



16th Biennial Challenger Society Marine Conference



Plymouth
8th - 11th September
2014



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16th Biennial Challenger Conference for Marine Sciences

Hosted by



Sir Alister Hardy Foundation for Ocean Science
Marine Biological Association of the UK
Marine Institute, Plymouth University



National Marine Aquarium
Plymouth Marine Laboratory
Diving Diseases Research Centre



Held at

Plymouth University

8th - 11th September 2014

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Welcome by Professor Hilary Kennedy

**President, Challenger Society for Marine Science
(2012–14)**

This year our Biennial Conference is located in Plymouth where there is an abundance of marine scientific institutions including the Sir Alister Hardy Foundation for Ocean Science (SAHFOS), Marine Biological Association of the UK (MBA), Plymouth Marine Laboratory (PML), National Marine Aquarium (NMA), Diving Diseases Research Centre (DDRC) and Plymouth University all of whom have supported the Conference and helped to organise this exciting event. The Conference organisation is not a trivial affair and we are very grateful to Nick Owens, his local and national organising teams for making the Conference happen. Our thanks also go to the thirteen confirmed sponsors of the Conference. You will see that there is a stimulating four day programme with a good mix of talks, posters, lectures and social events. The Conference is the time when we award the Challenger Medal to ‘a distinguished UK marine scientist who has made a single major contribution or a sustained contribution, to the development of marine science’. The 2014 Challenger Medallist is Professor Harry Bryden from the University of Southampton. We will also award Challenger Fellowships to early career scientists for their achievements and promise in a branch of marine sciences. The recipients of these Fellowships will be revealed at the Conference Dinner on Thursday evening. Other prizes include the Cath Allen prize for the best poster presentation, the Norman Heaps prize for the best oral presentation by an early career marine scientist, and the President’s photographic prize. This year's theme is ‘Interaction with marine science’ and submitted photographs are being displayed in the poster hall. Also, this year, to mark the Conference being held in Plymouth, the MBA is generously awarding a prize for the best student poster. The Challenger Society AGM will be held in Lecture Theatre 1 on Tuesday 8 September at 13:35. If you are a Challenger Society member, please come along to the AGM to listen to what we have done in the past year, participate in the election of new Council members, and most importantly to voice your opinions on what the Society is doing well and what it could do better. That evening there will be a reception and public lecture presented by Professor Ian Boyd, Chief Scientific Advisor to Defra. This is the 28th Annual Marine Science Lecture organised by the Marine Institutes in Plymouth.

I’m sure we are all going to have a great week of science, networking and social activities in Plymouth.

Thank you for coming.

Hilary Kennedy



Welcome by Professor Nicholas JP Owens

Chair, Conference Local and National Organising Committees

Dear Friends and Colleagues, welcome to the 16th Challenger Society for Marine Science Biennial Conference and welcome to Plymouth, Britain's Ocean City and home to the UK's largest community of marine scientists. A special welcome to the start of Plymouth's month-long marine festival – we are the opening event!

It is wonderful that so many of you are here to attend one of the highlight events of the UK marine science calendar; actually, I believe the Challenger Conference is THE highlight of our science calendar. Certainly for me the Challenger Society Conference is a 'must attend' event. I cannot remember a time when I have not attended a Challenger Conference – even if it was only to attend the last day and especially the dinner! So, when I noted the happy juxtaposition of the Conference's timetabled return to Plymouth, because of its 'comet-like' journey around the 'UK marine science institute's solar system', with my return to Plymouth as Director of SAHFOS, I readily agreed to take on the role as Chair of the Local Organising Committee.

I really believe these Conferences are important for UK marine science. I think the Challenger Society has a leadership role to play for UK marine science and I am somewhat disappointed and puzzled there is not a greater awareness and membership of the Society. I know this is something that all Challenger Society committees and Presidents have tackled and continue to address. All I can do is urge all of you, after having a wonderful time at this Conference (which I am confident you will have), to recruit a colleague to join the Society. Please see the information about the Society later in this booklet or on the website.

For this Conference, we have based our programme on the now well-proven model of four days of presentations, with keynote talks in plenary followed by two parallel sessions and posters. The poster sessions will be an integral part of the meeting rather than a separate event by being fully integrated into the Conference space. We have an excellent venue in the Roland Levinsky Building, which will allow a great deal of interaction between the delegates, sponsors, poster authors etc. As usual one of the features of the Challenger Society Conference is the focus on students and early career scientists; wherever possible the Organising Committee has favoured these when deciding on the science programme.

We are very fortunate and delighted this year to be able to host the Challenger Medal lecturer, Professor Harry Bryden, within the programme. The Challenger Medal is awarded by the Society to an eminent marine scientist and the recipient has the opportunity to deliver a lecture. I am pleased to say that Professor Bryden will deliver his Challenger Medal lecture at 13:30 in Lecture Theatre 1 on Thursday 11th September.

