THE WATER INSTITUTE

annual report 2013 2014

UNIVERSITY OF WATERLOO | the water INSTITUTE

our vision

To be a global leader that substantially advances the sustainable use and management of water for the benefit of the environment, economy and society.

our mission

To facilitate collaboration, support excellence and promote innovation in interdisciplinary research and education, and to promote knowledge exchange in addressing complex water challenges.

strategic goals

Promote and support relevant, collaborative, interdisciplinary water research.

Strengthen global networks and partnerships with leading water organizations and researchers.

Promote interdisciplinary perspectives in water-related education.

Strengthen the capacity of water resources professionals.

Photo by Prachi Deshpande

WATERLOO

MESSAGE FROM THE CHAIR OF THE EXTERNAL ADVISORY BOARD

The Water Institute's External Advisory Board provides an independent evaluation of the Institute's progress towards its goals, and offers recommendations on how it might make a greater impact. Board members come from industry, government, academia and civil society. I am pleased to report that the Water Institute continues to play an important role in facilitating and supporting excellence in water research and education at the University of Waterloo.

Earlier this year, the Board met with a variety of Water Institute stakeholders — senior university leaders, Institute administration, a cross-section of faculty members and graduate students — to review 2013/14 achievements. The Board was particularly impressed with the Institute's renewed strategic plan, the launch of the Collaborative Water Graduate Program and growth of the External Partners Program. Looking forward, the Board noted, with anticipation, a renewed commitment to the development of a research strategy, and the communication of research activities and outcomes to Canada's water community.

I congratulate the University of Waterloo for recently renewing the mandate of the Water Institute, and for highlighting water as a priority area in the University's new strategic plan "A Distinguished Past — A Distinctive Future". The Water Institute's ability to draw on specialists from multiple disciplines provides real opportunity to strengthen our understanding of complex water issues, and to influence management decisions that will have lasting benefits for the health of our water resources. As I noted last year, as a University of Waterloo alumnus and resident of Waterloo Region, it is an honour to be part of this initiative.

TONY MAAS
Principal, Maas Strategies, Kitchener, Ontario

MESSAGE FROM THE EXECUTIVE DIRECTOR

Centres and institutes of the University of Waterloo are subject to review every five years. With May 1, 2014 as the five-year anniversary of the Water Institute, 2013-14 was a period of reflection and consolidation, but more importantly, was used as an opportunity to revitalize our vision and to develop strategies to build upon the foundation laid during the first five years of the Institute's mandate. As listed elsewhere in this report, the Water Institute contributed to several major initiatives over its initial five-year term, and in particular, water-related research funding increased from about $13 to $28M over this period. More importantly, the Water Institute established its role as an effective partner and facilitator within the administrative and research domains of the University.

The renewed strategic plan developed over the past year builds on the experience of the initial five years. It provides refreshed vision and mission statements and highly ambitious goals and objectives that will continue to support the interdisciplinary character of the Institute, support more focused research and training activities and encourage a greater international presence. The Institute also received exceptional support from the recently-published University strategic plan, where "water" was identified as one of three priority research areas of the University.

We have exceptional research capacity, a strong foundation, a strong vision and an unprecedented expression of support from the University. The challenge for the next five years is to martial these strengths such that we achieve our vision for global leadership.

"The Water Institute is building on the tradition of excellence established by our founding water researchers by exercising the University of Waterloo's ethos – collaboration and innovation – in addressing increasingly complex water challenges."

– DR. FERIDUN HAMDULLAHPUR
President and Vice-Chancellor, University of Waterloo

DR. ROBERT W. GILLHAM
Executive Director, the Water Institute

Sampling benthic invertebrates in Muskoka.

what we do

The University of Waterloo established the Water Institute in 2009, building on four decades of excellence in water-related research, education and innovation. The Institute is comprised of about 135 faculty and 400 graduate students from across all six university faculties (Applied Health Sciences, Arts, Engineering, Environment, Mathematics and Science) including 18 departments.

Waterloo's water research programs are diverse, and collectively comprehensive, with core disciplinary expertise in areas such as:

- Hydrological (groundwater, surface water) science and engineering,
- Water/wastewater treatment and technology,
- Ecohydrology,
- Aquatic ecology and ecotoxicology,
- Water governance and management,
- Water and health.

