



## From the Director's Chair

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The concept that *timing is everything*, could hardly be truer than in the field of water research these days. With the Province of Ontario recently announcing a major initiative to promote water technology and water conservation, the opportunities for industry, academic, and government collaboration have never been better. Globally, the thirst for energy efficient technologies to replace aging water infrastructure has merited front page headlines. The management of water resources at all scales is now seen as a key component of global sustainability. Whether one considers the critical water issues from an industrial perspective, from the offices of municipal water providers, or through the eyes of conservation authorities, managing our water resources requires input from a wide range of disciplines. Herein lies both the complexity of the challenge and the enormity of the opportunity.

Senior administration at the University of Waterloo recognized this opportunity. After taking stock of the unique capacity in water research and training at Waterloo, a task force started down the path of establishing an institution designed to address the interdisciplinary nature of the modern water challenge. This academic entity has evolved into the Water Institute, which was approved by Senate in Fall 2009. From my perspective as inaugural director, the sheer breadth of opportunity in the water area was

much larger and more diverse than I would ever have imagined. On the other hand, after spending a considerable amount of time trying to catalogue the overall expertise and activity in water related research at Waterloo, I was overwhelmed by its depth. For instance, just log onto our website ([www.water.uwaterloo.ca](http://www.water.uwaterloo.ca)), look up our Institute Members page and click on the pictures of three or four of your fellow researchers, especially ones you might not recognize. You will be amazed by what you find. Co-ordinating this overall talent base in such a way that it facilitates exposure to emerging funding opportunities, while at the

*The challenge ahead of us is complex but full of opportunity*

same time enhancing current water research directions, is a core objective of the Water Institute. Easier said than done!

Since its inception, the Water Institute has been getting its feet firmly planted and has begun a number of initiatives, some of which are highlighted below.

### Team Building

Over the course of the last year, the foundation for the Water Institute has been under development. A key component of this process has been

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the establishment of the Internal Management Committee (IMC) consisting of 12 Water Institute members from a wide range of backgrounds and faculties. This team has been instrumental in providing strategic advice and a good deal of “heavy lifting” to get the main institutional components in place. You will meet the IMC further on in the newsletter. A second ad hoc management group has included two senior administrators and three external advisors who have been of critical importance in developing a business plan and governance structure, facilitating external relations for the Water Institute and providing much needed guidance in establishing a working model for institutional management within the university. Through the efforts of these two groups, we are now open for business!

### External Partnerships

External connections and partnerships have been the highest priority for the Water Institute over the past several months. In May of this year, the Water Institute signed an international Memorandum of Understanding with the Helmholtz-UFZ (Centre for Environmental Research) located in Leipzig, Germany. This new partnership opens the door for wide ranging collaborative opportunities throughout Europe for Water Institute members (more on page 4). As a result of extensive lobbying efforts, the Province of Ontario has included the Water Institute in discussion of the Water Opportunities and Conservation Act. This provides an invaluable opportunity to influence policy within the new legislation and also to position Water Institute members to participate fully as the political initiative unfolds. In addition, major international companies deeply involved in various aspects of water including IBM, Trojan, AECOM, Du Pont, Golder Associates, Maple Reinders, and Arcadis have approached the Water Institute to establish long-term collaborative ties with a specific interest in supporting both research and educational initiatives including the funding of new IRC Chairs in the water area.

### Progress On Campus

On campus, the Water Institute and many of its members played a significant part in securing the Canada Excellence Research Chair (CERC) in Ecohydrology (see page 3). A communications plan is underway that includes the website and this newsletter. A graduate student chapter of the Water Institute is being established that will include students from all faculties and which will be deeply involved in the evolution of the Water Institute. A seminar and film series will commence in the fall with a list of engaging speakers from around the world and educational movies that will motivate all with an interest in water. Finally, a detailed plan for establishing a unique, multi-disciplinary graduate program on water governance is under development by a multi-faculty collaborative team. This will contribute to the Water Institute's commitment to innovation in education and training (see page 7).

As the Water Institute moves forward, demonstrating value to our membership is a necessary and primary goal. After studying the successes and failures of similar institutes around the world, it is clear to me that the participation and support of the individual members and partners is the critical ingredient to success. Whether you are on one of the Water Institute committees, asked to assist with a specific opportunity, or simply attend one of the upcoming seminars hosted by the Water Institute, look for something that catches your interest and either contact me or a member of your IMC to get involved. We want everyone to benefit from their connection to the Water Institute, and the best way to do that is to climb aboard. The ship is getting ready to leave port and she is ours to sail!

