Information and news from WIRC @ Bath.

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Water Innovation & Research Centre | UNIVERSITY OF BATH

Dear all,

The summer holidays are coming to an end now. Before the summer we had a very successful 1st WIRC Water Science and Engineering conference. Also our Strategic Advisory Board met for the first time in July. It was exciting meeting, where our new research themes were discussed and agreed. The coming time will focus on further development of the research themes and a strategy to capitalise on the research outputs. This newsletter will report on these events and a few other interesting activities that took place over the summer.

Jan Hofman
Director WIRC @ Bath

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Looking back at the 1st WIRC Water Science and Engineering Conference

To mark the launch of our Water Innovation & Research Centre (WIRC @ Bath), we held our 1st WIRC Water Science and Engineering Conference. Two days of exciting presentations by international renowned speakers and our own researchers on a broad spectrum of water research. The conference brought together an audience of around 75 persons.

The conference was opened by Prof Bernie Morley, Deputy Vice-Chancellor and Provost and two inspiring keynote speakers. The first keynote was by Colin Skellett, the CEO of Wessex Water. He presented on 'A successful 21st century water company: more of the same, or some new approaches?'. According to Skellett, the priorities for future research are on how to deliver excellent customer service, how to achieve zero leakage on the long term, how to control diffuse pollution and manage surface water, especially in times of excessive rainfall, what at the best options for carbon footprint and how can technology applied from other sectors. The second keynote was given by Tony Rachwal, Director at the UK Water Partnership. He explained the mission and activities of the Partnership. Their main focus is to get stimulate innovation and increase

very lively panel discussions.
The conference ended with a closing address by Professor Eugene Cloete, Vice-rector of Stellenbosch University. He presented the amazing possibilities of nanotechnology for water treatment.
At the conference around 40 posters were on display and poster prizes were awarded:

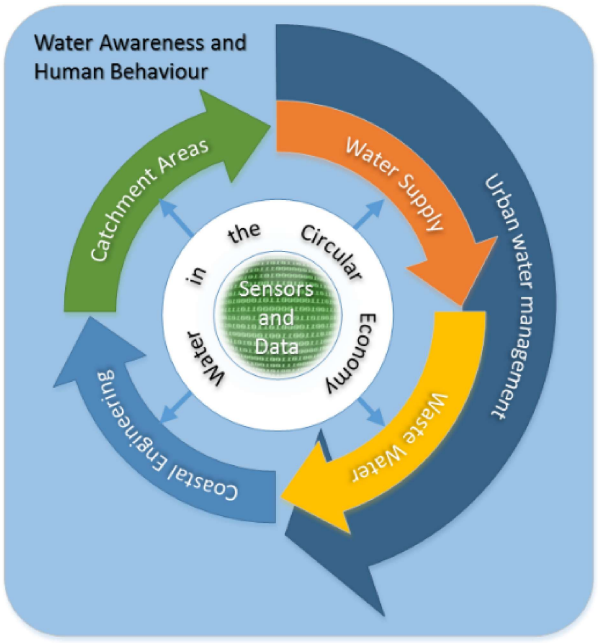
1. Svenja Mintenig, **Patrick Bauerlein**, Albert Koelmans Stefan Dekker, Annemarie van Wezel: *'Closing the gap between small and smaller'*
2. **Caitlin Taylor**, Jannis Wenk, Davida Mattia: *'Exploring membranes for bubble-less ozonation in water treatment'*
3. **Mr. Mukheled Al-Sameraiy,** Darrell Patterson: *'Comparison of Homogeneous and Heterogeneous Photocatalysis of PEG Synthetic Industrial Wastewater'*

Upcoming Events at Bath

17 November 2016: WIRC Colloquium - "Assessing the element of surprise of record-breaking flood events", Dr Thomas Kjeldsen, Department of Architecture & Civil Engineering, University of Bath

New research themes WIRC

In spring we started to restructure the research themes of WIRC. The idea was to create research themes that have a better alignment witht he grand challenges of the water sector. Each theme is led by two theme leaders.