A primary objective of the Water Institute is to facilitate interdisciplinary research and education to address increasingly complex water issues. In addressing this objective, the Water Institute provides its members with a range of services, including:

RESEARCH

- Identify funding opportunities and secure incremental funding,
- Provide seed grants to accelerate project development,
- Identify and introduce researchers with common areas of interest,
- Establish and support researcher working groups and clusters,
- Solicit letters of support for research projects,
- Provide review and advice on research proposals,
- Provide in-kind support to research projects.

EDUCATION

- Support the development of new education and teaching programs,
- Develop and administer graduate student scholarship program,
- Support and enable the Water Institute's graduate students chapter (SWIGS).

PARTNERSHIPS

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

KNOWLEDGE EXCHANGE

- Support and organize:
  - Seminars;
  - Workshops;
  - Research Symposia;
  - Public and Distinguished Lectures,
- Publish the triannual *Splash Pad* newsletter,
- Promote and profile researchers through various communications activities,
- Facilitate and support media relations.

by the numbers

138 FACULTY MEMBERS
6 FACULTIES
18 DEPARTMENTS

5 FELLOWS OF THE ROYAL SOCIETY OF CANADA

OF THE **7 MOST HIGHLY** CITED UW RESEARCHERS FROM 2000 TO 2008
5 ARE WATER RESEARCHERS

SPONSORED WATER-RELATED RESEARCH GREW FROM $14M IN 2009/10, TO
$28 million
IN 2012/2013

1 CANADA EXCELLENCE RESEARCH CHAIR

15 RESEARCH CHAIRS

WI MEMBERS PUBLISHED OVER
2,200 PAPERS BETWEEN 2009 AND 2013

1 COLLABORATIVE WATER GRADUATE PROGRAM

STUDENTS OF THE WATER INSTITUTE GRADUATE SECTION (SWIGS) HAS OVER
400 MEMBERS

WI HAS OVER
60 EXTERNAL PARTNERS

10th BEST WATER RESEARCH INSTITUTION IN THE WORLD

SOURCE: Lux Research Inc., Top Academics and Institutions in Water Research 2013, *www.luxresearchinc.com/news-and-events/ press-releases/168.html*

20th MOST PROLIFIC RESEARCH INSTITUTE IN THE WORLD

SOURCE: Stockholm International Water Institute and Elsevier, The Water and Food Nexus: Trends and Development of the Research Landscape, August 2012.

research

THE NEXT GENERATION

The Water Institute's 2011/12 and 2012/13 annual reports included tributes to the University's founding water researchers. Over Waterloo's first five decades, these founders, together with many other faculty, established a reputation for excellence and innovation, thus contributing immeasurably to the establishment of the Water Institute. This year's report highlights the achievements of several of our early-career researchers, particularly as evidence of the University's commitment to faculty renewal in the water area.

NANDITA BASU, Civil and Environmental Engineering and Earth and Environmental Sciences

Dr. Basu's research expertise lies in coupled hydrologic and biogeochemical modeling, with a focus on using stochastic models and travel time distributions to describe surface and groundwater processes. Nandita has contributed significantly in the field of data-driven approaches to finding patterns in landscape responses, and the role of humans in modifying such patterns, with the overall goal of providing innovative solutions to water sustainability challenges. She recently received the Early Researcher Award and a Strategic Project Grant to study nutrient legacies in anthropogenic landscapes. Modelling in her lab is complemented by experimental research to develop innovative, passive water quality samplers for surface and groundwater applications.

HANS DÜRR, Earth and Environmental Sciences

Dr. Dürr is a Research Assistant Professor in Biogeochemical Modeling within the Ecohydrology Group. Hans' primary interest is in regional to continental-scale hydrology, with expertise in water resources and chemistry, geoinformatics and global geodata. Using advanced coupled hydrological-biogeochemical models, he works across the entire range of spatial and temporal scales, from plot scale to global nutrient cycles. He contributes to several fields, including the first lithological world map, typologies of river and coastal systems, and dynamics of material fluxes such as nutrients and sediments at the land-ocean interface.

BRYAN GRIMWOOD, Recreation and Leisure Studies

As an Assistant Professor in the Department of Recreation and Leisure Studies, Dr. Grimwood's research examines human-nature relationships in contexts of leisure, livelihoods, and learning. One aspect of Bryan's research program is an extended case study examining the culturally diverse uses, relationships, and responsibilities associated with the Thelon River in Canada's Northwest Territories and Nunavut. This SSHRC funded study uses community-based and participatory methodologies to engage Inuit and Dene communities, as well as river tourists, in documenting knowledges about the Thelon as a special and changing Arctic riverscape.

