



Guest Editorial Invitation

This issue introduces guest editorials to the newsletter. Water Institute members are invited to use the “Splash Pad” forum to express their opinions about water issues. Submissions should be approximately 500-725 words.

Guest Editorial

Implementation Deficit and IWRM

Bruce Mitchell

‘Integrated Water Resources Management’ (IWRM) is receiving much attention for several reasons. First, water problems are rarely isolated from issues related to land and other resources, indicating a holistic approach is necessary. Second, governance arrangements are challenging because boundaries of administrative and political jurisdictions rarely align with catchments or river basins. Third, stakeholders often consider only their own interests and needs, without considering implications for others. Fourth, given the need to balance environmental, economic and social considerations, technical expertise is necessary but not sufficient. Mechanisms and processes are needed to engage the public when defining desirable futures, identifying problems and creating solutions.

IWRM is one means to overcome the above challenges, and the most frequently used definition of it is from the Global Water Partnership (GWP) (2000: 22): “a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.” By managing on the basis of watersheds, the intent is

to address relations between ground and surface water, upstream and downstream, water quantity and quality, and water and other resources. Some type of river basin organization integrates various aspects requiring attention to avoid a ‘silo approach’. And, provision is made for engagement with stakeholders in the basin.

Magic bullets are few and far between.

While IWRM ideals are normally acknowledged, criticisms have emerged about IWRM regarding lack of ability to move from concept to practical action. Critics suggest no agreed definition exists regarding a holistic or IWRM approach, and absent such definition it is not possible to determine if it is being achieved. It also has been argued that implementation of IWRM is difficult due to lack of political commitment, inadequate financial resources, insufficient data and incomplete scientific understanding, poor leadership, no or incomplete vision about a desired future, inability to monitor and assess progress, limited or poor communication, etc. In brief, critics allege an implementation deficit or gap exists regarding IWRM because, in their view, credible action too often does not happen.

Problems in facilitating implementation are not confined to IWRM. Man-

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Guest Editorial (cont.)

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agers have recognized implementation challenges in many fields for decades, and much research literature addresses this matter. Thus, rejecting IWRM because of implementation difficulties reflects lack of understanding about what any kind of management often encounters. Other considerations also deserve attention. For example, problems in watersheds usually have taken decades to develop and emerge, so it is naïve to believe they can be fixed quickly. In addition, often the easiest problems already have been addressed. Those remaining reflect significant complexity enhanced by continuous change and uncertainty. Magic bullets are few and far between. Thus, learning often occurs by ‘trial and error’, popularly characterized as ‘adaptive management’. Finally, when critics claim IWRM is not delivering because of an implementation gap, it would be helpful if constructive alternative approaches were offered. Too often, however, alternatives are not proposed, and it is highly probable that any other approach would also encounter implementation challenges.

While formidable implementation challenges related to IWRM will likely continue, much has been learned (Mitchell, 2009; 2011). In that context, the following deserve attention to enhance implementation:

- Recognize context, and develop custom-designed solutions.
- Maintain a long-term perspective, with initiatives phased in over time.
- Identify a vision for a desired future condition.
- Create legitimacy and credibility for the vision, through a mix of legislation, governance arrangements, and sufficient funding.
- Ensure one or more leaders or champions, especially to facilitate forward movement during almost inevitable periods of lack of progress and associated discouragement.
- Facilitate willingness to share and/or redistribute power.
- Use a multi-stakeholder approach to create commitment and buy-in from diverse stake-

holders.

- Be adaptable and flexible.
- Identify, monitor and assess outputs and outcomes so adjustments can be made.
- Develop effective communication to stakeholders to report about ends, means and achievements.
- Utilize demonstration projects to highlight tangible progress.
- Profile and celebrate achievements, and recognize key contributors to successes.

The above points cannot guarantee implementation success. However, experience suggests attention to them helps, even if they cannot be all pursued together. And, of course, other aspects could assist. I invite you to share your ideas about how we can become more effective in enhancing implementation regarding IWRM.

References:

Global Water Partnership, 2000, [Integrated Water Resources Management](#), Technical Advisory Committee Background Paper No. 4, Stockholm: Global Water Partnership.