Urban Water Management

Increasingly people are living in an urban environment - worldwide more than 50 % of the population live in urban areas, and often in big or mega cities. In Europe more than 70 % of the population lives in urban areas. From this it is obvious that urban water management is an important issue for both water companies and urban planners. The urban water management theme investigates water the management aspects of the urban environment in its broadest sense. This includes domestic and commercial water use, water quality in relation to intended use (water fit for purpose), water as component of urban systems design, smart buildings and cities, and the role of water in climate adaptation and resilience.

Theme leaders: Thomas Kjeldsen and Barbara Kasprzyk-Hordern

Catchment area management

Catchment areas are important production assets for water companies, and natural focal points for stakeholders. Catchments are important as resources for drinking water production, but also for agriculture, tourism, nature, and as a

via inappropriate water use or discharge. Water companies are an important stakeholder in catchment management in terms of water supply. Land use and human activity have an important influence on water quality of ground water and surface water that may be used as resource for drinking water production. Water utilities also have an important influence on catchment water quality through the discharge of treated waste water. Catchment area management strategies are therefore of crucial importance for water utilities, but also for the wider stakeholder population. This theme will develop novel catchment management principles (e.g. through permitting systems) for water utilities and other stakeholders interested in the whole water cycle, such as citizens and the water regulators, and translate them into use.
Theme leaders: Barbara Kasprzyk-Hordern and Marcelle McManus

Water supply from source to tap

This theme aims to develop an integrated approach for water resource management, advanced water treatment, and water supply systems, to deliver drinking water in a robust and sustainable manner which complies with modern standards. It will also include demand forecasting, water supply network design, leakage reduction and prevention, and development of tools for evaluation of the resilience and sustainability of the water supply network in the face of climate change.
Theme leaders: Jannis Wenk and Lee Bryant

Waste water collection and treatment

Waste water collection and treatment is important to protect the aquatic environment. Wastewater also contains valuable resources (water itself, feedstocks for biofuels & bioplastics, nutrients, metals, etc.) which can be recovered and reused. In the waste water collection and treatment theme the focus is to develop novel waste water treatment and processing options. This includes rethinking of sewer systems as components of waste water treatment systems, and the development of new treatment technologies for added value recovery and modular development.
Theme leaders: Tom Arnot and Rod Scott

Water in a circular economy

Almost all future visions of sustainability endorse or incorporate the concept of the circular economy. This approach aims to reduce waste production as far as possible, and then to recover waste materials and residuals as a valuable resource. In addition to reducing consumption of natural resources, this

water cycle is itself an important source of resource, comprising: water, nutrients, and feedstocks for biofuels or bioplastics.
Theme leaders: Ana Lanham and Alistair Hunt

Sensors and data

Development of robust and reliable sensors for water quality and water quantity is a growing need. Using sensors and data can create new services for customers, can lead to further optimisation of water supply and water treatment systems, and can connect the water sector to the development of the Internet of Things. This theme is inherently related to all of the other themes. The focus will be on the development of new sensors for water quality and system monitoring. The use of data from these sensors, data transmission and communication, integrated systems in the water cycle, and real time adaption and forecasting are also important.
Theme leaders: Pedro Estrela and Philippe Blondel

Water awareness and customer behaviour

To enhance sustainability and reduce costs it is crucial that people are aware of the role of water and the effect that their water use and habits have on the water environment and therefore management of water resources. Water consumption and waste water production are a direct result of people's behaviour. For water utilities it is important to understand how people use their water and how their behaviour can be influenced to improve the operation of the water supply chain and drainage / sewerage systems, and to reduce costs and risks for the environment. The use of tariffs is not effective in influencing human behaviour, and alternative approaches have to be developed to make customers aware how they can help to improve the water cycle as partners in the process. This theme will investigate new ways of influencing domestic and commercial users of water, and of engaging with citizens in partnership to help better manage and sustain local water systems.
Theme leader: Ian Walker

Coastal/Ocean Engineering

Many people live in large urban areas near the coast. This is because the oceans are often a vital resource for society, and because of economic/trading activity, transport systems, access to marine food resources, tourism, and there is now the potential for tidal energy production etc. Climate change is making coastal areas vulnerable and insight into the effect of climate change on coastal

Flood protection from upstream rainfall is an important aspect, and coastal areas are also important for their nature and biodiversity. This theme will investigate all aspects of coastal water management.
Theme leaders: Philippe Blondel and Chris Blenkinsopp