HYUNG-SOOL LEE, Civil and Environmental Engineering

Wastewater treatment is essential for securing human health within the context of an effective water management strategy and thus there is a need for more sustainable wastewater management strategies. Dr. Lee believes that innovative biotechnologies that recover value-added products from organic wastes and wastewaters or energy-efficient apparatus can transform "energy-consuming treatment processes" into "energy-saving, -neutral, or -positive systems". In Hyung-Sool's Waterloo Environmental Biotechnology Laboratory (WEB-Lab) biotechnologies are being studied that can capture value-added products from organic wastes and wastewaters using microorganisms. Products can include electric power, hydrogen gas, methane gas, hydrogen peroxide, acetate, butanol, PHB, and ammonia.

SHANNON MAJOWICZ, Public Health and Health Systems

Building on a decade of public health work experience, Dr. Majowicz's research is focused on the epidemiology of foodborne, waterborne and enteric diseases. Shannon investigates the burden of, and risks for, such illnesses in various populations, including how the situation in the population relates to what is captured in public health data. She is interested in investigating those who are at undue risk for, or who bear an undue burden of, such illnesses, including how we expect this to change in the future and what we can do about it.

CARRIE MITCHELL, Planning

Dr. Mitchell is currently a co-investigator on the SSHRC-IDRC funded "Coastal Cities at Risk" Project, led by Prof. Gordon McBean at Western University. Under this project, Carrie is exploring the policy and planning for adaptation in coastal megacities in Thailand, Philippines, Nigeria, and Canada. She is also a co-principal investigator (with Dr. Sarah Burch, GEM) on a synthesis of 125 climate change adaptation projects across Asia, Africa, the Middle East, and South America. She is a former senior program officer with the International Development Research Centre's Climate Change and Water program and has a background in waste management in Southeast Asia.

ALAIN-DÉSIRÉ NIMUBONA, Economics

Dr. Nimubona has developed research themes in environmental economics and industrial organization. He has a particular interest in the analysis of imperfect competition strategies of the eco-industry, the specialized industry that supplies abatement goods and services, such as air pollution control and wastewater management, to polluters. Along with other projects, Alain-Désiré is exploring these issues with applications in the Alberta oil sands industry. In addition, a current SSHRC-funded project is examining the role of international trade in climate change policies.

STEFANO NORMANI, Civil and Environmental Engineering

Dr. Normani has broad interests in computational geoscience with a focus on deep and highly saline groundwater systems in crystalline and sedimentary rock settings. For the long-term management of Canada's radioactive wastes, it is necessary to investigate the impact of continental ice-sheets on pore fluid migration over hundreds of thousands to millions of years. In this research, Stefano develops and applies advanced multi-physics computational models to conduct paleohydrogeological simulations of geosphere response to large-scale glacial perturbations. He has also developed numerical hydrogeologic models for Ontario Power Generation's proposed deep geologic repository for low- and intermediate-level radioactive waste.

SHEREE PAGSUYOIN, Civil and Environmental Engineering

Dr. Pagsuyoin has research interests in the behaviour of emerging contaminants in surface water and the application of agent-based modelling to environmental impact assessment. Of particular note, her interest in water and sanitation technologies for developing countries recently earned support from the Grand Challenges Canada program, where Sheree, along with two co-PIs, aim to improve the quality of drinking water in rural areas of the Philippines. The proposed technology includes a low-cost biofiltration system that will use indigenous materials and will have a modular design for portability and scalability so it can be adapted for household or communal use.

FEREIDOUN REZANEZHAD, Earth and Environmental Sciences

Dr. Rezanezhad's research interests concern the hydrological and biogeochemical processes of peatlands and wetlands, and groundwater-surface water interactions. Fereidoun has extensive field experience in wetland ecosystems, monitoring water levels and soil and water quality, as well as contaminant, nutrient, and greenhouse gas fluxes. As a member of the Ecohydrology Research Group, he has recently developed a series of novel laboratory techniques which will allow upscaling of bench scale systems for validating and accurately addressing physical and chemical heterogeneity at multiple spatial scales and is developing models of hydrogeochemical processes, which will improve the reliability of solute transport models.