Mitchell, B., 2009, “Implementation gap”, [IWRM Update](#), 22(3), July, 7-12.

Mitchell, B., 2011, “The implementation gap: from policy to implementation”, [Water Innovation Forum Report: A Competitive and Innovative Agricultural Sector](#), D. Cunningham, L. Coates and M. Harris, editors, London, Lawrence National Centre for Policy and Management, 56-61.

Bruce Mitchell is currently Professor of Geography and Environmental Management, cross appointed in the School of Planning, and Associate Provost, Resources at the University of Waterloo. His research specialization is the governance and policy aspects of water management, and integrated resource and environmental management.

Dr. Mitchell has studied water management for over 43 years, with particular attention to integrated management. He has written/edited 28 books and over 155 articles.



Notes from the Executive Director

As you make your way through this issue of "Splash Pad", perhaps you have noticed some changes in content and format. In particular, the lead article, which has previously been "From the Director's Chair" has been replaced by a guest editorial. This is intended to provide greater diversity in opinion in this section of the newsletter and to give members an opportunity to share their perspectives. We are grateful to Bruce Mitchell for getting this column off to a great start, and if you have a pet peeve, an uncontrollable urge to rant or simply a perspective that you feel would be of general interest to your colleagues and our readers, please let us know. The Director's report will normally be a summary of WI activities since the previous issue of "Splash Pad".

We have also added a new section dealing with historical aspects of water research at Waterloo. Normally this will include a brief biography of one of our founding professors or key alumni, though in this particular issue, it is focused on a technology, the Waterloo Pump. As a final change, the "Faculty Profile" column is being replaced by an "Emerging Technology or Innovative Research" column. We are grateful to Hyung-Sool Lee for his contribution to this issue and encourage others to volunteer an article on new and innovative technologies that are in development or novel inter- or trans-disciplinary research activities underway.

We would be happy to receive your comments on these changes and your suggestions for further change that you feel would increase the level of interest in "Splash Pad".

Water Researchers in the News

Keith Hipel Recognized for Research Contributions

Congratulations to Dr. [Keith Hipel](#), University Professor, Department of Systems Design Engineering, as he has recently been recognized for the contributions of his interdisciplinary research in water resources systems engineering by three different groups of academics.

Dr. Hipel is the 2012 recipient of the Japan Society for the Promotion of Science (JSPS) **Eminent Scientist Award**. This award is bestowed upon "foreign researchers, who possess a record of excellent research achievements and who are mentors and leaders in their respective fields". The award includes a visit to Japan to directly associate with younger Japanese researchers to provide mentorship and to stimulate and inspire them to greater research achievements. This award is usually granted to three or four scientists per year. Of the seven granted in the last two years, six were to Nobel Prize laureates.

In late 2011, Dr. Hipel was awarded the 2011 Sir John William Dawson Medal by the Royal Society of Canada (RSC) for important and sustained contributions in interdisciplinary research.

And finally, in recognition and acknowledgment of his eminence in water resources science and technology, Dr. Hipel was elected as an Honorary Member of the American Water Resources Association (AWRA) in the fall of 2011.

Brian Dixon Awarded Canada Research Chair

Dr. [Brian Dixon](#), Professor, Department of Biology, was recently awarded a Canada Research Chair in Fish and Environmental Immunology. This CRC award will provide \$1.4 M in funding to Dr. Dixon over seven years.

Dr. Dixon's research area includes understanding fish immunology and applying it to environmental problems such as climate change.

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Feature on Water Innovation: Recovery of Value-Added Products from Wastewater

Treatment of waste and wastewater are necessary to ensure a healthy environment and to protect water resources. Nevertheless, conventional treatment technologies are being challenged by a desire for improved effluent quality, including nutrient removal, and increasing volumes of discharge as a consequence of rapid urbanization. Though improvements to current practice can be achieved through the use of more energy-efficient equipment, achieving desired effluent standards would require excessive investments in energy and materials.