Bath to host next edition of the UK-IWA Young Water Professionals Conference

Water is a global resource that impacts lives, economic activities and different ecosystems across the world. It has no boundaries. This makes having a career in water one of the most rewarding professions but also very challenging. Traditionally water professionals were engineers, mostly civil, mechanical and then environmental engineers: they built pipes, they applied technologies, and they solved problems. However, the water sector is increasingly realising they also need ecologists, behavioural scientists, marketing professionals and economists, amongst others. The sector also realises that it cannot continue to quietly and reactively extract massive quantities of water from the natural source and then treat the used water back into its original form. It must plan ahead, it must intervene in society, it must influence customer behaviour, it must act to prevent instead of only remediating.

Next year in April, the University of Bath together with Wessex Water, through the Water Innovation and Research Centre, will host the next edition of the UK-Young Water Professionals (YWPs) Conference. The conference will focus on the challenges and opportunities for an effective communication of knowledge on water management across different boundaries. How can crucial water topics be discussed across disciplines, people, sectors etc. For example, how can you find inter-sectorial solutions, how can you influence policy-making, how can you best cooperate under a multi-disciplinary environment and how can you make the most of cross-generational mentoring and exchange?

It has now been over 17 years that the UK YWPs have been annually meeting to share experiences, to further their career development and to create useful networks that reinforce the sector across academia, industry and regulators. The YWPs is part of the wider International Water Association community (IWA)

regional and international IWA or YWPs events from specialist conferences to global congresses such as the World Water Congress, present numerous opportunities for increasing the visibility of YWPs as well as for career development and mentorship.

In 2016, the UK-YWPs conference was a fantastic success organised by the University of East Anglia in partnership with Anglian Water (you can read about it here) that brought together academia, industry and regulators around the very interesting triple bottom line sustainability concept, coined by John Elkington: People, Planet and Profit. In 2017, the 18th edition will hopefully match that success and continue to attract a large base of YWPs both nationally and internationally in order to foster their development and solidify a much needed network of opportunities, ideas, skills and best practices. In addition to the YWPs conference, WIRC will also simultaneously host the first UK edition of the Wetskills Water Challenges. This is a two-week workshop-based event targeting early career water professionals and postgraduate students that work in teams on real-life transdisciplinary cases of the water industry or water regulators. Participants of Wetskills will deliver their conclusions at the YWPs conference.

18th UK Young Water Professional Conference: **10-12th April 2017**

First Wetskills UK: 30th March – 12th April 2017

Prestigious PRIMaRE-2016 conference galvanises the Bluetech sector

The University of Bath is proud to host the 3rd PRIMaRE Conference on the 5-6 July 2016 as part of the 50th anniversary events by Dr. Jun Zang (Director of WEIR Research Unit), with Dr. Philippe Blondel (Deputy Director of CSAOS), and Prof. Andrew Plummer (Director of PTMC), to address challenges facing the marine renewable energy industry at the regional, national and international level. This annual conference provides an excellent opportunity to bring together leading researchers and engineers to exchange the latest research and development, as well as networking and fostering collaborations on Marine Renewable Energy.

The conference is a key part of the marine renewable energy calendar, and its 2016 edition showed the trademark characteristics of our University: leading international researchers presenting world-class science, with strong collaborations between academics and industry. The best poster presentations were rewarded with attractive prizes, and were all won by early-career female scientists. The large geographical distribution of the audience was nicely compounded with the presence of many young scientists. The panel discussions showed the way ahead for marine renewable energy research, and its increasing impacts toward sustainable electricity generation.

More details about the conference can be found at press release.

South Africa Diary

by Olivia Cooke, PhD student in Civil Engineering, University of Bath

- Olivia recently participated in the exchange programme in Stellenbosch University, South Africa.

