

Joint PRIMaRE and UK&CHN | CORE Summer School

University of Plymouth (COAST Lab)
University of Exeter (Penryn Campus)

10-14th September 2018

Hydrodynamic Modelling and Well-being in Engineering

Programme



www.primare.org

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 THE MARINE BIOLOGICAL
ASSOCIATION
Est. 1884
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PML | Plymouth Marine
Laboratory

Introduction

Dear Summer School Participants,

A warm welcome to this Joint PRIMaRE and UK&CHN|CORE Summer School on Hydrodynamic Modelling and Wellbeing in Engineering, hosted in collaboration between the Universities of Plymouth and Exeter. The Hydrodynamic Modelling module will take place at the University of Plymouth's COAST Lab while the Well-being in Engineering module will take place at the University of Exeter (Penryn Campus).

A variety of lectures and practical sessions have been designed to help you maximise your learning at this summer school and at the same time enjoy your stay in both cities. This represents a unique opportunity to learn from recognised experts in the sector and access some of PRIMaRE's state-of-the-art facilities and engage in UK-China ORE research activities. The hydrodynamic modelling module presents a unique opportunity to get an insight into physical modelling directly from one of the world-leading facilities, while the well-being in engineering module will tackle the conflict between work , day pressures and life balance. In addition, two evening lectures from internationally recognised experts in hydrodynamic modelling will take place on Monday and Tuesday.

I would like to take this opportunity to give a warm greeting to Professor Deborah Greaves, who was recently awarded an OBE for her enormous contribution to research in offshore renewable energy. Deborah, has been a fundamental actor behind PRIMaRE and is currently leading the new Offshore Renewable Energy SuperGen Hub, which will act as an essential catalyst to support and build on the existing academic capacity within these three internationally leading research areas (offshore wind, wave and tidal technology), whilst also enabling shared learning on common research challenges.

I hope this joint Summer School between PRIMaRE and the UK & China Centre for Offshore Renewable Energy sets the grounds for future international collaborations, and wider engagements between academia and industry.

I hope you have an enjoyable time in Plymouth and Falmouth. I would also like to thank everyone who has made this event possible, including the participants, sponsors and all those who have helped with the organisation.