The recovery of value-added products from organic waste and wastewater represents a viable solution to the challenge. Dr. Lee's research group is working on the development of innovative technologies for the recovery of value-added products using advanced biotechnology, new materials, and their combinations. The value-added products include electricity, hydrogen gas, methane, biochemicals, reusable water, nitrogen and phosphorus. The main technologies being explored are microbial electrochemical cells (MECs) and anaerobic membrane bioreactors (AnMBRs).

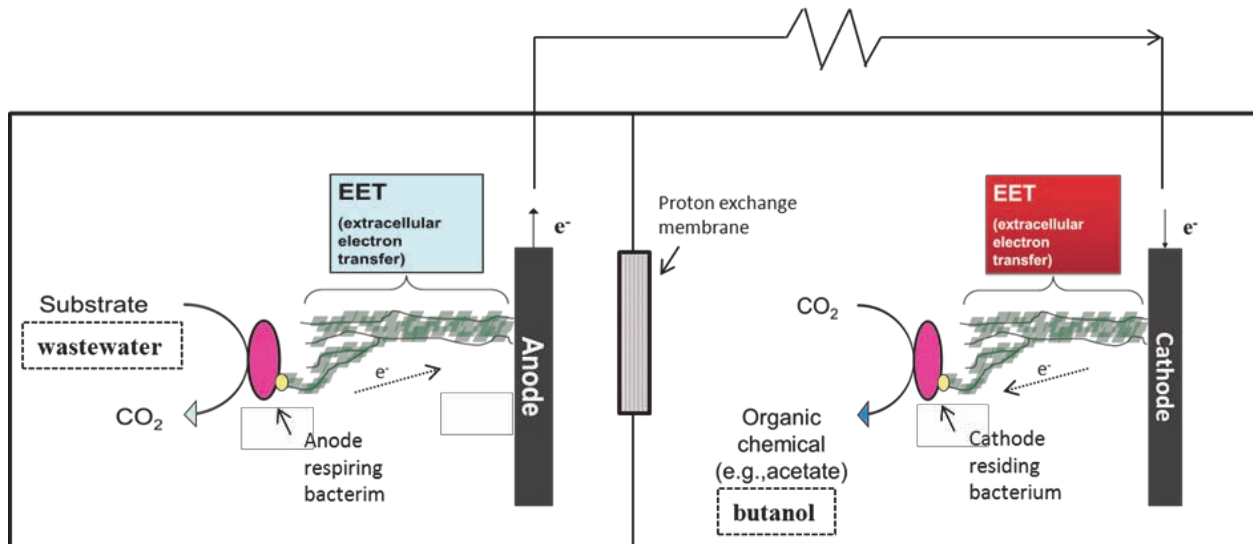
As electrode catalysts MECs use special bacteria (called anode-respiring bacteria) that can transfer electrons from organic compounds to conductive materials extracellularly (see Figure), thus generating electric power from wastes and wastewaters. Furthermore, MEC

fundamentals can be extended to chemical synthesis on the cathode where electrons from wastes and wastewaters react with protons or carbon dioxide, producing hydrogen gas, acetate, ethanol, and butanol (see Figure).

AnMBRs combine anaerobic digestion with membrane separation, allowing bioreactors to treat a variety of wastewater streams. In addition, membrane separation significantly improves wastewater effluent quality and increases methane gas production. Hence, AnMBRs can treat wastes and wastewaters to meet effluent standards simultaneously with methane recovery.

Successful development of new biotechnologies for waste and wastewater treatment could have substantial benefits for society. Cleaner water produced by advanced treatment processes will protect receiving waters and provide healthier environments and reuse of value-added products could yield significant economic benefits. Furthermore, value-added products can be recycled as energy or as intermediates for high-value products in renewable and carbon-neutral ways; providing the end-users with significant carbon credits. Finally, reuse of high-quality effluents, possibly for irrigation, will partially solve water shortage problems.

Dr. [Hyung-Sool Lee](#) is an Assistant Professor in the Department of Civil and Environmental Engineering.



Water Researcher in the News (cont.)

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The results of his research will not only help create vaccines and drugs for fisheries, but it will help us better understand ecosystems including the Great Lakes, and the evolution and function of similar immune-system molecules in mammals.

