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Inside this issue:

1. Introduction
2. A Word From The President
3. Events
4. Research Progress
5. Our Alumni
6. Recent Activities
7. Future Activities
8. Publications
9. Sudoku

1. Introduction

This issue of the IAHR Cardiff Young Professional Network (YPN) newsletter provides an update on the events of the past few months. We are pleased to report on the success of the latest activities organised by the new IAHR Cardiff YPN committee led by President Stephanie Muller.

The highlights of recent months covered within this newsletter include the workshop on Computational Resources in Research, which was co-organised with the WISE CDT in March, at which several HRC members presented their latest research and helped with the organisation of this significant workshop. The YPN Autumn Meeting provided the opportunity for six of our members to share their interesting and innovative work in the field of water research.

News of recent research progress is outlined by Shahla Nassrullah and Alex Stubbs, and future seminars held by the YPN committee are also featured.

2. A Word From The President

The past six months has seen much change for the YPN with many students moving on to different projects, friends graduating and the coming and going of many visiting students. We are pleased to represent the interests of our members and are excited about the opportunities that we have coming in the next term.

Over the course of the spring we were pleased to host a badminton event as well as a trip to see the Severn Bore at Minsterworth. Additionally, we saw the introduction of an informal monthly lunch to create room to discuss research challenges and share ideas - a perfect opportunity to bring everyone together. We hope to continue to organise events that interest you so get in touch through social media to share your ideas and get involved.

In the coming months we are looking forward to welcoming speakers from across the GW4 universities and other professional organisations. We are aiming to provide our members with the opportunity to share their research whilst strengthening our relationship across different departments and universities as well as the Water Research Institute and other CIWEM contacts. We hope to extend these seminars and to be able to welcome new speakers from industry, government and different research groups.

Through these activities we hope to spread our research and the word about our young professional network. To this end, special attention has been given to our Twitter page with the planned expansion of the use of Facebook and our official YPN homepage to reach a wider audience. We hope that an increased social media presence will help us attract new speakers, create new contacts and open new doors for cooperation. Therefore, we would like to encourage everyone to get involved by sharing their stories and research using our online platforms.

-- Stephanie Muller

3. Events

YPN Autumn Meeting

30/11/2018

Our annual YPN autumn meeting took place in November. The event was a great success with around 30 attendees from YPN and HRC. It was great to see such a range of topics as well as how they crossed over and interlinked. All presenters did a fantastic job at presenting clear and informative work, which made for a dynamic and interesting meeting.



Figure 1: YPN Autumn Meeting.

We would like to thank the speakers:

- Nefeli Makeygianni
- Bikash Ranabhat
- Meirong Zhou
- Shanshan Deng
- David Furnues
- Elizabeth Follett

As well as Professor Shunqi Pan for helping to organise the meeting and without whom it would have not been such a success.

Computational Resources in Research

26/03/2019

This workshop on Computational Resources in Research was co-organised by the WISE CDT was hosted by the IHR Cardiff YPN in March. The event was opened to our HRC group who were joined by colleagues from the Data Innovation Research Institute and researchers from University College London and Bath University.

The day was divided into two study areas with the morning focussing on the recent progresses of Hydro3D. This session was of most interest to Hydro3D users with discussions on recent research progress, updated code versions, published papers and online repositories.

The afternoon presentations looked at the broader topic of Computational Resources in Research. Speakers from three different universities and departments from Cardiff University contributed excellent presentations, with topics including Artificial Intelligence, "Big" Data, optimisation using genetic algorithms and the use of Python in research. The day concluded with practical illustrations on the use of Mendeley and Tecplot which proved to be beneficial to many HRC members.



Many thanks to Pablo Ouro for directing and leading this event.

- Jingjing Xue

4. Research Progress

Spring Research Update

By Shahla Nassrullah

Colmation occurs by straining and settling of suspended sediment as water moves through the river bed material, as well as due to other causes such as microbial transport. This phenomenon has multiple effects on the supply of oxygenated water to incubating salmon embryos. The impacts are threefold; it reduces oxygen in intra-gravel, affects fine particles such as clay in the exchange of O₂ through the egg membrane, and affects interstitial flow velocities and gravel permeability due to the accumulation of inorganic and organic sediment. In contrast, decolmation is the resuspension of deposited fine particles which increases hydraulic conductivity.