We also have another Medal lecture – the Annual Plymouth Marine Science Lecture – which we have incorporated into the Challenger Conference programme. This year's lecture, the 28th (Tuesday 9th September, at 1800) is organised through the auspices of the Plymouth Marine Science Education Foundation (PLYMSEF), which is an independent charity whose members are the marine science organisations in Plymouth, the very same institutions responsible for organising this Conference. PLYMSEF exists to foster marine science education for students and early career scientists based in

Plymouth, and provides grants and organises activities for Plymouth based younger marine scientists. The lecture, which has been presented in the past by a veritable 'who's-who' of notable scientists, including a Nobel Laureate, is one of the activities organised by PLYMSEF and is open to the public. This year we are delighted to host Professor Ian Boyd, Chief Scientific Advisor to the Government's Department for Environment, Food and Rural Affairs (Defra). Ian is an internationally acclaimed marine mammal biologist and will speak on the role of scientific advice and Government policy. Please do make a date in your diary for this. However, please note because this lecture is open to more than the Conference delegates we expect a large number of attendees and we anticipate the lecture theatre will be full. We will be 'live-streaming' the lecture into the Lecture Theatre 2 but if you wish to be in the main theatre please be early.

As well as having a great week of science, we hope you will take advantage of the various social events we have suggested. As well as the ice-breaker and dinner we hope you will enjoy being in our city. Plymouth is a fascinating place with some really interesting history and (I'm told!) some great party clubs. My own preferences for some 'downtime' are the more genteel, real-ale pubs and restaurants to be found around the Barbican area of Plymouth; but each to their own. And one of the great features of Plymouth is its location. It is wonderfully located 'betwixt the sea and the moors (Dartmoor)' and the entire south-west peninsula of the UK. If you get a chance to visit even a little bit of the wider area you will not be disappointed. We have made some suggestions for eating and drinking and even negotiated some discounts for you around Plymouth, this is just a tiny sample of what is available – there is a lot more than this.

To finish, I would like to acknowledge the support and hard work of a number of people who have made this Conference possible. I would like to thank the members of the Local Organising Committee for their sustained support and work, they have been great, we had some fun meetings and we hope you like the Conference we have created. Likewise, I would like to acknowledge the help of all the on-the-ground-helpers who you will see around during the Conference – they will be very visible in their distinctive light blue shirts! The members of the National Organising Committee were very important in helping to shape the scientific programme, many thanks for their inputs, which were invaluable; and especially the insights and advice I obtained from previous organisers of Challenger Conferences. I would also like to acknowledge the excellent support provided by Leon Thompson from Plymouth University. Leon has been a key member of the team and was involved from the start of the planning for the Conference and has been responsible for the liaison between the University and the Local Organising Committee.

I also must acknowledge and thank the support I have received from a number of key staff at SAHFOS who have enabled me to perform the role as Chair of the organising committee. I thank especially Marion, Gill and Jean who have variously organised my diary, sanity and the Conference finances. But the person who deserves the greatest praise is Kate Brailsford. Kate has been the key to the success of this Conference. Despite this being the first experience of such an event for Kate she has performed excellently: the meeting would not have happened without her. Thank you so much Kate. While I might be the figurehead for this Conference, all the above have been responsible for making things happen. Delegates, they have invested a great deal of time to ensure this Conference is a success: your positive experiences are thanks to them; any negative ones are my responsibility.

It is great to see you here, have a super Conference and a memorable time. A special plea for first-time Challenger Conference attendees: please get involved and keep coming – us 'old-timer's need some back up!

Nicholas Owens

Organising Committees

Local Organising Committee

Nick Owens, Sir Alister Hardy Foundation for Ocean Science
Ruth Airs, Plymouth Marine Laboratory
Kate Brailsford, Sir Alister Hardy Foundation for Ocean Science
Debbie Cracknell, National Marine Aquarium
Michael Cunliffe, Marine Biological Association of the UK
Jo Dixon, Plymouth Marine Laboratory
Nicholas Higgs, Marine Institute, Plymouth University
Usha Jha, Sir Alister Hardy Foundation for Ocean Science
Abigail McQuatters-Gollop, Sir Alister Hardy Foundation for Ocean Science
Gary Smerdon, Diving Diseases Research Centre
Leon Thompson, Plymouth University

National Organising Committee

Hilary Kennedy, Bangor University
Alex Beaton, National Oceanography Centre
Rosie Chance, York University
Marie-Fanny Recault, Plymouth Marine Laboratory
Angela Hatton, Scottish Marine Institute
Jo Hopkins, National Oceanography Centre
Priscilla Licandro, Sir Alister Hardy Foundation for Ocean Science
Maeve Lohan, Marine Institute, Plymouth University
Gerard McCarthy, National Oceanography Centre
Mike Meredith, British Antarctic Survey
Carol Robinson, University of East Anglia
Terry Sloane, Planet Ocean
Sevrine Sailley, Plymouth Marine Laboratory
Tiago Silva, Cefas

Conference Facilities

Registration Desk and Opening Times

Ground Floor, Roland Levinsky Building, Plymouth University, Drake Circus, Plymouth

Opening times

1500 – 1800 Sunday 7th September

0800 – Close Monday 8th September – Thursday 11th September

The Conference Registration Desk will be located on the Ground Floor of the Roland Levinsky Building. The information/registration desk will be staffed throughout Conference hours for queries and late registrations.

