SPLASH PAD

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BOB GILLHAM
Executive Director
the Water Institute

Reflections on China

I first travelled to China in 1995 to attend a workshop sponsored by the Scientific Committee on Problems of the Environment (SCOPE) being held at Tsinghua University in Beijing. This was well after the Tiananmen Square protests of 1989, and though Chairman Mao had died in 1976, vestiges of his regime, including the occasional Mao uniform and great reverence for the "red book" continued to be in evidence. The streets swarmed with bicycles, the only automobiles were taxis or government vehicles, and though there was great energy and industry, there was little outward evidence of the industrial revolution that was taking hold.

It was exotic! The Great Wall was spectacular, as were the Ming Tombs, and the Forbidden City; the first fast-food outlet in China (KFC) looked ridiculously out of place, the vegetation was lush and foreign, sea cucumber and duck's feet were considered delicacies and the end of a meal was heralded by the arrival of watermelon.

The workshop was focused primarily on groundwater, and though there was great eagerness on the part of the Chinese delegates, the level of technology and scientific enquiry appeared to be wanting. There was reasonable knowledge of the major aquifers and mapping of areas with natural contamination by fluoride and arsenic was in progress. Quantitative skills did not appear to be strong however, and little attention had been directed towards anthropogenic contributions to contamination.

I have had opportunities to travel to China several times over the past 20 years, most recently, this past May, as part of an eight-member Water Institute delegation. The pace of development over this period has been nothing short of blinding. There have been periods when there were more construction cranes operating in China than the total for the rest of the world, and while the office towers and apartment buildings seem to appear like mushrooms, the accompanying infrastructure, including exceptional highways, airports,

The Water Institute delegation and workshop participants from the Chinese Research Academy of Environmental Sciences (CRAES).

One of many wonderful meals enjoyed by Water Institute delegates.

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train stations and municipal services have kept pace. Remarkably, as we discovered during our most recent trip, with no high-speed train service prior to 2007, China now has more high speed rail (16,000 km) than the rest of the world combined. (Unbelievably smooth and quiet at 300 km/hr.)

The purpose of the delegation's visit to China was to explore opportunities for collaboration with Chinese institutions in water-related research and teaching. Clearly successful collaboration requires mutual benefit, and in this respect we believe the current conditions to be favourable. China has a great variety of large, complex and fascinating water-related problems, and while the technical and scientific level of the Chinese researchers has made great advances over the past two decades, in general, they have not yet achieved the depth and breadth of experience common to western researchers. In addition, the Chinese government is now committing substantial resources to environmental improvement. As examples, billions of dollars have been committed to improving air quality and recently $11 B was committed to the remediation of contaminated soil and groundwater. Thus, while we believe we have valuable expertise and experience to contribute, in return we could be afforded an opportunity to participate in some large and dynamic projects.

The delegation visited four cities, all located along the Yangtze River, Chongqing, Wuhan, Hangzhou and Nanjing, and met with representatives from six different institutions. We were well received, the hospitality was truly exceptional and strong commitments to collaboration were expressed. Areas of collaboration that appeared to be of mutual interest included various forms of graduate student and faculty exchange, professor-to-professor collaboration on specific topics, and development of a major investigation that could involve several professors /institutions. There was also considerable discussion concerning methods to initiate and implement collaboration. Further details concerning the specific discussions will be provided shortly in a trip report. In the meantime, I would encourage WI members to consider work in China among your academic activities. There are fascinating research topics and excellent students, and it must surely be one of the most intriguing countries in the world to explore.

