IAHR Cardiff YPN Newsletter

A Word from the New President

At the start of the academic year we are pleased to welcome all new and returning students to the IAHR YPN in Cardiff!

The past term was a busy one for the YPN including three micro-conferences and a science themed pub quiz as well as three of our members passing their VIVAs! All of which you can read about in the rest of the newsletter.

In September you elected your new committee and we are excited for the coming year with plans in the pipeline for a poster session and trips further afield as well as more frequent socials and of course the continuation of our micro-conference series. We are also pleased to share the ongoing partnership with the Water Research Institute, with YPN Vice-president Stephanie Mueller representing our interests on their early career researcher's committee.

And with the aim of creating more links with industry we have begun a relationship with the Institute of Water's YPN too. We have also increased our presence on social media platforms and hope to update our website soon, so please follow us on Facebook IAHR Cardiff YPN and Twitter @YpnCardiff.

Our YPN exists to help facilitate collaborations between researchers in the realm of hydro-environmental engineering as well as to build relationships between academics and members of industry so please get in touch if we can help you in any way or if you have ideas for future activities and projects.

Thanks to everyone who has been involved in our activities over the past year, especially our regular Round Table and we look forward to seeing you at future events.

Content

Committee

President:

Catherine Leech

Vice-President:

Stephanie Mueller

Secretary:

Giovanni Musolino

Social Secretaries:

Samuel Rowley

Nicolas Hanousek

Ceri Howells

Santiago Lopez

Past Events

WORKING TOWARDS BETTER CLIMATE AND WEATHER RPREDICTIONS

By Nefeli Makrygianni

Presenting my work in the weather and climate seminar last May it was a great opportunity for me. The seminar was very well organised and included all GW4 universities, which gave us all the chance to follow what our colleagues and friends work on. In addition, having an audience with different backgrounds gave me the opportunity to better understand how to explain as simple=y as possible a part of hydro-environmental science that may not be clear to others.

Being able to present in May was perfect as I had some initial results to show and was more sure of my work. Most importantly, the attendance of people from Natural Resources Wales was a great opening to talk with experts, they were very helpful giving their opinions and ideas on our work.

THE FUTURE OF TIDAL ENERGY

By Catherine Leech

In June we were pleased to welcome professionals from the world of hydro-engineering to share their expertise in tidal energy. Chris Binnie introduced the subject explaining the options for exploiting the large tidal range of the Severn Estuary and how they could help reach some of the UK's sustainable energy targets. YPN member, Bin Guo, further explained the technical detail of tidal range energy projects whilst Edith Rojo Zazueta of the Cardiff Marine Energy Research Group shared some interesting stories of her time conducting field research to test the readiness this technology. Andrew Schofield from the Water Research Institute provided the concluding remarks on environmental considerations of tidal turbines. This event provided a really interesting overview of many of the possibilities and barriers surrounding tidal energy.

CREATE YOUR OWN LUCK: ADVICE ON CAREER DEVELOPMENT

By Stephanie Mueller

In September, Marie Curie Prof Annmarie Nelson (School of Medicine, Cardiff University) and her daughter Rosie Nelson (Sociology PhD student at Bristol University) gave their first family presentation in which both reported about their careers and diverse experiences. While Annmarie told us about her unusual career path and portfolio approach to developing a career, Rosie discussed the importance of networking (including through social media), capitalising on opportunities and how strategic thinking has helped establish her career path. Whilst differing from our other seminar topics this was a really thought provoking session and many useful conversations followed.

Summer Schools

PRIMaRE Summer School

By Santiago Lopez

The 2nd PRIMaRE Summer School was one of the best events this year for young researchers that want to make contributions in the marine renewable energy and offshore sector. The main reason being that it brings together technicians and designers from companies, academic researchers, influencers, shareholders and lawmakers. The overall goal of the summer school this year was to promote the transfer of knowhow and multiple perspectives of feasibility through a series of talks and a competition where participants could pitch their ideas to make extracting energy from the sea possible, mainly deploying farms of offshore wind turbines, wave and tidal-stream energy converters.

This year, the summer school was a 4-day event organized by the universities of Bristol and Bath, part of PRIMaRE, a consortium of key national supply chain companies and academic research centers working towards making marine renewable energy a reality. During my short time at Bristol, I realized the effort being made there for elaborating soil models of the seabed to study the grappling power of anchors attached to the mooring lines of floating wind turbines and make the mooring systems more reliable. On the other hand, at Bath University I was introduced to the PIC code for doing simulations and how power take-off systems of wave energy converters are designed and tested.