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Dave Rudolph  
Director  
Water Institute



## CERC Chair in Ecohydrology



As you may be aware, the University of Waterloo received two of 19 prestigious Canada Excellence Research Chairs (CERC) recently awarded by the federal government. Of particular relevance to the Water Institute, one of these is in the area of Ecohydrology and will be held by

Philippe Van Cappellen, currently a distinguished professor at the Georgia Institute of Technology. Van Cappellen will take up his duties in the department of Earth & Environmental Sciences in June 2011.

Van Cappellen will lead an interdisciplinary program addressing the effects of watershed management on the health of aquatic ecosystems. His area of expertise, and his particular contribution to the effort, concerns geochemical changes at hydrologic interfaces, with a focus on the transport of nutrients and metals from groundwater to surface water.

As part of its contribution to the CERC, the university will make three incremental faculty appointments. The CERC program, therefore, will make a substantial contribution to the university's capacity for water research.

## Water Institute Events & Services

The mission of the Water Institute is, most generally, to *“facilitate excellence in research, education, and innovation in water science, technology, management, and governance.”* How we best do this is continuously evolving. However, a number of events and initiatives are planned for the fall and beyond:

- The start of the Water Institute's first active term will be celebrated at a **Town Hall event** in late September. Plan on being there!
- The Water Institute **Seminar series**, bringing in local and international speakers to discuss water issues of general interest, will begin in October.
- The Graduate **Water Institute film series**, a monthly popcorn-fueled documentary and silver screen event is slated to begin in the fall term.
- Spearheaded by Waterloo International, there is an initiative to develop an **Israel-Canada collaborative research partnership**, where the Water Institute will play a significant role.
- A two-day **water workshop and student poster event** is tentatively scheduled for early December.

- A number of **industrial partnerships** are being built with key industrial collaborators in the water services and environmental sectors.
- Talks are underway with a variety of provincial agencies regarding novel **academia-government collaborations**.
- A **student chapter** of the Water Institute is being established by student volunteers from multiple departments across campus.
- Water Institute-sponsored **meet-and-greets with industry professionals** are being conducted to expose our students to the best water-related job opportunities in Canada.

In addition to the above activities, the Water Institute is actively soliciting suggestions for ways we can help individual student and faculty members push the envelope in the area of water research, and ensure that Waterloo continues to be a leader in the field. We encourage any of our members to contact us at [water.institute@uwaterloo.ca](mailto:water.institute@uwaterloo.ca) with comments and suggestions.

## Faculty Profile: Ed Sudicky, Earth & Environmental Sciences

Ed Sudicky, Canada Research Chair in Quantitative Hydrogeology, has been with the University of Waterloo since he was an undergraduate civil engineering student. Since his early days as a co-op student developing computer code in the Department of Earth Sciences, Ed has been using his considerable mathematical acumen to develop bigger and better models of groundwater and surface water systems. Many of these models have been pioneering contributions for improving our understanding of groundwater flow and contaminant transport, earning Sudicky fellowships in the Royal Society of Canada, Canadian Academy of Engineering, the American Geophysical Union and the Geological Society of America, as well as many prestigious international awards. Continuing to push the frontiers of groundwater science, Ed is currently concentrating his efforts on developing regional - and continental-scale, fully-integrated groundwater-surface water models

that can be used to better understand complex processes and water management challenges. The 3D

*HydroGeosphere* (HGS) model developed by Ed and his research team, together with his former PhD student Rene Therrien (Chair of Geological Sciences at Laval University), is

now considered the academic/industry standard to address problems involving integrated water management. The HGS model is being used worldwide. Sudicky collaborates internationally and he has actively worked to establish partnerships for research teams at Waterloo. One example is the collaborative agreement with the Helmholtz Association in Germany (see below), which was made possible as a result of Ed's long-term research relationships with colleagues at the Centre for Environmental Research-UFZ in Leipzig, Germany.



## The Helmholtz Connection

The Memorandum of Understanding signed on April 29, 2010 between the Water Institute and the German Helmholtz Centre for Environmental Research - UFZ is a major step forward for water research at the University of Waterloo.

The Helmholtz Centre for Environmental Research—UFZ is one of 16 flagship research centres supported by the Helmholtz Association. The Helmholtz Association, with more

than 30,000 employees, is Germany's largest scientific organization with an annual budget of approximately three billion euros.

In conjunction with the signing of the MOU, nineteen influential researchers from the Helmholtz Centre convened on the Waterloo campus to talk shop with our membership, discuss collaborative research endeavours, and, of course, visit Niagara Falls.

The agreement calls for collaboration in the areas of water science, technology and governance. One goal is to establish a Canada-Germany water alliance based on watershed scale research. Research will focus mainly on studies in the Grand River watershed and the TERENO watershed facilities in Germany.