REBECCA ROONEY, Biology

Wetlands are the intersection between upland and aquatic habitats, and thus exert tremendous influence on downstream water quality and quantity. As an ecologist, Dr. Rooney recognizes their enormous habitat value: supporting diverse bird, fish, herptile and plant communities. Despite the goods and services we derive from wetlands, historical prejudice resulted in campaigns of drainage and infilling. Most remaining wetlands are degraded by habitat loss, hydrologic modification, invasive species and climate change. Rebecca's research program examines wetland health and the response of biotic communities to differing forms of disturbance, e.g. industrial mining, invasive species and agricultural activities. Her research helps inform government and industry decision makers.

ANDREA SCOTT, Systems Design Engineering

Decreasing ice extent in the Arctic has led to more ship routing through this region due to the shorter distances and reduced travel times than the southern routes. However, sometimes ships get stuck in thick ice cover. The occurrence of these events could be reduced through improved sea ice thickness forecasts. The focus of Dr. Scott's research has been on development of a method to improve ice thickness forecasts by incorporating satellite data into a background state from a forecast model in an optimal manner using data assimilation.

HEIDI SWANSON, Biology

Passionate about working with multiple stakeholders to achieve better stewardship and management of freshwater fisheries, Dr. Swanson co-led an initiative to have the University of Waterloo accepted into a network of American institutions and agencies (Cooperative Ecosystem Studies Network). Her research program includes collaborations with the US Geological Survey, the Great Lakes Fishery Commission, De Beers Canada Ltd, and the Deh Cho First Nations. Heidi places great value on engaging government, industry, and First Nations into her research program. She and her students are currently working with a variety of multi-stakeholder teams at field sites that range from the North Slope of Alaska to Lake Superior.

SARAH WOLFE, Environment and Resource Studies

Dr. Wolfe examines questions of:

- How are people influenced by experiences of water scarcity over time and place?
- How does interdisciplinary teaching and experiential learning influence students' understanding of complex water problems and decision making processes?
- How do emotions influence our supposedly 'rational' decision-making processes? Specifically, how do individuals and groups negotiate emotion-laden decisions?

Sarah's research program is focused on understanding the ways that individuals make decisions about water outside the official rules and processes. This includes both the research and policy experts and the general public. By including this aspect of decision-making, it becomes possible to examine the foundation assumptions on which explanations of political will, economic incentives, policies/regulations are based.

LINGLING WU, Earth and Environmental Sciences

The overall theme of Dr. Wu's research is to quantify the biogeochemical cycling of elements, including carbon, phosphorus, nitrogen, base cations, and metals, in both modern and ancient environments. Much of Lingling's current research focuses on using iron isotopes to probe changes in mineral surface phases during water-rock interactions. A particular area of interest concerns iron isotope signatures of lake sediments, aimed at incorporation of chemical and isotopic data into diagenesis models and a better understanding of iron cycling in lacustrine environments.

education

PROMOTING INTERDISCIPLINARY PERSPECTIVES

COLLABORATIVE WATER PROGRAM

A key strategic goal of the Water Institute is to "promote interdisciplinary perspectives in water-related education". The launch of the new Collaborative Water Program in the Winter 2014 term was therefore a significant milestone for the Institute. Supported by a generous gift from the RBC Foundation, the new graduate program — jointly offered by eight Departments — supplements specialist training provided by the respective Departments with two new, collaborative courses (WATER 601 and 602) which require students to learn and problem-solve across disciplinary boundaries.

The inaugural Collaborative Water Program cohort consisted of 25 graduate students (17 Masters, 8 PhD) from eight participating Departments:

- Applied Mathematics,
- Biology,
- Civil and Environmental Engineering,
- Earth and Environmental Sciences,
- Economics,
- Environment and Resource Studies,
- Environment, Enterprise and Development,
- Geography and Environmental Management.

Graduate students and faculty interact at the monthly Blue Drinks events hosted by SWIGS.

"We can't be experts in every field, but we can learn to appreciate what other disciplines have to offer and how it might complement our own skills and knowledge".