We departed China on May 31, with great hope for China-Water Institute collaboration, and comforted in the knowledge that while there have been great changes, some things remain timeless: the duck remains an important source of delicacies (tongues on this occasion) and watermelon continues to signal the end of a meal.

water researchers in the news

DAVID BLOWES RECEIVES NSERC SYNERGY INNOVATION AWARD

David Blowes, Department of Earth and Environmental Sciences, was awarded an *NSERC Synergy Innovation Award*, which recognises partnerships in research and development between universities and industry. David is the Principal Investigator on the Diavik Waste Rock Research Project, a ten-year collaboration with researchers from the University of Alberta, University of British Columbia, Carlton University and engineers at Diavik Diamond Mine. They have been collaborating to develop a sustainable method of mitigating acid mine drainage at Diavik's site in Northern Canada. The results of the research are leading to better mine waste management and better protection of the environment worldwide as other mining companies are beginning to use the methods to improve their mining waste sites.

uwaterloo.ca/science/news/diamond-mine-rough

Susan Elliott, Geography and Environmental Management

SUSAN ELLIOTT RECEIVES FUNDING FOR SCHOLARSHIPS

Susan Elliott, Department of Geography and Environmental Management, received funding for prestigious *Canadian Queen Elizabeth II Diamond Jubilee Scholarships*. This funding allows Canadian students to participate in internships or academic study in another Commonwealth country and they are also available to students from Commonwealth countries to attend a Canadian university for graduate studies. The Scholarships form part of university-designed projects that address pressing local, national and global issues. Susan hopes to bring at least four fully funded graduate students to Waterloo to develop a global wellbeing index similar to the Canadian Index of Wellbeing, a project developed at Waterloo. The global wellbeing index will focus first on countries in east Africa to develop appropriate indicators that can realistically measure wellbeing in low to middle income countries.

uwaterloo.ca/geography-environmental-management/news/susan-elliott-receives-funding-canadian-queen-elizabeth-ii

PHILIPPE VAN CAPPELLEN FEATURED IN RESEARCH2REALITY CAMPAIGN

A new social media and television campaign sponsored by the group Research2Reality was launched in May. It celebrates the success of science research and demonstrates its impacts on people's daily lives. Philippe Van Cappellen, Department of Earth and Environmental Sciences, appears in a video titled "All Life on Earth Depends on Water" and is also featured in an interview discussing access to clean water and balancing the need for clean water for humans and for natural ecosystems.

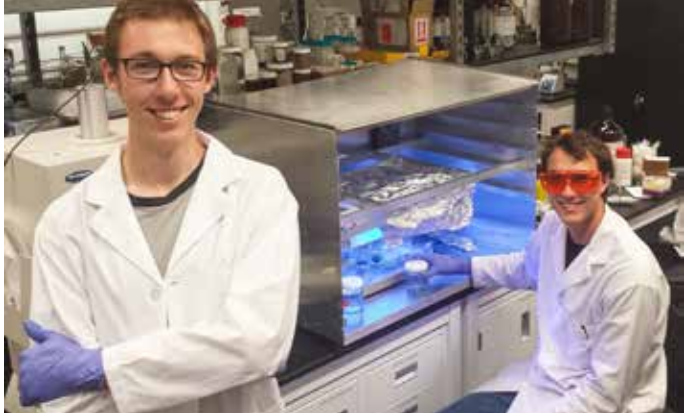
research2reality.com/videos/clean-water

ERS STUDENTS AWARDED FIRST PLACE IN WATER WISE COMPETITION

The top prize in the Canadian Institute of Plumbing and Heating's *2015 Canada's Most Water Wise School Case Competition* was awarded to a team of undergraduate students from the Department of Environment and Resource Studies led by faculty advisor **Sarah Wolfe**. The competition challenged college and university students to identify ways to increase water conservation at their schools. The team of Seana Hadala-Turkington, Chris Nadeau and Catherine Wang was awarded first place with their plan to reduce water consumption in the student residences.

uwaterloo.ca/environment-resource-studies/news/ers-students-win-3000-canadas-most-water-wise-school-case

technology and innovation



PhD students Tim Leshuk and Stuart Linley shed some light on nanotechnology for water treatment