As part of the continued partnership with the Helmholtz UFZ, plans are in place for a visit of Waterloo researchers to Germany in 2011 to continue the fruitful exchange of ideas.



The Helmholtz contingent during their visit to the Waterloo campus.

## Spotlight: Centre for Trenchless Technologies

The Centre for Trenchless Technologies (CATT), housed within the Department of Civil & Environmental Engineering, is a group of university, industrial, and government agencies dedicated to the advancement of trenchless technologies, which are primarily used for installation and rehabilitation of sewer and water supply pipelines. CATT's goal is to address the critical issues facing underground infrastructure installation, assessment, repair, renewal and management, a critical component of water supply infrastructure both locally and abroad.

Co-ordinated by civil & environmental engineering professor Mark Knight, the centre is a hub of academia-industry partnerships that directly link practitioners and students. One of their hallmark events is the annual Trenchless Technology road show, which brings together municipal, engineering and contractor personnel from across North America to learn from university researchers and other experts.  
<http://www.civil.uwaterloo.ca/catt/contact.html>



CATT students posing with Mark Knight upon receipt of a NASTT award to CATT













## Naming Competitions

Students, staff, and faculty Water Institute members are encouraged to contribute ideas for:

- **the title of this newsletter** (i.e., something better than "Water Institute Newsletter") and
- **the tagline/motto** for the institute (e.g., "the water is at Waterloo" or "the drip stops here").

Please send all ideas via e-mail before Oct. 15 to [water.institute@uwaterloo.ca](mailto:water.institute@uwaterloo.ca). The entries will be judged by the communications committee, and the winners will each receive a Water Institute water bottle, T-shirt, and a \$100 gift certificate to The Keg.

## Meet the Internal Management Committee

	Jim Barker, Earth & Environmental Sciences		Monica Emelko, Civil & Environmental Engineering		Mark Servos, Biology
	James Craig, Civil & Environmental Engineering		Roland Hall, Biology		Michael Stone, Geography & Environmental Management
	Robert de Loë, Environment & Resource Studies		Margaret Insley, Economics		Ed Sudicky, Earth & Environmental Sciences
	Claude Duguay, Geography & Environmental Management		Kevin Lamb, Applied Mathematics		Neil Thomson, Civil & Environmental Engineering

Ex-Officio Members (not pictured): George Dixon, BIO; Bruce Mitchell, GEM; Wayne Parker, CEE; Dave Rudolph, EES.

The Internal Management Committee (IMC) is tasked with designing and implementing strategic initiatives in all aspects of the Water Institute including developing partnerships, exploring research opportunities, enhancing education and training capacity, and advising on budgetary issues. The IMC is intended to be a direct conduit to the Water Institute: contact any one of us to participate in the Water Institute and find out what is happening.

In addition to the IMC, an Ad-hoc senior management committee, consisting of George Dixon (VP, Office of Research), Bob Gillham (EES Professor Emeritus), Ross McGregor (uWaterloo Senior Adviser), Bruce Mitchell (Associate Provost Academic), and Gilles Patry (University of Ottawa) have played a crucial role in the startup phase of the Water Institute.

## Water Research funded by MRI

In the last call for proposals from the Ontario Research Fund – Research Infrastructure (ORF-RI) program, a number of Water Institute members and their teams were successful in obtaining funding for research in the wide-ranging fields of water quality, contaminant transport, glacial terrains, aquatic microbiology, and microfluidics.

**James Barker**, in the Department of Earth & Environmental Sciences (EES), received a \$9-million grant for the proposal "Water Quality Research Platform in Urban and Urbanizing Watersheds." Using a section of the Grand River watershed designated for future growth, researchers from eight universities are developing breakthrough technologies in drinking water and wastewater treatment to meet current and emerging challenges. They use "smart" hydrologic instruments to determine the impacts on water quality from changing agriculture practices, increased waste and storm water discharge, and water reuse.

**Walter Illman**, also in the Department of Earth & Environmental Sciences, was successful in obtaining funding for a program in subsurface imaging. Illman and his team are conducting cutting-edge field, laboratory and computational research, with the goal of developing a new method for accurately predicting the way

contaminants are transported. This research will lead to new subsurface characterization approaches that will result in accelerated cleanup and substantial cost savings to the government and industry.

**Martin Ross**, of Earth & Environmental Sciences, is leading a team of scientists who are using innovative technology and approaches to conduct field-based research on our glacial landscape and subsurface geologic features. The goal is to learn more about these glacial terrains and their complex relationships with surface landforms. What the researchers discover will be made available through web-based applications to anyone with an interest.