— DR. MARK SERVOS
Collaborative Water Program Director

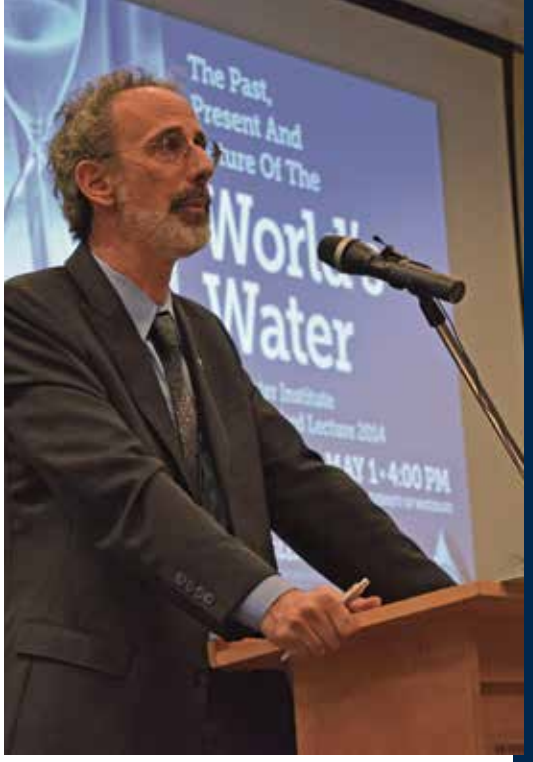
In the initial offering of WATER 601 more than 30 Water Institute faculty members and water professionals from various backgrounds contributed to lectures, seminars and panel discussions on current water issues. Multidisciplinary groups of students were assigned well-known case studies to assess baseline conditions, issues and management options. In the 2014/15 academic year, the inaugural student cohort will complete WATER 602, a project-based course which will allow multi-disciplinary groups to work with a faculty mentor to explore complex water issues in greater detail. In addition, the second Collaborative Water Program cohort will begin studies.

In support of the Collaborative Water Program, the Water Institute recently launched the RBC Visiting Fellows program to attract established water researchers, thought leaders and professionals to the university. Visiting fellows will participate in the graduate program, thereby enriching the learning experience for students, and will also explore collaborative research opportunities with Water Institute faculty.

DISTINGUISHED LECTURE 2014

The Water Institute was honoured to present Dr. Peter H. Gleick, President and Co-founder of the Pacific Institute in Oakland, California, as its 2014 Distinguished Lecturer. Dr. Gleick is a leading scientist, innovator, and communicator on global water and climate issues. He received the prestigious MacArthur "genius" Fellowship in 2003 and has been named "a visionary on the environment" by the BBC. He was elected in 2006 to the U.S. National Academy of Sciences.

Dr. Gleick's lecture, "The Past, Present and Future of the World's Water", reviewed the three "Ages" in water, from early use through the industrial revolution, to what Dr. Gleick considers the ongoing transition to a sustainable water future. He discussed the core of our current challenges, including climate change, energy, agriculture, and ecosystems, and his vision of a sustainable water future.



2014 Distinguished Lecturer Peter Gleick.

STUDENTS OF THE WATER INSTITUTE, GRADUATE SECTION

The Water Institute's graduate students section (SWIGS) was established in 2010 to promote interdisciplinary water research and learning among graduate students from various academic faculties. By 2013/14, SWIGS had over 400 graduate student members from across all six faculties. Under the leadership of the SWIGS executive, a variety of academic, social and outreach events focused on water-related themes were successfully organized and well attended. Of particular note, was the annual World Water Day Graduate Research Fair organized and co-hosted by the Water Institute, SWIGS and Wilfrid Laurier University. The event featured graduate student posters, industry booths, keynote speakers, and a networking reception.

The 2013/14 SWIGS Executive team included:

- **NATHANAEL COUPERUS**
  Chair, Civil and Environmental Engineering
- **BIPRO RANJAN DHAR**
  Vice Chair Academic, Civil and Environmental Engineering
- **LILLIAN KNOPF**
  Vice Chair Conference, Biology
- **LIZANNE PHARAND**
  Vice Chair Operations, Civil and Environmental Engineering
- **CAILIN HILLIER**
  Co-Vice Chair Outreach, Earth and Environmental Sciences
- **SILVIA VLAD**
  Co-Vice Chair Outreach, Civil and Environmental Engineering
- **BRAD WILSON**
  Vice Chair Social, Civil and Environmental Engineering

WATER INSTITUTE SCHOLARSHIP RECIPIENTS 2013-14

We are most grateful to the Platinum members of our External Partners Program for their generous contributions in the form of graduate student scholarships.