USING NANOTECHNOLOGY TO TREAT OIL SANDS PROCESS-AFFECTED WATERS

Over the past decades, mining operations in the Athabasca oil sands have dramatically expanded. The conventional industrial process uses alkaline hot water to extract surface-mined bitumen, producing large volumes of oil sands process-affected water (OSPW) in the process. Due to leaching of pollutants into the water during the extraction process, OSPW has been found to be acutely and chronically toxic to many forms of life, and is stored in tailings ponds on site due to the industry's self-imposed "zero-discharge" policy for this water, as it is not suitable for release back to the environment. The toxicity of OSPW arises primarily from dissolved naphthenic acids, which are highly persistent organic pollutants recalcitrant to many attempted forms of treatment, including biodegradation over the period of decades. A wide spectrum of treatment techniques have been researched for treating this water, but no practical solutions have been identified, and an estimated 1 billion tonnes of OSPW has been accumulated to date in over 170 km^2 of tailings ponds in Alberta.

Here at the University of Waterloo, Professor Frank Gu, Canada Research Chair in Nanotechnology Engineering, is leading a team of researchers to develop new wastewater treatment methods to solve this challenging problem. Nanotechnology has great potential to address environmental issues, as nanostructuring offers access to new material properties, while high specific surface areas lead to exceptional treatment activity and efficiency. In Gu's lab, PhD students Tim Leshuk and Stuart Linley are working to design and synthesize photocatalytic nanomaterials for environmental applications. Photocatalysis is an extremely powerful advanced oxidation process (AOP) which can utilize sunlight to drive treatment of surface waters, with the potential to address a broad spectrum of organic contaminants. Leshuk, Linley and their co-workers in Gu's lab recently demonstrated the potential of photocatalysis to completely remove toxic naphthenic acids from OSPW, where the advantages of this process are easy scalability and the ability to recycle the catalyst for multiple uses. Effective nanoparticle recovery following treatment has previously been a roadblock to large-scale implementation of photocatalysis, but the team have developed innovative nanoengineering solutions to address this challenge.

The facilities at Waterloo are among the best in Canada for enabling innovative cross-disciplinary research in nanotechnology for water treatment, hosting both the Water Institute and the Waterloo Institute for Nanotechnology (WIN). Prof. Gu's lab is based in the Mike & Ophelia Lazaridis Quantum Nano Centre (QNC), a state-of-the-art $250 million research facility stocked with advanced equipment required to develop and characterize new nanomaterials. "While nanotechnology may require advanced instrumentation to research, nanoparticles themselves can be very low-cost to produce," says Leshuk. "We can bring conventional Chemical Engineering processes to bear for large-scale production."

Leshuk, Linley and Gu are currently working hard to develop and scale-up their water treatment technology for industrial application, and exploring commercialization options to bring the proven benefits of nanotechnology from the lab bench to the treatment plant.

nanoengineering.uwaterloo.ca/research.html

water institute news

WATER INSTITUTE SEED GRANTS AWARDED

In November 2014, the Water Institute launched its new Seed Grant Program to stimulate interdisciplinary collaboration, to facilitate interaction with international authorities, and to encourage the development of research proposals. With the available funds ($100K), we were able to support six of the eight proposals received. A call for proposals for the 2015/16 program will be initiated in the Spring/Fall 2015 terms.

The principal investigators, co-applicants and seed grant project titles are:

» **Nandita Basu**, Peter Deadman, Prateep Nayak, Johanna Wandel
Monsoon Harvests in rapidly changing landscapes: Understanding the role of the ancient tank irrigation systems in increasing climate change adaptability

» **Susan Elliott**, Shannon Majowicz, Robert Case, Corrinne Schuster-Wallace
Empowering women through WaSH across the lifecourse

» **Stephen Murphy**, Bruce MacVicar, Derek Armitage, Rebecca Rooney, Paul Ryan
Comparative indicators of socio-ecological resilience and restoration of aquatic ecosystems

» **Josh Neufeld**, Sherry Schiff, Merrin Macrae, Lingling Wu
Microbiology of Archaean ocean analogues within the Experimental Lakes Area: Implications for cyanobacterial blooms, mercury cycling, and beyond!