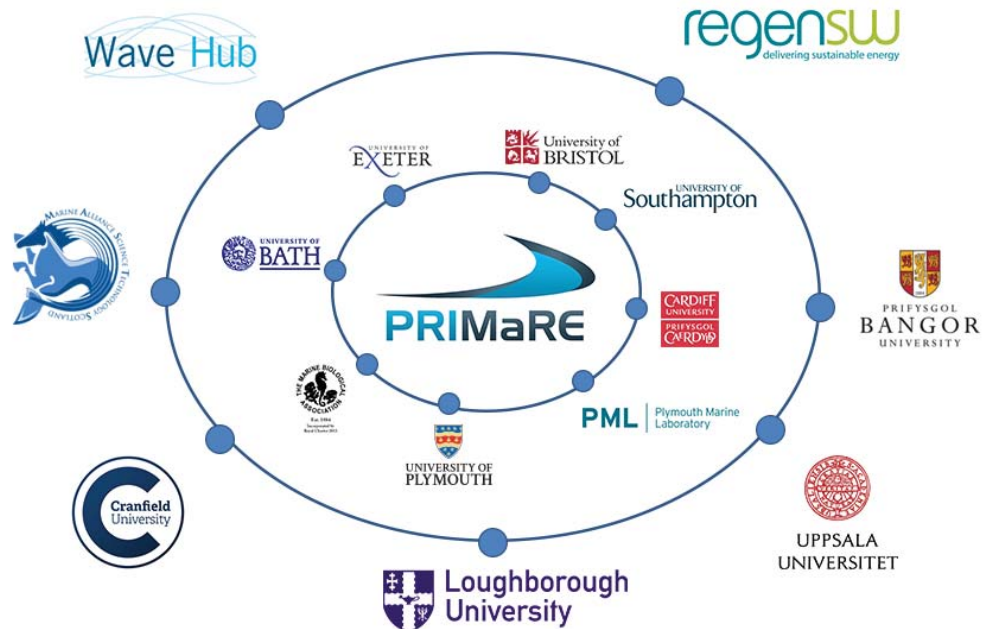
Kind regards,



Carlos Perez-Collazo
PRIMaRE Research Fellow
University of Plymouth

PRIMaRE Overview

The Partnership for Research in Marine Renewable Energy (PRIMaRE) is a consortium of marine renewable energy experts across higher education, research and industry which have joined together to establish a network of excellence centred in the south of the UK. The work of PRIMaRE aims to address the research and development challenges facing the Marine Renewable Energy (MRE) sector, including wave, tidal stream, tidal range and offshore wind. The main Partner organisations are the Universities of Plymouth, Exeter, Southampton, Bristol, Bath and Cardiff, along with the Marine Biological Association of the UK and Plymouth Marine Laboratory. We also work closely with a number of Associate Partners, including Wave Hub, Regen and the Universities of Cranfield, Loughborough and Uppsala.



UK&CHN | CORE Overview

Researchers from the UK and China will collaborate on five projects to develop the next generation of offshore renewable energy (ORE) technologies to enable the safe, secure, cheap and efficient provision of clean energy.

The collaborative, multidisciplinary three-year-long projects will use environmental science, technology and engineering to tackle key challenges affecting the development of ORE systems, such as offshore wind, wave and tide facilities, and maximise their environmental and socio-economic benefits. The projects will determine where the best energy resource is available and where would be best to implement ORE technologies, and inform the development of technology so that structures are resilient to extreme events such as typhoons and earthquakes.

General Information

University of Plymouth:

The University of Plymouth is renowned for high quality, internationally-leading education, research and innovation.

With a mission to Advance Knowledge and Transform Lives, Plymouth is a top 50 research university with clusters of world class research across a wide range of disciplines including marine science and engineering, medicine, robotics and psychology. A twice winner of the Queen's Anniversary Prize for Higher Education, the University of Plymouth continues to grow in stature and reputation.

It has a strong track record for teaching and learning excellence, and has one of the highest numbers of National Teaching Fellows of any UK university. With 21,000 students, and a further 17,000 studying for a Plymouth degree at partner institutions in the UK and around the world, and over 100,000 alumni pursuing their chosen careers globally, it has a growing global presence.

<http://www.plymouth.ac.uk>

University of Exeter:

The University of Exeter is a Russell Group university and in the top one percent of institutions globally. It combines world-class research with very high levels of student satisfaction. Exeter has over 18,000 students and is ranked 8th in The Times and The Sunday Times Good University Guide league table, 10th in The Complete University Guide and 12th in the Guardian University Guide 2014. In the 2008 Research Assessment Exercise (RAE) 90% of the University's research was rated as being at internationally recognised levels and 16 of its 31 subjects are ranked in the top 10, with 27 subjects ranked in the top 20. Exeter was The Sunday Times University of the Year 2012-13

The University has four campuses. The Streatham and St Luke's campuses are in Exeter and there are two campuses in Cornwall, Penryn and Truro. In a pioneering arrangement in the UK, the Penryn Campus is owned and jointly managed with Falmouth University. At the campus, University of Exeter students can study programmes in the following areas: Renewable Energy, Animal Behaviour, Conservation Biology and Ecology, English, Environmental Science, Evolutionary Biology, Geography, Geology, History, Human Sciences, Mathematics and the Environment, Mining and Minerals Engineering, Politics and International Relations, and Zoology.

<http://www.exeter.ac.uk/>

Summer School Sponsors:

The Summer School is sponsored by PRIMaRE and the UK-China ORE Research and Partnership Fund. Funding which has the economic support of the Engineering and Physical Sciences Research Council (EPSRC), the Natural Environment Research Council (NERC) and the Newton Fund.