Reach-scale alterations of the physical characteristics of streambed substrate can be quantified by hydraulic conductivity such as clogging which leads to low hydraulic conductivity in reaches. At this time, more work is required to understand large-scale patterns of change in the hydraulic conductivity of rivers.

Knowledge of rough-bed flows is important for river engineers and environmental scientists because most natural overland flows and open channels belong to the category of hydraulically rough-bed flows. These overland flows and open channels affect fine sediment transport, which has a harmful effect on fish spawning and incubation, invertebrate development, as well as oxygen availability by colmation with low velocity. Oxygen concentration increases with increasing hydraulic conductivity by decolmation at high velocities. Therefore, the objective of this study is to better understand the turbulent flow conditions near bed and interstitial flow by measuring the velocity profile above a rough gravel bed.

WISE ESPRC CDT –

Overseas Research Placement

By Alex Stubbs

Based at the University of Canterbury, New Zealand for 3 days per week and at Aqualinc Research Limited, New Zealand for 2 days per week I continued my research into the use of Large-Eddy Simulation (LES) to model near-bed and pore-space turbulent flow in gravel riverbeds. During this placement, my research focused on model development using the finite difference LES code, Hydro3D. This included the successful application of a novel 3D meshing technique to the geometry of an artificial riverbed created using CAD, as well as the mathematical analysis of that geometry in comparison with natural riverbeds. During my time at the University of Canterbury I was exposed to the latest experimental research using PIV, ADV, PTV and other novel techniques. Such experiments are not currently possible at a similar scale at Cardiff University. The opportunity to learn from this experience has greatly benefited my understanding of this type of experimentation and has the potential to enhance my research which uses experimentally derived data. Whilst at Aqualinc I had the opportunity to actively contribute to a funding proposal led by the company in-conjunction with the University of Aberdeen, University of California Santa Barbra, University College London and the University of Canterbury. Whilst in New Zealand I also wrote and published my first journal article and co-authored a second article which is currently under review. This placement has been a real highlight of my PhD, both personally and academically, and I am very grateful to Prof. Thorsten Stoesser, Prof. Roger Nokes and Dr. Andrew Dark for enabling such an opportunity.



Figure 2: Packhorse Hut overlooking Lyttelton Harbour/Whakaraupō

5. Our Alumni

Jonathan King



For those of you that don't know me, my name is Jon and I've spend the last four years studying for a PhD at the HRC under the supervision of Dr Reza Ahmadian and Prof. Roger Falconer. I originally started at Cardiff back in 2009 to study Civil Engineering and after a brief stint working for a building contractor upon graduating was tempted back.

My work focussed mainly on numerical modelling of bacterial processes in coastal waters, a large part of which was applied to a case study of the water quality in Swansea Bay. I was also lucky enough to be awarded funding to visit Tsinghua University in Beijing for three months to carry out a study on the impact of turbulence on pollutant transport.

Unfortunately after eight years of university it had to come to an end and I finally submitted my PhD thesis back in January. Just the viva to go now!

Since September I've been working full time for JBA Consulting in their Newport office. My work involves a mix of engineering and hydraulic modelling, with a focus on flood risk, and though mostly office based has the occasional site visit thrown in. Though I can't mention any specific projects, I'm currently involved in a range of schemes within Wales which range from small to large coastal and fluvial studies.

Working as a consultant is a definite change from studying for PhD but one I've so far enjoyed. It's great to see research applied in practice and I can already see how much of the work going on at the HRC will be of value to industry in the future.

Stefan Runge



I feel very privileged to have had the opportunity to spend three years on an industry part-funded PhD research project at Cardiff University aiming at understanding the behaviour of a novel freestream vertical axis twin turbine which harnesses energy from the movement of water in a canal environment.

