-engineering/people-profiles/raymond-legge

Christine Moresoli: https://uwaterloo.ca/chemical-engineering/people-profiles/christine-moresoli

Water Institute News

Thank You RBC

The official announcement of the RBC gift of $1.75 million in support of the Integrated Water Management graduate program took place on June 4. Over its term of eight years, the gift will support about 120 entrance scholarships for masters and doctoral students, several visiting fellows, an annual student symposium and other enrichment activities. In addition to Dave McKay, Group Head, Personal and Commercial Banking, RBC, several local and regional representatives of RBC attended. As highlights of the event, it is difficult to top a gift of $1.75 million, however the three-minute thesis presentations given by five of our graduate students came a very close second.

Guests toured an ecohydrology lab after the RBC announcement. Ekaterina Markelova (Ph.D. candidate, Earth & Environmental Sciences), Jane Black (Regional Vice President for the Greater Waterloo Market, RBC), Feridun Hamdullahpur (President, University of Waterloo), Dave McKay (Group Head, Personal and Commercial Banking, RBC), Robert Gillham (Executive Director, WI), Francine Dyksterhuis (Regional President for South Western Ontario, RBC) and Mark Servos (Professor, Biology and Chair, IWM Program Committee)

Inaugural Research Symposium

The annual Water Institute Research Symposium is one of the benefits of membership in our External Partners Program. The purpose of the symposium is to provide our external partners with an introduction to some of our areas of research and to provide opportunities for networking among our partners, faculty and students. The inaugural symposium was held on May 2nd. Based on our attendance of 140 and generally favourable comments, this year's success bodes well for similar events in the future. We particularly wish to thank the organizing committee: Derek Armitage, Sheree Pagsuyoin, and Jessica Leung. The committee was chaired

by Kevin Boehmer with administrative support provided by Mary Anne Hardy. We also wish to thank the several graduate students who assisted with various tasks during the symposium.

Distinguished Lecture

The Distinguished Lecture for 2013 was delivered by Prof. Asit K. Biswas, Distinguished Visiting Professor, Lee Kuan Yew School of Public Policy, Singapore. Dr. Biswas spoke to a crowd of over 250 people on the topic of the: *Future of the World's Water: Rhetoric and Reality*. Dr. He argued that there is a crisis in water management but not in global water quantities. A poster exhibition highlighting the breadth of water research at the university followed the lecture.

the Water Institute Distinguished Lecture Series Now Available on YouTube

The Water Institute's Distinguished Lecture Series (Allan, 2011 and Biswas, 2013) is now available on the Water Institute's YouTube channel: http://www.youtube.com/playlist?list=PLawkBQ15NDEkajDjQxgbRZIqXCKXbvtJJ

WI Welcomes Grant Murphy

The Water Institute welcomes Grant Murphy as our new Industrial Liaison Officer. Initially, Grant's primary responsibilities will be focused on development of the External Partners Program. Grant values communication and collaboration, and is looking forward to working with Water Institute members and partners.

For over 25 years, Grant has been involved in many aspects of the public utility and municipal sectors, having worked with Peterborough Utilities, Toronto Hydro and the Scarborough Public Utilities Commission. As City Engineer for Kitchener, Grant was responsible for the management of the engineering services, transportation planning, parking operations, the sanitary utility and developed an award winning stormwater utility during his tenure there.

As a member of the Ontario Water Works Association and Water Environment Association Ontario, Grant understands the importance of providing clean, safe water for our society and the critical role that research has in developing sustainable approaches to protecting water sources. Grant is active with these associations, as an author, presenter and committee chair.

Grant is proud to be a Vice President of the Children's Water Education Council, and former Chair of the Peterborough Children's Water Festival. He is a licensed professional engineer in Ontario and a graduate of the University of Western Ontario (Bachelor of Engineering Science). In 2010 he completed a Masters Degree in Distance Education from Athabasca University. Grant then started up Two Point Oh! e-learning services, to help transform employee training and public outreach programs into productive and meaningful on-line experiences.

Grant and his wife Emma enjoy spending time between their home in Kitchener and their cottage in Lakefield, Ontario. Grant is a Waterloo Central Railway volunteer, an avid model railroader, and enjoys water colour painting.