Plymouth Venue:

COAST Laboratory
Marine Building
University of Plymouth
Drake Circus
Plymouth PL4 7QX



Penryn Venue:

University of Exeter
Penryn Campus
Penryn
Cornwall TR10 9FE



Websites:

- <https://www.plymouth.ac.uk/your-university/visit/getting-here>
- <https://www.plymouth.ac.uk/your-university/visit>
- <https://www.visitplymouth.co.uk/>
- <https://www.exeter.ac.uk/visit/directions/cornwall/>
- <http://www.exeter.ac.uk/thesouthwest/cornwall/>
- <https://www.falmouth.co.uk/>

Summer School Schedule

Monday 10th September 2018

	START	END	SESSION	VENUE
Day 1 - Monday 10 th September	08:30	09:15	Arrival, registration and briefing (Deborah Greaves)	Room 200, Smeaton Building
	09:15	10:30	Introduction to physical modelling (3 groups) All groups: Ocean Basin (Deborah greaves) Group A: Coastal Basin (Carlos Perez-Collazo) Group B: Flumes (Martyn Hann) Group C: Lab induction (Alastair Reynolds)	COAST Lab, Marine Building
	10:30	11:15	Modelling: from concept to reality (Carlos Perez-Collazo)	Room 200, Smeaton Building
	11:15	11:30	Tea and coffee break	Room 200, Smeaton Building
	11:30	12:15	Model construction for scientific experimentation (Richard Pemberton)	Room 200, Smeaton Building
	12:15	13:00	Instrumentation, error & repeatability (Alison Raby)	Room 200, Smeaton Building
	13:00	14:00	Lunch	Campus Cafes
	14:00	16:00	Model calibration (3 Groups) Group A: Sensor Calibration (WF) (Carlos Perez-Collazo) Group B: Pendulum test – IST buoy (MF) (Richard Pemberton) Group C: Decay tests – IST buoy (OB) (Nan Xie)	COAST Lab, Marine Building
	16:00	16:30	Tea and coffee break	Outside LT2 RLB
	16:30	17:30	Key note speaker 1 Peter Stansby (University of Manchester) Model testing (operational and extremes)	Lecture Theatre 2, RLB
17:30	-	Close		

Summer School Schedule

Tuesday 11th September 2018

	START	END	SESSION	VENUE
Day 2 - Tuesday 11 th September	09:00	09:10	Day briefing (tea/coffee) (Carlos Perez-Collazo)	Room 200, Smeaton Building
	9:10	9:50	Experimental planning I: Facilities & set-up (Carlos Perez-Collazo)	Room 200, Smeaton Building
	9:50	10:30	Experimental planning II: Fixings & moorings (Martyn Hann)	
	10:30	10:45	Tea and coffee break	Room 200, Smeaton Building
	10:45:	12:45	Experimental issues (3 Groups) Group A: Effect of mooring lines (OB) (Martyn Hann) Group B: Noise and accuracy (CB) (Carlos Perez-Collazo) Group C: Inst. limits/reflection (WF) (Scott Brown & James Allen)	COAST Lab, Marine Building
	12:45	13:30	PTO: Turbine aerodynamics & control for OWCs João Henriques (IST - Lisbon)	Room 200, Smeaton Building
	13:30	14:30	Lunch	Campus Cafes
	14:30	16:30	Model test (3 Groups) Group A: Operational Conditions (CB) (Carlos Perez-Collazo) Group B: Extremes & Survivability (OB) (Martyn Hann) Group C: Currents & Turbulence (WF) (Scott Brown & James Allen)	COAST Lab, Marine Building
	16:30	17:00	Tea and coffee break	Outside LT2 RLB
	17:00	18:00	Key note speaker 2 João Henriques (IST - Lisbon) The development of spar-buoy OWC at IST	Lecture Theatre 2, RLB
18:00	-	Close		

Summer School Schedule Wednesday 12th September 2018

	START	END	SESSION	VENUE
Day 3 - Wednesday 12 th September	08:45	09:00	Luggage drop	Room 201, Smeaton Building
	09:00	09:10	Day briefing (tea/coffee) (Carlos Perez-Collazo)	Room 200, Smeaton Building
	09:10	09:50	Data analysis Theory (Martyn Hann)	Room 200, Smeaton Building
	09:50	11:20	Data analysis practice (Martyn Hann)	Computer Lab, Room 100 Smeaton
	11:20	11:40	Tea and coffee break	Room 200, Smeaton Building
	11:40	12:20	Measurement and modelling the environment (Daniel Conley)	Room 200, Smeaton Building
	12:20	13:00	Practical applications/ CFD (Deborah Greaves)	
	13:00	13:10	Farewell (Deborah Greaves)	
	13:10	13:30	Lunch	Room 201, Smeaton Building
	13:30	15:00	Tea and coffee break	Depart from James Street on Campus
	15:30	16:00	Welcome to Penryn Campus Overview of Programme (Tea & coffee provided)	Penryn Campus Peter Lanyon Building, Seminar Room3
	16:00	17:00	Wellbeing through sleep: "Go to bed and get some sleep: overcoming sleep problems"	Peter Lanyon Building, Seminar Room3
	17:15	17:45	Travel to accommodation Penmere Manor Hotel, Falmouth, Mungleath Road, Falmouth TR11 4PN; https://penmeremanorhotel.co.uk/	Departure from Penryn Campus Bus stop