The series of talks were focused on describing the processes that influence power generation and conveying it to the electrical grid. For example, a representative of the design company behind the ATLANTIS tidal turbine explained considerations of reliably generating electricity efficiently and the implication on the maintenance cost. Besides this, other attention gathering lectures were the ones about numerical simulations for studying the performance and survivability capabilities of marine energy devices and experiments carried out in EMEC center (Orkney Islands in North Scotland) to study how tidal-stream turbines and fixed offshore wind turbines have changed certain behavior patterns of fish and the seals praying on them.

In this year's competition, participants proposed new ideas and designs aiming to bring down the Levelized Cost of the Electricity, also known as LCOE, a figure that expresses how much money it takes to produce electricity. The winners of this year were proposals of device installation strategies for reducing the CAPEX (CAPEX stands for the capital cost which includes the design, installation and decommissioning expenses) and how machine learning and big data can decrease the OPEX (In the offshore sector this is known as the operation cost, or in other words, the maintenance bill that the electric company has to pay through the life cycle of the energy device).

All in all, the summer school underlined the fact that fixed offshore wind turbine technology is doing well but more has to be made as far as floating devices are concerned. The latest economic figures from the sector show that the LCOE for fixed offshore wind turbines is 75 GBP/MW generated which is very close to the 50 GBP /MW reported by the operators of nuclear power-plants. Unfortunately, both

floating and fixed tidal-stream turbines and wave energy devices are not anywhere near that level of performance. So far the combined power output of the tidal-stream turbines installed produce 10 MW and the associated cost is around 300 GBP/MW. The good news is that if nations around the globe start implementing this kind of technology reaching up to 200 MW of installed power, the current cost will drop by half and it is predicted that once the 1GW milestone is achieved, the LCOE would be less than 100 GBP/MW. The same conclusion can be applied to floating wind turbines and wave energy devices, the LCOE decreases with the more units installed.

WISE CDT Summer School

By Stephanie Mueller

In June this year WISE CDT cohorts 4 and 5 were invited to the annual summer school, this year organized by the University of Exeter in Devon. Under the theme of coastal and river flooding, we explored different flood defense interventions within the surrounding area. Led by the Torquay council, this year's challenge focused on exploring various flood defense solutions for different parts of Torquay. With great pleasure our YPN president Catherine Leech won the challenge with her team by presenting their ideas to solve the problem of coastal flooding in Goodrington. Besides the challenge, short presentations and a poster session including all 5 WISE Cohorts provided the chance to gather feedback and networking opportunities. It was great week and a good opportunity catch up with our cohort friends from the different universities.

NC3R Summer School

By Stephanie Mueller

Between the 26th and 28th of June the National Centre for the Replacement, Refinement and Reduction of Animal Research (NC3R) held its annual summer school for students from around the UK coming from different disciplines including medicine, biology, maths and engineering. The NC3R is a national organisation, established over 50 years ago, to enhance and advance the 3Rs principles aiming to provide a framework for more humane animal research on a national and international basis. Starting off with an introduction about the NC3Rs, networking and presenting our research under the special focus of the 3Rs, the following two days were filled with workshops covering science communication, designing experiments using the Experimental Design Assistant (EDA), the arrive guidelines, management tools and career opportunities. Besides these workshops, the opportunity to discuss current results within a data clinic were provided and a team challenge focusing on applying the 3Rs within arthritis and stroke research was set.

Working with animals in my research, this summer school was a great opportunity to learn about experimental design considering the 3Rs principles, applying the arrive guidelines while writing and using the online support tool for statistical data analysis (InVivoStat). The opportunities to network with students from various disciplines, NC3R scientist and NC3R team allowed to find contact persons regarding the application of the 3R and conducting statistical analysis. It was a valuable experience and great chance to think towards developments minimising the usage of animals in research.

For more information visit: https://nc3rs.org.uk/

Outreach Activities

TRIO-SCI-CYMRU PROJECT

By Stephanie Mueller

Over the past year, the Welsh government introduced the Trio Sci Cymru project – an innovative outreach project aiming to increase the take-up of STEM subjects. Over a period of three years approximately 2790 pupils from across Wales will have the opportunity to participate in three unique STEM programs: apothecary bees, chemistry in the third dimension and universe lab; led by the Welsh Government's National Science Academy and in collaboration with the Institute of Physics as well as Cardiff, Swansea, Aberystwyth and Bangor University.

Within the last year I had the chance to support the project as student ambassador. Having never been an ambassador before or experiencing such a scheme during my own time at school, becoming a student ambassador in this project was a matter close to my heart. Supporting pupils learning about science, showing different career opportunities and paths as well as encouraging young pupils taking-up STEM projects and considering careers in sciences were my key tasks.