Experimental tests of a 1:10 scale model were carried out in the Hydro-Environmental Research Laboratory at Cardiff University in order to perform a comparison between the hydrokinetic energy available and the extracted energy. The wake recovery downstream of the turbine was investigated to predict the interaction between turbines in an array. Moreover, the electrical components needed for operating the turbine at different scales were investigated and a control strategy for the maximum power point extraction was developed.

In order to justify system functionality and performance in a relevant environment as well as up-scalability, a 1:3 scale model of the twin turbine was successfully implemented and tested in a discharge channel of a water treatment plant in Atlanta, Georgia, USA. This paved the way for a full-scale application which was effectively installed, deployed and tested in the South Boulder Canal near Denver, Colorado, USA.

Finally, the development stages of the twin turbine system were benchmarked by performing the Technology Readiness Level (TRL) assessment procedure. It was shown that the described turbine reaches TRL 7.

Since October 2018, I have been employed with the Carbon Trust where I work on wide-ranging consultancy activities to help public and private sector clients become more energy efficient, reduce their environmental impact and integrate renewables in their operations.

6. Recent Activities

Badminton

We held our first badminton tournament of the season back in February at Talybont sports centre, motivating members to compete and have fun!



Figure 3: YPN Sports-Badminton

Trip to Severn Bore



Figure 4: Severn Bore trip to Minsterworth

Our first field trip of the year took seven of our members to Minsterworth on the Severn Estuary to witness the tidal bore at the Spring Equinox. This evening out was a lot of fun and enabled students studying the effects of tide to experience first-hand the extreme range of the River Severn by the light of a super-moon.

First Round Table

The YPN Round Table is a great opportunity to share up to date ideas and challenges in an informal setting. This regular gathering is held at lunch time without presentations or posters. People are invited to share and discuss any problem, technological discoveries or other current points of interest.

Our first meeting gathered a dozen members from the YPN and HRC to share lunch and ideas. During this time several topics were addressed, including the update of IAHR memberships, details of the upcoming Hydro3D workshop organised by Pablo Ouro, as well as common discussion on attending conferences and the discovery of several useful online tools.



Figure 5: 1st YPN Round Table

YPN Round Table are fixed at the 13:00 on the second Friday of every month. Details of the schedule for the next 3 months can be found below:

| Date | location |
|------------|----------|
| 10/05/2019 | S4.10 |
| 14/06/2019 | S4.10 |
| 12/07/2019 | S3.24 |

We highly recommend our members to attend whenever they are able and share in this time of supporting one another in a social setting.

7. Future Activities

- 17th May 2019 **“Working towards better weather and climate change predictions.”**
An afternoon of seminars followed by a Science Pub Quiz at 10 Feet Tall
- 12th June 2019 **“Tidal Range Energy and Swansea Bay Lagoon.”**
An afternoon of seminars followed by a BBQ and Rounders match at Bute Park
- 26th July 2019 **“Career Development Paths”**
An afternoon seminar followed by bowling and dinner at Cardiff Bay

8. Publications

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- Runge, S., Stoesser, T., Morris, E., White, M. (2019) “Technology readiness of a vertical-axis hydro-kinetic turbine.” *Journal of Power and Energy Engineering*, 6 (8), p. 63. 10.4236/jpee.2018.68004
- Stubbs, A., Stoesser, T., Bockelmann-Evans, B. (2018). “Developing an Approximation of a Natural, Rough Gravel Riverbed both Physically and Numerically.” *Geosciences*, 8(12), 449. 10.3390/geosciences8120449.
- Nassrullah, S., Stubbs, A., Stoesser, T., Bockelmann-Evans, B. [in review]. “Quadrant Analysis of the Flow over a Gravel-Bed Surface to Quantify Near-Bed and Pore-Space Turbulence.” *Earth Surface Processes and Landforms*.

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We're not that cool yet!

9. Sudoku

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| | 1 | | | 6 | | | 4 | |
| 6 | | | 1 | | 8 | | | 2 |
| 4 | 2 | | | | | 5 | | |
| | | | 9 | | | 6 | | |