Jonathan Price Leads \$6.7M NSERC CRD Project to Reclaim Peatlands

Dr. [Jonathan Price](#), Professor, Department of Geography and Environmental Management, is the Principle Investigator on a recently awarded NSERC CRD of \$6.7 M in total funding. The research project aims to reclaim peatlands in the Athabasca region of northern Alberta which have been removed for oil sands mining. The research team members include Richard Petrone (WLU), Maria Strack (Univ. of Calgary), and David Cooper (Colorado State Univ.). The NSERC portion - \$2.65 M - is one of the largest-ever grants awarded under the CRD program.

[Media Announcement](#)

Recent Additions to the Water Institute's Membership

The Water Institute can count several new members among its ranks. A warm welcome to:

[Derek Armitage](#), Department of Environment and Resource Studies;

[Raoul-Marie Couture](#), Department of Earth and Environmental Sciences;

[Elizabeth English](#), School of Architecture;

[Chris Fletcher](#), Department of Geography and Environmental Management;

[Juewen Liu](#), Department of Chemistry;

[Shannon Majowicz](#), School of Public Health and Health Systems;

[Sheree Pagsuyoin](#), Department of Civil and Environmental Engineering;

[André Roy](#), Department of Geography and Environmental Management; Dean, Faculty of Environment;

[Lingling Wu](#), Department of Earth and Environmental Sciences.

Waterloo—Brazil Link Formalized

In April 2012, the University of Waterloo signed an agreement with the University of São Paulo, Brazil to promote joint research and education in *"water science, engineering, technology, health, economics, management, policy and governance with a particular focus on interdisciplinary activities"*.

Waterloo's President Feridun Hamdullahpur was in Brazil to sign the agreement where he commented that *"water-related research and education is a core strength of our two institutions. We look forward to expanding opportunities for our students and faculty while addressing real issues affecting water security in Brazil and Canada."*

The [University of São Paulo](#) is Latin America's leading comprehensive university. The recent agreement will broaden existing Waterloo-University of São Paulo co-operation from groundwater-focused activities to a wider spectrum of co-operation across the water sector.



Looking Back: The Waterloo Pump

Problem solving through applied research and the development of appropriate technologies is close to the cultural core of the University of Waterloo. Perhaps there is no better example of these values than the development of the “Waterloo Pump”.

Even today, the World Health Organization estimates that 1.8 million people die each year from diarrhea-type illnesses, with contaminated water as the primary vehicle for transmission. Furthermore, women in developing countries often have the primary responsibility for supplying household water needs, frequently requiring that water be carried over long distances from streams, impoundments or other surface supplies. Groundwater wells that are appropriately located generally provide water of much better quality than surface supplies, and when located near villages can relieve women of the laborious and time consuming chore of fetching water. There is, of course, the requirement for an effective means of withdrawing water from the well.

In the mid-1970's, the International Development Research Centre (IDRC) challenged two University of Waterloo Professors, Alan Plumtree of Mechanical Engineering and Alfred Rudin of Chemistry, to develop a hand-operated pump suitable for use in developing countries. Particular requirements included that it be: capable of being manufactured in developing countries, inexpensive, corrosion-resistant, adaptable to a wide range of local conditions and easily repairable by the local population.

Drs. Plumtree and Rudin studied the hand pumps commonly used in the local Mennonite community and adapted the same principles of operation to the Waterloo Pump. Important modifications included replacement of most cast iron and steel parts with PVC (which is widely available in most developing countries and is light and corrosion-free), reduction in the number of moving parts and valves constructed such that they could be easily re-

placed or repaired using local tools and materials.

IDRC supported a program of laboratory and field testing in the late 1970s and over a wide range in conditions. In addition to some necessary refinements, the testing revealed some unanticipated problems such as hyenas chewing on the white PVC, apparently thinking it to be bone. The pump was first manufactured in Malaysia and by the late 1990s, was estimated to be providing water to almost a million people in 13 countries. Though there have been several modifications over time, the Waterloo Pump continues to be used throughout the developing world.

Though perhaps lacking in sophistication, the Waterloo Pump was nevertheless clever, innovative and appropriate for its intended purpose. Indeed one could be hard pressed to find a uWaterloo innovation that has contributed more to human wellbeing.