» **Jonathan Price**, David Rudolph, Rich Petrone, Rebecca Rooney, Piet-Louis Grundling, Althea Theresa Grundling
Incorporating wetlands for water management in reclamation of post-mined landscapes

» **Fereidoun Rezanezhad**, Philippe Van Cappellen, Tony Endres, Lingling Wu, Jonathan Price, Trevor Charles, Alex Furman
Capacity building in hydrobiogeophysics (HBGP) at the University of Waterloo

Symposium speakers Bruce MacVicar and Bryan Grimwood

Sunita Narain delivers the 2015 RBC Distinguished Lecture

RESEARCH SYMPOSIUM 2015

The Water Institute's third annual Research Symposium, held on April 30th, was a resounding success, setting a new milestone for participants. The presentations touched on several areas of water research at Waterloo, including Cold Regions Research, Water Sustainability in Waterloo Region, Urbanization Impacts on Water, and Nanotechnology and the Water Sector. The day began with an insightful session on Water Security for First Nations in Canada with invited presentations from Steve Hrudey (University of Alberta), Irving Leblanc (Assembly of First Nations) and Merrell-Ann Phare (Centre for Indigenous Environmental Resources). A graduate student poster exhibition showcased the broad range of water research occurring at Waterloo and provided an opportunity for participants to discuss the research interests and endeavours with the students. Many of the Water Institute's External Partners attended the symposium and appreciated the chance to network with each other, water researchers and students. Thanks to all of those who contributed to the symposium and attendees.

The Research Symposium was followed by the Water Institute RBC Distinguished Lecture, delivered by Sunita Narain, Director General for the Centre of Science and Environment, India. Dr. Narain's talk "Challenges for Water Security in the Poor's World" was very engaging and relevant to Canadian water research and education. Her lecture can be viewed on the Water Institute YouTube channel.

youtube.com/playlist?list=PLawkBQ15NDEkajDjQxgbRZIqXCKXbvtJJ

collaborative water program

PROGRAM UPDATE

The Collaborative Water Program has become very successful in only its second year. Twenty nine students from eight departments across campus participated in Water 601 this winter (led by Mark Servos, Biology and Simon Courtenay, Environment and Resource Studies) and examined a diversity of case studies of water issues ranging from historical issues such as John Snow and cholera outbreak in London to the current droughts in California. Focusing on peer-to-peer learning, groups of students, supported by faculty interaction, explored interdisciplinary concepts, processes and case studies that provided a forum for discussion and debate. The second field oriented course in the series, Water 602, is being offered this fall using the Grand River watershed as the classroom with on-site interaction with researchers and water managers, thus providing an opportunity to further explore the complexities of integrated water management and security. Anyone interested in the Program should contact the Water Institute or their Faculty Graduate office.

2015 RBC WATER SCHOLARSHIP RECIPIENTS

A significant part of the RBC Foundation's multi-year gift to the University of Waterloo is the RBC Water Scholarships. The scholarships were formally awarded prior to the RBC Distinguished Lecture on April 30th. The Water Institute is pleased to announce the 2014/15 recipients.

» **Aurleia Adams**, MArch Candidate, School of Architecture

» **Rachel Baldwin**, MSc Candidate, Department of Earth and Environmental Sciences

» **Nicole Balliston**, MSc Candidate, Department of Geography and Environmental Management

RBC Water Scholars. back row: Hongli Liu, Alexandra Crichton, Lauren Smith, Behrad Ghardegaghloo; Front row: Sajida Sultana, Jessica Leung, Maricor Arlos, Ehsan Pasha, Ashok Selvaraj

» **Catherine Brown**, MSc Candidate, Department of Geography and Environmental Management

» **Aaron Coutino**, MMath Candidate, Department of Applied Mathematics

» **Behrad Gharedaghloo**, PhD Candidate, Department of Geography and Environmental Management

» **Jessica Leung**, PhD Candidate, Department of Biology

» **Hongli Liu**, PhD Candidate, Department of Civil and Environmental Engineering

» **Katie McCann**, MSc Candidate, Department of Biology

» **Tatjana Milojevic**, MSc Candidate, Department of Earth and Environmental Sciences