I was happy to be able to support the universe lab program organised by the School of Physics and Astronomy which used the topic of space to engage pupils with science. In various hands-on workshops pupils learned about different objects in space and live and work in the International Space Station using pictures obtained with robotic telescopes, 3D shows and virtual and augmented reality.

It was a pleasure to see the pupils' enthusiasm and interest in these topics and great experience to learn with and from the pupils about their views of science and how they image a scientist.

I am very much looking forward to supporting the project in its second year starting in November.

Find more information from: https://www.cardiff.ac.uk/about/our-profile/who-we-are/university-for-all/raising-aspirations/trio-sci-cymru

FUTURE EVENTS

It has been a great year with a lot of seminars, field trips, placements and the establishment of new collaborations and contacts. Therefore, with great pleasure we are looking forward to the New Year and our upcoming events featuring talks in cooperation with industry, government, the Water Research Institute, the Institute of Water and WISE as well as plenty of social activities and research visits.

SEMINAR SERIES

January – Walter Quality

February – Natural Flood and River Management

March – Climate Change

April – Flooding

May – Reservoirs

June – Coastal Processes

FIELD TRIPS

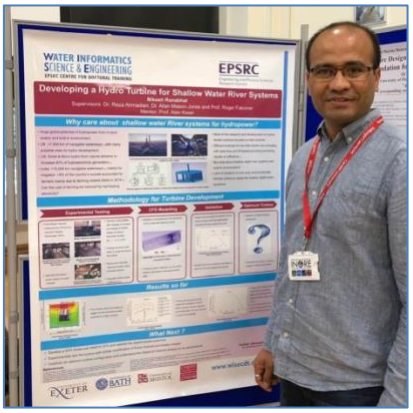
March – Severn Bore

March – Elan Valley Trip

Conferences

6th PRIMaRE Conference

By Bikash Ranabhat



The 6th PRIMaRE annual conference took place in July at Cardiff University. The two-day event, started with a welcoming remarks from the 6th PRIMaRE chair Prof. Tim O'Doherty of Cardiff University - "This is a platform to help promote discussion across disciplines and keep focus on the common challenges and new opportunities of marine renewable energy." The conference provided a unique opportunity for more than 80 participants to showcase their research conducted among the different partner institutions, their industrial collaborators and the wider academic sector. The sessions covered a wide range of topics, including: technology, policy, environment, hydrodynamics, resource characterisation, materials, operations and management. And congratulations to YPN member Bikash Ranabhat for winning the prize for best poster.

38th IAHR WORLD CONGRESS

By Giovanni Musolino

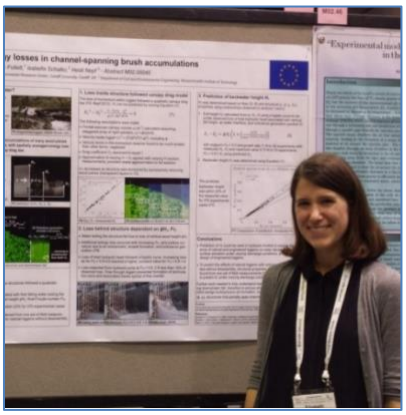
In September I had the fantastic opportunity of participating in the 38th IAHR Word Congress in Panama City.

As a PhD student it was a great opportunity for me to present my work and have the opportunity to meet academics from all around the word. Participating in conferences is extremely beneficial for academic life as it gives you the opportunity to hear about lots of interesting research giving you more ideas about how to improve your work and can lead to future collaborations.

The vibrant and dynamic atmosphere and the fantastic location made this experience even more unique. I particularly enjoyed the gala dinner and the night visit of Casco Viejo, the historic district of Panama City organised by IAHR YPN Panama. As well technical tours of the Panama Channel, Miraflores and Madden Dam.