Summer School Schedule

Thursday 13th September 2018

	START	END	SESSION	VENUE
Day 4 - Thursday 13 th September	8:00	09:00	Rise & Shine – Starting the day with practice	Penmere Manor Hotel
	09:00	10:30	Breakfast	Penmere Manor Hotel
	10:45	11:15	Transfer / Travel to Penryn Campus	
	11:30:	12:30	Wellbeing Practice (mindfulness)	PL, Seminar Room 3
	12:30	13:30	Lunch	Stannary
	13:30	14:30	Equality and Diversity – Challenges and Actions for University Research	PL, Seminar Room 3
	14:30	15:00	Personal Diary – Thoughts and reflections of the day	
	15:00	15:30	Coffee	
	15:30	16:00	Transfer / Travel to Falmouth	
	16:00	18:00	Activity - Coasteering	Gyllyngvase Beach
	19:00	-	Workshop Dinner	Lecture Theatre 2, RLB

Summer School Schedule

Friday 14th September 2018

	START	END	SESSION	VENUE
Day 5 - Friday 14 th September	8:00	09:00	Rise & Shine – Starting the day with practice	Penmere Manor Hotel
	09:00	10:30	Breakfast	Penmere Manor Hotel
	10:45	11:15	Transfer / Travel to Penryn Campus	
	11:30:	12:30	Inclusivity – Teamwork & Decision making	PL, Seminar Room 3
	12:30	13:30	Lunch	Stannary
	13:30	14:30	Teampay – Know your type	PL, Seminar Room 3
	14:30	15:00	Personal Diary – Thoughts and reflections of the day	
	15:00	15:30	Coffee	
	15:30	16:00	Discussion & close	PL, Seminar Room 3
	16:00	-	Departure	

Legend:

Details about the Hydrodynamic modelling module (Plymouth) PRIMaRE Summer School:

- OB:** Ocean Basin
- CB:** Coastal Basin
- WF:** Wave Flume
- MF:** Mezzanine Floor

Details about the Well-being in Engineering (Falmouth), UK&CHN Summer School:

- PL:** Peter Lanyon Building, Penryn Campus
- Accommodation:** Penmere Manor Hote, Mongleath Road, Falmouth TR11 4PN,
<https://penmeremanorhotel.co.uk/>

P.S.: Please do bring swimwear - you will be close to the beach and we will have an activity in the water

Keynote Speakers

Model testing (operational and extremes)

Professor Peter Stansby, University of Manchester



Peter graduated with a BA in Engineering from Cambridge University in 1971, and a PhD in aerodynamics three years later. His working life began in industry with the Atkins Group. In 1980 he joined the University of Manchester where he was awarded a DSc. He has been a Fellow of the Royal Academy of Engineering since 2001. His research interests have focused on offshore structures, coastal engineering, marine energy (wave and tidal), and Computational Fluid Dynamics (CFD) including Smoothed Particle Hydrodynamics (SPH). He has supervised over 60 grants/contracts mainly as PI and published 140 papers in Q1 journals, with a Scopus h-index of 33, making several seminal contributions. He is now the Osborne Reynolds Professor of Fluid Mechanics at Manchester.

The lecture focuses on physical model testing for wave energy converters (WEC) covering operational and extreme conditions for power generation and survivability respectively. Froude and Reynolds are introduced followed by experience with the M4 WEC. Investigations on extreme loading and pressures including breaking waves are described for single point absorbers and fixed columns as well as M4. The importance of coupling physical and numerical modelling and basic analysis for design is emphasised. The benefits, limitations and uncertainties in physical modelling are discussed.