Name Badges and Security

For security reasons and for catering purposes, please ensure that you wear your Conference badge throughout the Conference.

Replacements for lost badges will be available from the Registration Desk. Please write your name in the Conference Handbook, and do not leave your Handbook or bags unattended. Please note we will not be able to supply replacement Handbooks and an electronic copy will be available from the Conference Registration Desk.

Keynote/Plenary and Oral Presentation Locations

The keynote Conference sessions, Annual Marine Science Lecture, Challenger AGM and Challenger Medal Lecture will be held in Lecture Theatre 1, Roland Levinsky Building, Plymouth University. In case of overfill during the keynote session and lectures, the presentations will be linked to Lecture Theatre 2, situated directly next door.

Parallel oral sessions will be held in Lecture Theatre 1 and Lecture Theatre 2. Please see the full programme for individual sessions, presentations, poster sessions and catering times etc.

Lecture Theatre 1 All keynote/plenary sessions, Annual Marine Science Lecture, Challenger AGM and Challenger Medal Lecture

Lecture Theatre 1 & 2 Parallel oral presentations

Ground Floor (Crosspoint) Exhibitors, Poster Session 1 & 2, Lunch and Refreshments

WiFi



WiFi is free throughout the Conference. Passwords for the Eduroam Network are available on request at the Conference Registration Desk.

There is another free network available at the Conference called **withPlymouth** with free guest login. The **withPlymouth** wifi is available for 4 hours a day from when you make the connection.

Conference Lunch and Refreshments

All lunch and refreshments will be served at the Conference venue, Roland Levinsky Building, at the times indicated in the Conference Programme. Please note all dietary requirements indicated in the registration process will be catered for.

Access

All lecture theatres, lifts and toilets are on the Ground Floor of the Roland Levinsky Building, and are fully wheelchair accessible. Guide dogs are welcomed by Plymouth University. Please note parking on campus is limited to blue badge holders only. If you are a blue badge holder and require parking, please contact events@plymouth.ac.uk

Oral Presentations and IT

All keynote/plenary and oral presentation lecture theatres are equipped with a lectern with a Windows 7 PC with full Microsoft Office 2010 software including Microsoft Office 2010, and Windows Media Player etc, so video formats are supported. Roving and lapel microphones and PowerPoint clickers will be provided.

There is also the facility to connect a laptop/Mac. However, if you wish to use a Mac, we would be grateful if you could bring your own VGA connector due to the variety of Mac connectors available.

Please report to the Conference Registration Desk in the Roland Levinsky Building with your presentation on arrival, where a technician will load it onto the system for you.

There will also be an opportunity to rehearse your presentation during the break sessions/ lunchtime etc.

Apart from the keynote lectures, all talk slots will be of 12 minutes, duration which will leave time for some questions and time for a change of speaker within the 15 minutes available. Please keep to the times allocated so the programme does not overrun.

Poster Presentations – A0 Portrait, A1 Landscape

Please report to the registration desk on arrival to be allocated your poster space dependant on which poster session you have been allocated (please see below). All posters should be in standard format, A0 portrait, or below. All poster fixings will be supplied and we would be grateful if you could write your name on your poster tube.

Would students please mark their poster clearly with a red star (or similar) this is to enable posters eligible for prizes to be easily identified.

There are **two poster sessions** allocated on the programme.

Poster Session One Mon 0800 – Tues 1700	Poster Session Two Weds 0800 – Thurs 1700
Marine Biodiversity	Marine Time Series
Emerging Technologies	Biogeochemical Cycles
Marine Microbes	Deep-sea Ecosystems
Exchanges at the Air/ Sea Interface	Modelling interactions between Hydrodynamics and the Environment
Physical Dynamics and Connections of Coastal Oceans	Observing and Modelling the Open Ocean
Marine policy: Challenges and Tools	
Remote Sensing	

Challenger Conference Prizes

Presentations will be made at the Conference Dinner.

The Norman Heaps Prize

The Norman Heaps prize was first awarded in 1988, and is awarded for the best oral presentation by an early-career stage non-established scientist.

The Cath Allen Prize

The Best Poster Prize was first awarded in 1988 and was renamed in the honour of Cath Allen, a research scientist at Proudman Oceanographic Laboratory in 1991.