72nd ANNUAL MEETING OF THE AMERICAN PHYSICAL SOCIETY DEVISION OF FLUID DYNAMICS

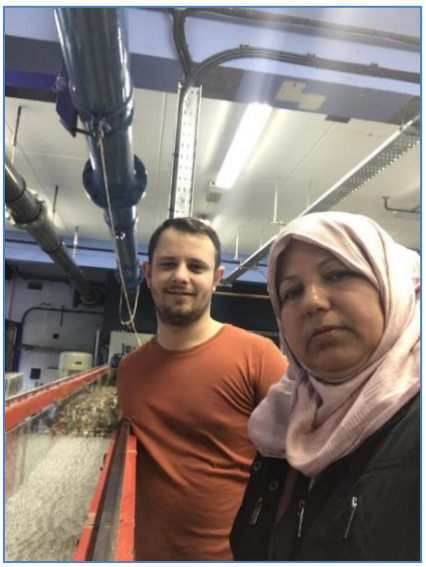
By Stephanie Mueller

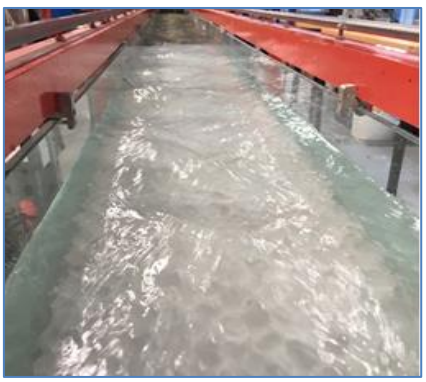


In November Elizabeth, Catherine, Valentine and Stephanie made their journey to Seattle, Washington in the US to participate at the 72nd APS DFD conference. With more than 3000 oral and poster presentations researchers from around the world shared their latest research on every facet of fluid dynamic include bio-inspired technologies, wind and tidal energy in which Catherine presented our latest work on the "wake dynamics of two closely spaced vertical axis turbines". Of particular interest was a session organised by Dr Catherine Wilson focusing on "fish swimming kinematics and hydrodynamics" allowing Valentine and Stephanie to present their experimental work and to meet some of the most important researchers in their field. Different to the ordinary oral presentations, Elizabeth took the chance to present her work within a 1-minute flash presentation.

USING CAST ACRYLIC TO REPRESENT A GRAVEL RIVERBED

By Alex Stubbs and Shahla Nassrullah





This study presents a novel method for the physical representation of a gravel riverbed using cast acrylic. The riverbed was designed using Solidworks and cut from sheets of 30 mm thick cast acrylic using a 5-axis milling machine (Stubbs et al. 2018). The riverbed is 120 mm deep, 300 mm wide and 2.048 m long (Stubbs et al. 2018).

Analysis of the artificial riverbed by Stubbs et al (2018) showed that the porosity, void ratio and particle distribution are comparable to that of natural gravel riverbeds found in the UK. However, following power spectral density function analysis, the degree of roughness of the artificial riverbed was found to be much lower than that found in nature (Stubbs et al. 2018). The artificial riverbed will be used for future analysis between an experimental investigation and a numerical simulation using the in-house LES code Hydro3D. The experimental investigation is being carried out in Cardiff University's School of Engineering narrow flume which is 10 m long, 0.3 m wide and 0.3 m deep.

Reference:

Stubbs, A., et al. (2018) "Developing an Approximation of a Natural, Rough Gravel Riverbed Both Physically and Numerically." *Geosciences*, 8 (1), p.449. doi: 10.3390/geosciencesB120449

For more information about this research, please contact

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or Shahla Nassrullah: nassrullahsa@cardiff.ac.uk

Socials

PUB SOCIAL AT STICKY FINGERS

By Nicolas Hanousek

The first social of the semester was held at Sticky Fingers Bar and Street Food on Friday the 15th of November, the evening saw around 25 PhD students, post-docs, lecturers and professionals stopping by for food, drinks, and casual chat. The aim of the event was to raise awareness of the IAHR YPN within the engineering buildings and to offer a social event to those outside of the core working groups, and on that front it was successful with attendees from all three engineering schools as well as industry. We look forward to the next event!

FIELD TRIP TO ELAN VALLEY

By Stephanie Mueller

On the 20th of October our YPN members made their way into the beautiful Elan Valley to take part at the open dam day and enjoy the unique chance to explore the Pen y Garreg Dam from inside as well as the central tower. Despite the freezing conditions, it was a great opportunity to explore the amazing engineering work as well as the beautiful scenery.

Keep your eyes peeled for our next trip to Elan Valley in spring 2020 with hopefully warmer temperatures and sunny weather to enjoy and explore the beautiful landscape surrounding the reservoir.

CHRISTMAS DINNER AND LUNCH

By Stephanie Mueller

To kick off the festive season, we started with an indulgent Christmas dinner at I Giardini Di Sorrento. Many thanks to Giovanni Musolino for organising this great evening full of lovely conversations and amazing food – what a great get-together to celebrate one of the best seasons of the year.

Just a week later, we held a Christmas themed Round Table. This was a great way to round up the year and enjoy the last (at least for most of us!) day of work. Delicious food provided by our members highlighted our diversity and brought together the best of all our different nationalities. Another highlight was the exchange of our secret Santa gifts handed out by our own Santa: Nefeli!

Publications 2019

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A great thank to everyone who supported us this year!

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