Notes and Further Information:

Following retirement in 2004, Professor Plumtree was named a Distinguished Professor Emeritus and continues to be active in the Department of Mechanical & Mechatronics Engineering.

Professor Rudin, also named a Distinguished Professor Emeritus following retirement in 1989, passed away in 2011.

[IDRC Archives](#)

[uWaterloo Science Research story](#)

[CRB Foundation “Heritage Minute”](#)



Students of the Water Institute, Graduate Section

2012-2013 Executive

On March 29, 2012, SWIGS held its Annual General Meeting at which the executive for 2012-2013 was elected. The new executive team includes:

Chair—Melissa Barnard (Civil and Environmental Engineering)

Vice Chair Academic—Josh King (Geography and Environmental Management)

Vice Chair Social—Ben Plumb (Civil and Environmental Engineering)

Vice Chair Outreach—Allison Bawden (Civil and Environmental Engineering)

Vice Chair Conference—Jessica Leung (Biology)

Vice Chair Operations—Terin Robinson (Biology)

The new executive has several events planned

for the spring term including Blue Drinks, an intermural ultimate Frisbee team, rock climbing and tubing events, and continuation of the student lecture series. Water awareness week will be marked July 9-12 at the SLC. See swigs.uwaterloo.ca for details.

2012 Photo Contest Winners

A student photo contest was held in conjunction with World Water Day celebrations in March. Congratulations to the winners in the two categories:

Water Inspiration: Melissa Hollingham for “Sunrise on McCullough Lake”

Water Research: Daniel Guestrin for “Kaskawalsh Glacier, Kluane National Park, Yukon Territory”

STUDENTS OF THE WATER INSTITUTE
SWIGS
GRADUATE SECTION

Student Profile: Melissa Barnard



Melissa Barnard is pursuing a PhD in Civil and Environmental Engineering under the supervision of Dr. Jon Sykes. Before starting at Waterloo, Melissa attended Brock University where she earned a Master's

degree in Earth Sciences as well as Bachelor's degrees in Earth Sciences and Education. Her current research, funded by NSERC, focuses on the impact of glaciation and periglacial conditions on surface and subsurface flow. This work is part of a long-term safety assessment for deep geologic repositories of low and intermediate level nuclear wastes and used fuel. Melissa is also completing the Certificate in

University Teaching offered by the Centre for Teaching Excellence, and hopes to work as a university instructor or professor upon graduation.

Melissa was a founding member of the graduate section of the Water Institute (SWIGS). She is serving as the Chair of SWIGS for 2012-2013 and served as Vice-Chair Operations during SWIGS' first two years. As Vice Chair Operations she wrote the group's constitution, maintained their website, and kept track of membership. As Chair, she plans to build on that foundation and see SWIGS' membership grow and diversify. Together with her executive team, she hopes to increase collaboration between graduate students, promote awareness for water-related issues, and strengthen relationships between SWIGS and the Kitchener-Waterloo community.



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**UNIVERSITY OF
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WI's Strategic Planning Committee

The Strategic Planning Committee (SPC) has primary responsibility for developing and implementing strategies, programs, and initiatives that support and further the goals of the Water Institute. The SPC members for 2012-13 are:

Bob Gillham, the Water Institute (Chair)

Melissa Barnard, SWIGS

James Craig, Engineering

Rob de Loe, Environment

Monica Emelko, Engineering

Roland Hall, Science

Margaret Insley, Arts

Mark Knight, Centre for Advancement of Trenchless Technology

Ellsworth LeDrew, Canadian Cryospheric Information Network

Merrin Macrae, Environment

Shannon Majowicz, Applied Health Sciences

Stephen Murphy, Centre for Ecosystem Resilience & Adaptation

Mark Servos, Science

Marek Stastna, Mathematics

Andre Unger, Waterloo Institute for Groundwater Research

George Dixon, VP-Research (ex-officio)

Bruce Mitchell, Associate Provost, Resources (ex-officio)

Kevin Boehmer, the Water Institute (ex-officio)

"When the well is dry, we learn the worth of water."

Benjamin Franklin

Sunrise on McCollough
Lake

Melissa Hollingham

WWD Student Photo
Contest Winner

