

UK Institutional-links WSI Early Career Fellow Workshops 2021

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Summary

The UK Institutional-links WSI Early Career Fellow programme aims to bring together excellent UK Early Career Researchers (ECRs) in the field of Wave Structure Interaction (WSI), thus forming high-quality collaborations by improving experimental, computational and analytical skills as well as soft skills such as co-production and grant application.

The programme consists of a series of workshops in different UK institutions. In 2021, two workshops were successfully held in Imperial College London and the University of Plymouth. The workshops were delivered in the form of themed seminars, observations of WSI experimental facilities and brainstorming potential collaborative ideas. These were followed by consultation with senior academic mentors to identify the key research questions and put action plans together. The fellows are developing a long-term partnership for collaborative research and resource sharing; the intended outcomes are top journal publications and joint research grants.

The schedule of the two workshops is given below:

London workshop, Imperial College London (Dates, 06-07 December 2021)

Day 1		Day 2	
13:00 - 14:00	Fellows gather and have an overview of the programme	10:00 - 12:00	Form preliminary ideas for collaborations. Put together a list of follow-up actions
14:00 - 16:00	Overview of the experimental facilities and opportunities at Imperial College London	12:00 - 13:00	Discuss and list out potential funding opportunities
16:00 - 18:00	Fellows introduce respective expertise through presentations	13:00 - 15:00	Introduction to senior academic staff at Imperial College London. Research ideas feedback from experts in the field (Lunch discussion)
18:00 - 19:00	Brainstorming for “next big things” research projects in WSI		
	Dinner		

Plymouth workshop, University of Plymouth (Dates, 13-14 December 2021)

Day 1		Day 2	
14:00 - 16:00	Visit the experimental facilities of the University of Plymouth	9:00 - 11:00	Agree on the collaborative projects to carry on; specify the roles/tasks of each fellow in each project
16:00 - 18:00	Presentations to report background work that has been done after the London workshop, showing critical literature review and potential outcomes	11:00 - 13:00	“Next steps” planning
18:00 - 19:00	Overview assessment of the progress so far	13:00 - 15:00	Meeting and discussing with other colleagues at the University of Plymouth (Lunch discussion)
	Dinner		

Progress

The workshops started with the introductory presentations of Professor Graham Hughes and Professor Alison Raby, followed by the fellows visiting the Hydrodynamics laboratory at Imperial College London and the COAST lab at the University of Plymouth. IK introduced seven sets of wave tanks at Imperial, each of which serves different experimental purposes based on their dimension, size and water depth; the generation of various regular and irregular waves was demonstrated. LM introduced the experimental technology to investigate wave impact forces on structures, hydroelastic effects, and the scaling between lab and real seas.

Subsequently, SM and SZ demonstrated the state of art regarding how analytical solutions are applied in the field of WSI. Examples of predicting the behaviours of floating energy converters and sea ice are demonstrated. They identified the theoretical gap of developing second/higher-order wave theories to be applied in those WSI processes.

In terms of computational simulations, LH introduced a novel approach to model fully-coupled interactions between ocean waves and deformable structures. HD presented simulations of combining wave energy devices with coastal defence and demonstrated how to optimise the design based on the computational capability. DBM presented simulations to utilise the array effect of multiple wave energy devices put in close proximity.

Taken together, the fellows found well-balanced expertise between experimental, computational and analytical approaches. The mutual interest is identified as hydroelastic WSI, which is currently understudied compared with wave interactions with rigid structures. Then, the funding officers and senior academics at Imperial College London reviewed the mutual interest and suggested two directions of funding applications based on core themes:

- Engineering applications, e.g. wave energy converters, which is in line with the EPSRC funding (Engineering and Physical Sciences Research Council)
- Climate change, e.g. predicting sea ice evolution, which is in line with the NERC funding (Natural Environment Research Council)

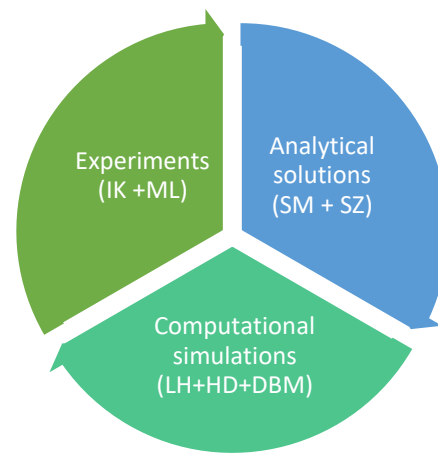
In addition, SZ introduced small-amount grants through the SuperGen ECR Research Fund, which would be suitable for the fellows as early career researchers.

Output

At the end of the workshops, the fellows agreed to contribute a collaborative paper which will be a comparative study between the three approaches. A generalised elastic floating plate is selected as the first-stage research object, which will be a prototype extendable for further investigations, e.g. on marine energy devices, sea ice, breakwaters. It is expected that this action will help the fellows learn the practical details of others' research approaches and derive a complementary methodology to use the advantages of all the approaches. Hence, advanced fluid/structural features can be analysed based on the multiple investigation tools to solve key gaps of the hydroelastic WSI field, which will then facilitate more papers and grant ideas.

Acknowledgements

This programme is supported by a Researcher Link grant, ID 2019-RLWK11-10588, under the New Fund partnership. This grant is funded by the UK Department of Business, Energy and Industrial Strategy and National Science Foundation of China (NSFC) and delivered by the British Council. We greatly appreciate the coordinating support from Dr Jun Zang at the University of Bath.



Workshop photos