AECOM

JESSICA MENDOZA
MSc Candidate, Department of Biology

FEI (ALEX) CHEN
PhD Candidate, Department of Civil and Environmental Engineering

GOLDER ASSOCIATES

SILVIA VLAD
MASc Candidate, Department of Civil and Environmental Engineering

HELEN POWLEY
PhD Candidate, Department of Earth and Environmental Sciences

STANTEC

SCOTT KETCHESON
PhD Candidate, Department of Geography and Environmental Management

RBC WATER SCHOLARS

A major portion of the RBC Foundation grant in support of the Collaborative Water Program is committed to entrance scholarships. The initial group of RBC Water Scholars includes:

MARICOR ARLOS
PhD Candidate, Biology

TARIQ AZIZ
PhD Candidate, Earth and Environmental Sciences

AYMAN KHEDR
MASc Candidate, Civil and Environmental Engineering

JENNIFER MEAD
MSc Candidate, Earth and Environmental Sciences

GHAZAL MEMARTOLUIE
PhD Candidate, Economics

ARUN RAJ
MES Candidate, Environment, Enterprise and Development

GRACE SAUNDERS
MES Candidate, Environment, Enterprise and Development

SARAH SCARLETT
MSc Candidate, Geography and Environmental Management

SARAH SINE
MSc Candidate, Earth and Environmental Sciences

YING ZHOU
MES Candidate, Environment, Enterprise and Development

partnerships

COLLABORATION AT WORK

EXTERNAL PARTNERS PROGRAM

A key strategic goal of the Water Institute is to facilitate partnerships between researchers and members of the private sector, government, civil society or other organizations that have a particular interest in the water sector. In response to this goal, the Water Institute launched its External Partners Program in early 2013.

The External Partners Program builds on the traditional strengths of the University of Waterloo and the Water Institute to develop close associations and collaborative opportunities with water sector stakeholders. Four levels of membership are available to our partners — Platinum, Gold, Silver and Bronze — with commensurate benefits.

Depending upon the membership level, External Partners Program benefits can include:

- Water-related information and news,
- Invitations to the Water Institute's seminar series,
- Introductions to relevant Waterloo researchers to discuss opportunities for collaboration,
- Invitations to the annual Water Institute Research Symposium and Distinguished Lecture,
- Support for student recruiting activities, such as a World Water Day booth or Career Days,
- Recognition through Water Institute graduate scholarships (Platinum members only),
- Recognition and acknowledgment of membership and scholarship support on the Water Institute website and at our Research Symposium.

Platinum Level

AECOM

Golder Associates

RBC Foundation

Stantec

Gold Level

CH2MHILL

Kitchener

Matrix Solutions Inc. Environment & Engineering

The City of Waterloo

WESA a BluMetric company

Silver Level

aquanty

C3 Water

Geosyntec consultants engineers | scientists | innovators

Peterborough Utilities Group

Platinum, gold and silver memberships require a monetary contribution to the Water Institute. We are particularly grateful to these members for their support.

RESEARCH SYMPOSIUM 2014

The Water Institute held its second annual research symposium on May 1, 2014 with 160 people attending. The purpose of the symposium is to showcase the breadth of Waterloo's water research programs, focusing on areas of particular interest to our External Partners, and to provide an opportunity for Partners to interact with researchers and students.

Research Symposium 2014 included several plenary presentations on Key Trends and Emerging Challenges, including drinking water treatment, groundwater research and water and climate change. Three concurrent breakout sessions showcased multidisciplinary research related to specific themes or issues; specifically watershed ecohydrology, global change and resource development. A roundtable was convened with representatives from government agencies, environmental non-governmental organizations and academia to discuss the "Future of the Great Lakes". A particular highlight of the day was a brief session devoted to "three-minute thesis" presentations by Students of the Water Institute, Graduate Section.

The Water Institute's Research Symposium 2014 was immediately followed by our Distinguished Lecture, graduate student poster session and reception.

"At Stantec, we use an interdisciplinary approach to manage increasingly complex water resources projects. Seeing this same approach applied to water research and education resonates with our values and practice, and makes us proud to be a supporter of the Water Institute".

— **STEVE BROWN**
MBA, P.Eng., Canada East
Surface Water Lead, Stantec

Steve Brown presents PhD candidate Scott Ketcheson with the Stantec Graduate Scholarship in Water Research.