**Dongqing Li** and **Carolyn Ren** of Mechanical & Mechatronics Engineering are working on improving lab-on-a-chip (LOC) devices: miniaturized biomedical laboratories that can perform the same functions as their room-size counterpart. The advantages are obvious: LOC devices are small, portable and can be used in the field to produce results on the spot, significantly reducing the cost of testing media ranging from biological tissue to, of course, water. But so far, no complete LOC devices exist. This research program aims to change that, by

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### Student Profile: Erin Jones, Biology/Civil & Environmental Engineering



Erin is pursuing a joint MAsc degree in Biology and Civil & Environmental Engineering under the supervision of Ralph Smith of Biology and James Craig of Civil & Environmental Engineering. With an undergraduate degree in environmental engineering from Waterloo, Erin wished to apply her quantitative skills to a topic she really enjoys: Great Lakes ecology. Sticking

around Waterloo was the perfect opportunity, as Smith's research team has been using complex hydrodynamic-ecological models to understand nutrient transport, invasive species, and fish habitat in Lake Erie. Working with feet in two departments, Erin had the chance to pursue a joint degree developing better computational zooplankton models of the lake to inform our understanding of cross-lake spatial variability in walleye recruitment.

## Staff Profile: Mary Anne Hardy

The Water Institute is pleased to both welcome and introduce Mary Anne Hardy, who was hired this spring as administrative co-ordinator to the Water Institute. Mary Anne is responsible for handling many of the Water Institute's day-to-day operations, including meeting co-ordination, event scheduling, office management, and just about any other detail that needs attending to. Working directly with director Dave Rudolph, and as an active member of the communications committee, Mary Anne is plugged into all of the goings-on of the institute.

Mary Anne has both bachelor's and master's degrees in Environmental Studies from Waterloo. Her masters thesis was focused on the influence of climate change on small catchment water balances. Since graduation, she has worked for the Waterloo Centre for Ground-

water Research and later as the research program manager for the Contaminant Hydrogeology Research Group in Earth & Environmental Sciences. During her time at Waterloo, she has worked in the field taking water samples and in the office fostering partnerships with industry, working with students, and managing complex research projects.



Mary Anne's attention to detail, pleasant personality and competence in all tasks big or small make her a joy to work with and a real asset to the institute. When you get the opportunity, introduce yourself to Mary Anne and learn why the Water Institute was so fortunate to convince her to join the team.

## Big Plans for Water Graduate Education

As part of the push to be an international centre of water innovation, a program development team within the IMC headed by Rob de Loë of environment and resource studies and including Monica Emelko in civil and environmental engineering, has been working at establishing the framework for a unique, multidisciplinary graduate program on water science and governance. The program, still in its design phase, will be geared specifically

toward water professionals who require a fully distance-based, interdisciplinary, part-time graduate program that provides an even balance of policy, governance, science and technology. While the details are still in the works, this unique program is anticipated to be a major component of the Water Institute's contribution to water education and training at uWaterloo. Keep posted for more news as this program unfolds.

## MRI (cont.)

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developing the chip technology required to produce the first fully integrated, fully automatic, handheld LOC devices. This research will give a boost to the province's biotech sector and ultimately benefit Ontario's health care and food and water inspection sectors.

## Looking for Contributions

If you would like your research highlighted in the Fall issue of the Water Institute Newsletter or would like to have recent successes or future water-related events communicated to the University and beyond, please contact Assistant Professor James Craig at [jrcraig@uwaterloo.ca](mailto:jrcraig@uwaterloo.ca).



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## UNIVERSITY OF WATERLOO

The sustainable management of the world's fragile water resources has emerged as one of our greatest challenges. The University of Waterloo has been actively involved in water-related research throughout its history. Since its inception in 1957, Waterloo has deliberately and systematically fostered a highly diversified water research capacity in topics that cross faculty boundaries campus wide. Over the more than five decades of growth, Waterloo has emerged as an internationally recognized research institution specializing in aquatic ecology and toxicology, groundwater, atmospheric sciences, hydrological sciences, water and wastewater treatment, and water policy, management and governance. More than 110 faculty members from all six faculties and close to 20 departments are engaged in these key areas providing innovative expertise in research, education, and technology development.

Fostering interdisciplinary research and empowering individual faculty, the Water Institute aims to use the strength of Waterloo's people to improve the management and understanding of our most precious commodity.

*"Anybody who can solve the problems of water will be worthy of two Nobel prizes — one for peace and one for science."  
-U.S. President John F. Kennedy*



Simon Wilson  
Photography

### Contact Us!

The Water Institute is actively recruiting student and faculty volunteers, and always on the lookout for new ways to improve the services we provide. Contact [water.institute@uwaterloo.ca](mailto:water.institute@uwaterloo.ca) or talk to one of the IMC members to get involved.