» **Md. Abdus Sabur**, PhD Candidate, Department of Earth and Environmental Sciences

» **Lorenzo Simonetti**, PhD Candidate, Department of Civil and Environmental Engineering

» **Lauren Smith**, MES Candidate, School of Environment, Enterprise and Development

» **Evelyn Worthington**, MSc Candidate, Department of Biology

students of the water institute

GRADUATE SECTION

While many of us are busy with field work this time of year, SWIGS is still going strong and keeping busy! We have a lot planned for the coming months and year, so be sure to stay tuned and to check the SWIGS website and Facebook often.

NEW EXECUTIVE COMMITTEE

We are thrilled to welcome our new executive team for 2015/2016. Interested in helping out? E-mail water.grad@uwaterloo.ca for more information. Vice Chair Conference and volunteer opportunities are available.

Chair:
Catherine Brown
Environment, Geography and Environmental Management

Vice Chair Operations:
Lauren Smith
Environment, SEED, Sustainability Management

Vice Chair Social:
Nicole Balliston
Environment, Geography and Environmental Management

Vice Chair Outreach:
Katie McCann
Science, Biology

RECENT EVENTS

» March 23: World Water Day 2015
The theme for UN World Water Day this year was Water and Sustainable Development. The event was co-organized by graduate students at UWaterloo and Wilfrid Laurier University (WLU), and this year was hosted by WLU. The day was a great success with knowledge sharing of graduate research and great guest speakers.

» April 18: SWIGS Group Rock Climb
It was a fun day of fitness and climbing at Grand River Rocks. Stay tuned for more exciting events in the coming months.

» April 30: Water Institute Research Symposium
Graduate poster exhibition, lectures, scholarship presentations, and the RBC Distinguished Lecture from Dr. Sunita Narain.

UPCOMING EVENTS

Join us for our upcoming events.

» SWIGS Blue Drinks
June 16th; July 15th; August 19th. 6:30 – 8:30 p.m. upstairs at the Grad House. Join us for food, drink, and great water conversations!

» SWIGS September BBQ
Details TBA

CONTACT US

swigs.uwaterloo.ca
(Find out more or contribute to our blog!)
water.grad@uwaterloo.ca (Join our mailing list!)
facebook.com/uw.swigs (Engage in conversation!)
@UW_SWIGS (Updates at events and news of water interest!)

water institute external partners program

Platinum Level

AECOM

Golder Associates

RBC Foundation

Stantec

Gold Level

ch2m

Kitchener

Matrix Solutions Inc. ENVIRONMENT & ENGINEERING

The City of Waterloo

Steve Brown of Stantec with Ye Zhou, MASc candidate (Civil and Environmental Engineering), winner of the Water Institute Graduate Scholarship 2014-15.

David Smyth of Golder Associates with Maricor Arlos, PhD candidate (Biology), winner of the Golder Associates Graduate Scholarship in Water 2014-15. Not pictured is Colin McCarter, PhD candidate (Geography and Environmental Management).

EXTERNAL PARTNER — SUPPORTED SCHOLARSHIPS

The Platinum Level External Partners of the Water Institute, AECOM, Golder Associates, and Stantec Consulting, generously supported five graduate scholarships in water research during the 2014/2015 academic year, each valued at $5,000. The scholarships were available to Masters and PhD students conducting water-focused research. There was a highly competitive field with 28 outstanding applications being received from across four faculties. The scholarships were awarded on April 30th at Research Symposium 2015.

The Water Institute is grateful to all of our External Partners that were able to attend the symposium and particularly to those that contributed to the program.

Contact Grant Murphy at g3murphy@uwaterloo.ca or at 519-888-4567, ext. 31883 to find more information about the External Partners Program.

Paul Murray of AECOM with Gregory Lui, PhD candidate (Chemical Engineering), winner of the AECOM Graduate Scholarship in Water 2014-15. Not pictured is Kai Liu, Masters of Science candidate (Earth and Environmental Sciences).

the water INSTITUTE

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