RESEARCH CHAIRS

The Water Institute has 15 members who currently hold prestigious research chairs:

CANADA EXCELLENCE RESEARCH CHAIR

DR. PHILIPPE VAN CAPPELLEN
Ecohydrology

CANADA RESEARCH CHAIRS

DR. DAVID BLOWES
Groundwater Remediation

DR. PU CHEN
Nano-Biomaterials

DR. BRIAN DIXON
Fish and Environmental Immunology

DR. JOHN HEIKKILA
Stress Protein Gene Research

DR. JANUSZ PAWLISZYN
New Analytical Methods and Technologies

DR. DANIEL SCOTT
Global Change and Tourism

DR. MARK SERVOS
Water Quality Protection

DR. ED SUDICKY
Quantitative Hydrogeology

DR. JOHN YEOW
Micro and Nanodevices

INDUSTRIAL RESEARCH CHAIRS

DR. PETER HUCK
Water Treatment

DR. JANUSZ PAWLISZYN
New Analytical Methods and Technologies

UNIVERSITY RESEARCH CHAIRS

DR. ROB DE LOË
Water Policy and Governance

DR. SHERRY SCHIFF
Watershed Biogeochemistry

DR. MICHAEL TAM
Functional Colloids and Nanomaterials

CENTRE FOR GOVERNANCE AND INNOVATION RESEARCH CHAIR

DR. THOMAS HOMER-DIXON
Global Systems

looking back

THE FIRST FIVE YEARS

The inaugural strategic/business plan of the Water Institute was approved in 2010, and included the Institute's mission, vision and strategic and operational goals and objectives through 2013. Progress against the business plan was reported in the 2011/12 and 2012/13 annual reports.

Key achievements over the Water Institute's initial five-year mandate (2009/10 to 2013/14) included:

- Established the Institute's governance structure, including the Strategic Planning Committee, Senior Management Committee and External Advisory Board.
- Instrumental in securing $18.5M incremental new research funding, including the Canada Excellence Research Chair in Ecohydrology, Southern Ontario Water Consortium and Communitech DATA.BASE project.
- Supported the Interdisciplinary Workshops Program to develop new skills, networks and collaborations ($150K).
- Led development of the new graduate Collaborative Water Program, and worked with Waterloo Advancement to obtain $1.75M in support from the RBC Foundation.
- Implemented the External Partners Program to strengthen communication and stimulate research collaboration and student recruitment with external organizations.

"Waterloo will allocate current resources and align future resources to support areas of research where we have the greatest potential for world leadership, including quantum science, water and aging."

- Organized two highly successful Research Symposia and three Distinguished Lectures.
- Organized an annual Seminar Series.
- Supported the Students of the Water Institute, Graduate Section (SWIGS).
- Secured support from external partners to provide graduate scholarships in water ($125K).
- Facilitated water-specific agreements with the Helmholtz Centre for Environmental Research (Germany), the University of São Paulo (Brazil), Nnamdi Azikiwe University (Nigeria), Hohai University (China) and the State Key Laboratory of Urban Water Resource and Environment (China).
- Developed various communications channels, including the Institute website, *Splash Pad* newsletter, Twitter account, YouTube channel and annual reports.
- Provided "one window" access for persons outside the University to water-related research activities and services.

In preparation for its five-year review in mid-2013, the Water Institute initiated a strategic planning process. This resulted in updated mission and vision statements and set new goals and objectives in three core areas: research, education and training and brand. The new strategic plan will guide activities of the Water Institute over the next five years.

(left) Visitors from the Mekong River Commission learn about water research taking place at the University of Waterloo. (right) David Schindler delivering a Water Institute Public Lecture.

looking forward

THE NEXT FIVE YEARS

In late 2013, the University of Waterloo issued its new five-year strategic plan "A Distinguished Past — A Distinctive Future" which states **"Waterloo will allocate current resources and align future resources to support areas of research where we have the greatest potential for world leadership, including quantum science, water and aging."** Shortly thereafter, the University renewed the Water Institute for an additional five-year period (2014/15 to 2018/19). With a revitalized strategic plan and the unprecedented support of the University, the Institute's vision of global leadership is within our grasp. The specific goals and objectives of the strategic plan include:

GOALS AND OBJECTIVES

RESEARCH

1. Promote and support relevant, collaborative, interdisciplinary water research.

Objectives:
- » Identify key research challenges, catalyze research teams, develop new projects.
- » Facilitate recruitment of key faculty.
- » Establish fellows program.
- » Establish seed grants program.
- » Strengthen seminar program.
- » Communicate research outcomes.

2. Strengthen global networks and partnerships with leading water organizations and researchers.

Objectives:
- » Grow External Partners Program.
- » Establish cooperative agreements with key organizations.
- » Increase diversity of the External Advisory Board.