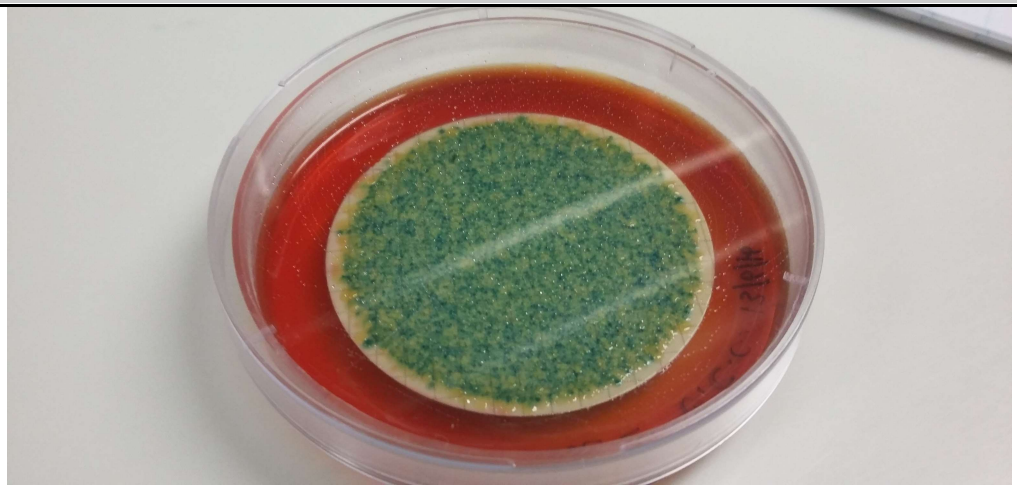
"I cannot believe that I have been here for a month and a half so far. Time has gone by so quickly swallowed up by microbiology training and getting my head around working in a laboratory. My training has consisted of indicator

how to analyse the DNA extracted using PCR. There is so much time needed just to analyse one sample, but as I get more familiar with the process, my speed increases.

My first trip to Enkanini, involved the rain gauge being installed within the settlement on top of one of the rainwater tanks that belong to Stellenbosch University, sitting between my sampling sites. In terms of my sampling I have been and collected water twice from Enkanini. The rain has been fairly infrequent so far, and locals tell me that in the last few years, the rainy season

Stellenbosch has been incredibly dry so rain is very much needed over the next few months.

Each time I go into Enkanini I am still amazed at the dramatic difference in living conditions between the settlement and the town, despite a distance of only about 3km. To go from a tourist town in the heart of vineyards to an informal settlement of small huts and shacks. When you walk through the settlement, you notice the piles of rubbish lying in ditches and on the side of the road, the blocks of toilets and Porta-loos, houses made from crates and corrugated metal, goats and chickens roaming free, and children running barefoot over the mud and dirt roads. Prior to any analysis of my water samples, the likelihood of contamination could be predicted due to the smell of the water, similar to that of sewage, which flows right next to the houses. Rainfall in Stellenbosch is often intense and even within the town, a day of rainfall can lead to flooding on the roads due to water not being able to drain fast enough. Within Enkanini, the steep slopes immediately become a muddy mess after the rainfall and water flows down side channels of the roads and paths between houses. Going in for my second sample, a local stopped and asked us what the work was that we were doing when I was collecting water from one of my sites. Apparently locals are often worried with new research as they worry in case firstly there is a problem with the drinking water and secondly whether sampling would need to be done within their homes- worried about a problem and also an invasion of their privacy (the university uses a general explanation of testing water in terms of rainfall so as not to spread panic). Though each time we go in the locals are friendly, as they are now quite used to seeing students around due to the ongoing work within the settlement using the rainwater harvesting systems.



Whilst I am still working on my first samples and the analysis of them, from a first glance there is significant pollution within the samples including high counts of faecal and total coliforms and enterococci. PCR work and chemical analysis still needs to be undertaken on my samples. I am learning so much regarding the microbiology side to my project and am excited about how my project will go forward once I have collected more samples and further analysis, to bring together data from all the disciplines, which my project encompasses. I am very lucky with the combination of my three supervisors, Dr Lee Bryant and Dr Thomas Kjeldsen at University of Bath and Dr Wesaal Khan at Stellenbosch University, which ensures the multidisciplinary nature of my project and enables me to benefit from their expertise. I also cannot stress enough, how incredibly lucky I am to be in this lab with Dr Khan's students to learn about microbiology from them. They are so kind in the willingness to help me and I am really enjoying studying at Stellenbosch University and experiencing South Africa."

Upcoming Conferences

9-13th October: World Water Congress & Exhibition 2016 Brisbane, Australia