Development of the spar-buoy OWC at IST

Dr João Henriques, IST - University of Lisbon



João Henriques is an Assistant Professor of Mechanical Engineering at IST, University of Lisbon. His PhD was in numerical modelling of turbomachinery. Most of his research has been dedicated to the development of oscillating water column wave energy converters, covering a broad range of topics such: as numerical modelling and optimisation, experimental testing, aerodynamic design of air turbines, and power take-off control. He participated in ten European projects in the area of wave energy. He also holds five patents, four in the field of wave energy and another in wind power.

The lecture aims to present the development of the spar-buoy OWC from its inception to the current status. Closely linked to the design of the spar-buoy is the development of a new self-rectifying air turbine by the IST group, the so-called biradial turbine. The presentation covers the original idea behind the spar-buoy, the preliminary design stages, the numerical modelling and optimisation of the hull shape, and the experimental tests in several wave facilities (NAREC, COAST Lab and IST). The path that led to the invention of the biradial turbine is also described, as well as the one-year real sea test campaign of the turbine performed at the Mutriku wave power plant (Basque Country, Northern Spain). Besides, the talk addresses how the intellectual property affected the development process.

List of Speakers

Speakers at the Hydrodynamic modelling module (Plymouth) PRIMaRE Summer School:

Prof Deborah Greaves: Professor in Ocean Engineering

Prof Alison Raby: Professor in coastal Engineering

Dr Daniel Conley: Associate Professor in Coastal Dynamics Modelling

Dr Richard Pemberton: Lecturer in Mechanical and Marine Engineering Design

Dr Martyn Hann: Lecturer in Coastal Engineering

Dr CarlosPerez-Collazo: PRIMaRE Research Fellow

Dr Nan Xie: Reseaech Fellow

Dr Scott Brown: Research Fellow

Mr James Allen: Research Fellow

Mr Alastair M. Reynolds: Lab Technician

Participants

Name	Affiliation	Email	Group
Anna Feichtner	University of Exeter	af506@exeter.ac.uk	A
Chenyu Zhao	University of Plymouth/ Ocean University of China	chenyu.zhao@plymouth.ac.uk	A
Jack Huges	Swansea University	708774@swansea.ac.uk	A
James Doddrell	ARC Marine	james@arcmarine.co.uk	A
Oscar de la Torre	University of Plymouth	dela.oscar@gmail.com	A
Panpan He	Dalian University of Technology	hpl0806@mail.dlut.edu.cn	A
Sixdelys Lan	Marine Renewable Energy	sixdelys.lan@gmail.com	A
Yu Zhou	Dalian University of Technology	yuzhouzhouyu@mail.dlut.edu.cn	A
Binzhen Zhou	Harbin Engineering University/ University of Oxford	binzhen.zhou@eng.ox.ac.uk	B
Emilio Faraggiana	Swansea University	951180@swansea.ac.uk	B
Guangmao Chen	Shanghai Jiao Tong University	chengm@sjtu.edu.cn	B
Philippa Davies	University of York	psb519@york.ac.uk	B

Participants (Continuation)

Name	Affiliation	Email	Group
Siming Zheng	University of Plymouth	siming.zheng@plymouth.ac.uk	B
Simon Waldman	Heriot-Watt University / Marine Scotland Science	s.waldman@hw.ac.uk	B
Tom Birbeck	ARC Marine	tom@arcmarine.co.uk	B
Darshana Dassanayake	University of Plymouth	dassa.dassanayake@plymouth.ac.uk	C
Efrain Carpintero Moreno	The University of Manchester	efrain.carpinteromoreno@manchester.ac.uk	C
Lin Yang	Harbin Engineering University	yanglin@hrbeu.edu.cn	C
Luis Recalde-Camacho	University of Strathclyde	luis.recalde-camacho@strath.ac.uk	C
Mohammed Al Moghayer	Heriot-Watt University	ma211@hw.ac.uk	C
Ross Gwenter	Swansea University	881656@swansea.ac.uk	C
Wentao Xu	Shanghai Jiaotong University	wentao.xu@sjtu.edu.cn	C

Notes

EPSRC

Engineering and Physical Sciences
Research Council

NERC

SCIENCE OF THE
ENVIRONMENT



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