EDUCATION AND TRAINING

3. Promote interdisciplinary perspectives in water-related education.

Objectives:
- » Sustain the Collaborative Water Program.
- » Establish fellows program.
- » Strengthen seminar program.

4. Strengthen the capacity of water resources professionals.

Objectives:
- » Assess market needs and training capabilities.
- » Facilitate delivery of training or professional development activities.

BRAND

5. Increase the Water Institute's profile.

Objectives:
- » Secure new physical space.
- » Improve marketing and communications.
- » Increase engagement with the local community.
- » Initiate Public Lecture series.
- » Increase profile with the media.
- » Increase member satisfaction.

VISITING DELEGATIONS 2013/14

- Three Gorges Commission, China
- Mekong River Commission, Laos
- Nanjing University, China
- State Key Laboratory of Urban Water Resource and Environment, Harbin, China
- Desert Research Institute, Nevada, U.S.A.
- DHAN Foundation, India
- University of Bordeaux, France
- Environment Canada/Chinese Research Academy of Environmental Sciences

WATER INSTITUTE SEMINARS

SEPTEMBER 17, 2013

PHILIPPE VIDON
The State University of New York

Multi-contaminant dynamics in riparian zones in the US Midwest: Driving variables, pollution trade-offs, and implications for water and air quality management

DECEMBER 12, 2013

MICHAEL PATERSON
International Institute for Sustainable Development

Towards a new vision for the Experimental Lakes Area

MARCH 12, 2014

MIKE STONE
UWaterloo Department of Geography and Environmental Management

Long term impacts of large scale land disturbance by wildfire on water quality in the Oldman River basin, Alberta

MARCH 24, 2014

LAPOLOGANG MAGOLE
University of Botswana

The Okavango Delta Management Project: Reflection on nearly a decade of process

WATER INSTITUTE INTERDISCIPLINARY WORKSHOPS

The Water Institute supports workshops or small symposia to encourage new initiatives in interdisciplinary water research or education. Workshops are co-ordinated by faculty members and provide an opportunity for a variety of international experts to visit campus and share knowledge. 2013/14 workshops included.

OCTOBER 24-25, 2013

Faculty Co-ordinator: **SARAH WOLFE**
Environment and Resource Studies

Thinking about Water: What, Why and How We Teach to Engage the Next Generation of Interdisciplinary Water Leaders

NOVEMBER 25-27, 2013

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School of Public Health and Health Systems

Water for Wellbeing in Marginalized Communities

MARCH 24-25, 2014

Faculty Co-ordinator: **LARRY SWATUK**
Environment, Enterprise and Development

Healthy Climates: Governance in the Water, Energy, Food and Climate Security Nexus

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Photo by Ben Hlina

FLOATING HOUSES

Amphibious houses that rise and fall with flood waters could help save lives and protect First Nations and other vulnerable communities devastated by flooding every spring. University of Waterloo architecture professor and Water Institute member, Dr. Elizabeth English says amphibious housing allows homeowners to evacuate with peace of mind, knowing that when they return, their houses will have little, if any, damage.

Dr. English was researching the impacts of wind-borne debris at the Louisiana State University (LSU) Hurricane Centre when Hurricane Katrina hit in 2005. She began working on amphibious housing after she witnessed first-hand the needless loss of life and how entire neighborhoods were torn apart by flooding. "My social conscience became so overstimulated that I decided to start working on flood mitigation," says English.

The concept involves attaching pontoons, or "buoyancy blocks", beneath the house. They can be made of expanded polystyrene, empty tanks or barrels, or other combinations of materials that can displace water. When flooding reaches the home it floats up guided by "vertical guidance posts" embedded in the ground next to the house. After the flood disappears, the house settles back down on its original foundation. "The whole thing happens passively so you don't have to be there to do anything," says English.

Dr. English is reaching out to other communities where the technology might prove helpful. While she's looking at Canadian locations like Kashechewan First Nation in Northern Ontario and Peguis First Nation in Manitoba, she's also connected with international regions including Nicaragua and Bangladesh, and also sees opportunities in Haiti, Vietnam, Thailand and the Philippines. "There's a lot of interest around the world," says English. "My work now is more focused on vulnerable at-risk communities in developing countries."

For more information, visit the Buoyant Foundation Project at **www.buoyantfoundation.org**.

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