Grant Murphy: g3murphy@uwaterloo.ca

External Partners Program

Though the External Partners Program was announced in February, and the Research Symposium was recently held in support of the program, active recruitment of partners was delayed until we could provide more dedicated and consistent service. This is now the case with the hiring of our Industrial Liaison Officer, Grant Murphy. We are looking forward to greater interaction with our potential partners over the next few months. In the meantime, we are delighted to welcome those that joined the program early. Currently we have four platinum, three gold, one silver and 11 bronze partners.

Further details of the program are available at: http://water.uwaterloo.ca/epp/

Platinum Partners:

ARCADIS
Infrastructure · Water · Environment · Buildings

RBC Foundation

Golder Associates

AECOM

Gold Partners:

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

CH2MHILL

WESA
a BluMetric company

Silver Partner:

aquanty
HYDROSPHERE ANALYTICS

Students of the Water Institute, Graduate Section

2013-2014 Executive Committee

At the end of April 2013, SWIGS elected its Executive Committee for 2013-2014. The new executive members are:

Chair: Nathanael Couperus
Vice Chair Academic: Bipro Ranjan Dhar
Vice Chair Conference: Lillian Knopf
Vice Chair Operations: Lizanne Pharand
Co-Vice Chair Outreach: Cailin Hillier
Co-Vice Chair Outreach: Silvia Vlad
Vice Chair Social: Brad Wilson

The new committee is excited to get activities underway. We are looking forward to meeting all of the new students in September. The diversity of the new committee, with backgrounds in engineering, earth sciences, and biology, will ensure all SWIGS activities appeal to a wide variety of students.

Thank you to our outgoing executive committee for the wonderful job they did for 2012-13.

Summer Fun!

If you enjoy spending your afternoons watching baseball, join SWIGS and ESGA (Earth Science Graduate Association) on June 8th as they take a trip to a **Blue Jays Game** in Toronto. Tickets are $30 and include transportation to and from Toronto, as well as a ticket to the baseball game. Tickets can be purchased on Fridays from 11am to 1pm outside of the Earth Science Office in EIT or by contacting Brad Wilson at b8wilson@uwaterloo.ca.

For information related to other activities and events, keep an eye on the SWIGS website, and Facebook page. Upcoming events include:

- Student Lecture Series – monthly events
- Blue Drinks – monthly events
- Campus Rec teams—beach volleyball and ultimate
- Welcome BBQ

Thank you to Laura Beecraft (PhD Candidate) and Jessica Leung (MSc Candidate), the student presenters at the May 22nd **Student Lecture Series**. Thank you also to all the SWIGS members who made it out to the lunch time talk.

New Logo

SWIGS recently held a logo design contest. Below is the new SWIGS logo designed by Cole Mitchell.

Stay connected!

Get up to the minute information related to SWIGS events and activities by visiting www.swigs.uwaterloo.ca, and joining our group on Facebook.

SWIGS is now on Twitter! Follow us **@UW_SWIGS** to get updates about SWIGS events and activities.

Remember, the success of SWIGS depends on the people involved! If you are a faculty member who participates in water-related research, please encourage your graduate students to get involved with SWIGS. There are many ways to learn more about the world of water through SWIGS, from volunteering on committees to leading event planning as an executive! To get involved join the mailing list by emailing water.grad@uwaterloo.ca.

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New Water Institute Members

The Water Institute has added several new members to its ranks in the last year. A warm welcome to:

Nandita Basu, Earth & Environmental Sciences and Civil & Environmental Engineering

David Blowes, Earth & Environmental Sciences

Ioannis (John) Chatzis, Chemical Engineering

Hans Dürr, Earth & Environmental Sciences

Tadeusz Górecki, Chemistry

Robert Gracie, Civil & Environmental Engineering

Bryan Grimwood, Recreation and Leisure Studies

Peter Johnson, Geography & Environmental Management

Carol Ptacek, Earth & Environmental Sciences

Fereidoun Rezanezhad, Earth & Environmental Sciences

Rebecca Rooney, Biology

Andrea Scott, Systems Design Engineering

Daniel Scott, Geography & Environmental Management

Heidi Swanson, Biology

Olaf Weber, Environment, Enterprise & Development

Steven Young, Environment, Enterprise & Development

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"In nature there are neither rewards nor punishments; there are consequences."

Robert Green Ingersoll

Alberta Rockies

Collin Fair

winner of 2013 WWD photo contest

Cover banner photo by Jacqueline Ho

Research Symposium and Distinguished Lecture photos by Kevin Turner