The Marine Biological Association Prize

A prize donated this year by the MBA in recognition of the Conference being held in Plymouth for the best student poster.

The President's Photographic Prize

The President's Prize for the best Photograph on a designated theme was introduced in 1994 by the then President, Dr Brian McCartney.

The Best Report of the Challenger Meeting

A prize will be awarded for the best personal report of the meeting, which will be published in *Ocean Challenge*.



Can You Produce Winning Words?

As in many previous Challenger Society Conferences, a prize will be awarded for the best report of the meeting, which will be published in *Ocean Challenge*. The report should be your personal impression of the meeting - both science and social aspects, highlights and lowlights - rather than a blow-by-blow report. The emphasis should be on lively writing and good communication.

Entries should be sent to the Editor at AngelaMColling@gmail.com within three weeks of the end of the Conference, and be about 1000 words long. The writer of the best report will receive a cheque for £75.

CHALLENGER 2014 SCIENCE PROGRAMME

	MONDAY (8 th)		TUESDAY (9 th)		WEDNESDAY (10 th)		THURSDAY (11 th)		FRIDAY
0850 - 0855	Housekeeping Introduction – Prof Nicholas Owens Lecture Theatre 1		Housekeeping Introduction – Prof Nicholas Owens Lecture Theatre 1		Housekeeping Introduction – Prof Nicholas Owens Lecture Theatre 1		Housekeeping Introduction – Prof Nicholas Owens Lecture Theatre 1		
0855 - 0900	Sponsor Introduction		Sponsor Introduction		Sponsor Introduction				
0905 - 0955	Keynote/Plenary: Biological		Keynote/Plenary: Modelling		Keynote/Plenary: Time Series		Keynote/Plenary: Deep-Sea		Special interest groups
	Jason Hall-Spencer		Icarus Allen		Isabelle Rombouts		Adrian Glover		
1000 - 1230	Session 1 Lecture Theatre 1	Session 2 Lecture Theatre 2	Session 5 Lecture Theatre 1	Session 6 Lecture Theatre 2	Session 9 Lecture Theatre 1	Session 10 Lecture Theatre 2	Session 11 Lecture Theatre 1	Session 12 Lecture Theatre 2	
	Biodiversity	Air/Sea Exchange	Observations and Modelling	Marine Policy	Time Series	Biogeochemical Cycles	Deep Sea	Modelling Hydrodynamics	
Chair	Dr Michael Cunliffe	Dr Rosie Chance	Dr Sevrine Sailley	Dr Abigail McQuatters-Gollop	Dr Priscilla Licandro	Dr Maeve Lohan	Dr Nicholas Higgs	Dr Tiago Silva	
1000 - 1015	5489 Kasia Kenitz	5482 Tom Bell	5519 David Munday	5322 Jacqueline Tweddle	5484 Cecilia Balestreri	5544 Jonathan Sharples	5452 Kerry Howell	5326 Lei Ren	
1015 - 1030	5422 Glauca Fragoso	5438 Dan Jones	5470 Pat Hyder	5343 Richard Lampitt	5324 Glen Terran	5382 Robyn Tuerena	5511 Rebecca Ross	5463 Juan Jesus Gomiz Pascual	
1030 - 1045	5467 Antony Knights	5499 Natasha Lucas	5300 Sophie Wilmes	5429 Jennifer Skinner	5477 Jacueline Maud	5336 Mark Fitzsimons	5329 Laetita Gunton	5472 Charlie Rogan	
1045 - 1100	5444 Bryony Pearce	5397 Jan Zika	5508 Craig Rye	5546 Matthew Gianni	5490 Michael Blackett	5551 Elizabeth Robertson			
1100 - 1130	Coffee & Posters 1		Coffee & Posters 1		Coffee & Posters 2		Coffee & Poster 2		
	Emerging Technologies						Biogeochemical Cycles		
	Dr Alexander Beaton						Dr William Homoky		
1130 – 1145	5284 James Cowles	5380 William Landing	5375 Clare Bellingham	5354 Frances Peckett	5356 Alexandra Brearley	5464 William Homoky	5478 Nichola Lacey	5358 Chris Daniels	
1145 – 1200	5316 Amy Scott-Murray	5580 Theodore Wilson	5473 Alexander Forryan	5411 Jennifer Riley	5471 Matthew Humphreys	5505 Alastair Lough	5488 Thomas Linley	5522 Clare Ostle	
1200 – 1215	5502 Phil Culverhouse	5400 Ollie Legg	5317 Jess Silvester	5474 Rebecca Shellock	5561 Jennifer Loxton	5378 Angela Milne	5555 Bhavani Narayanaswamy	5526 George Wolff	
1215 - 1230	5539 Bastien Queste	5310 Peter Land	5483 Peter Browne		5341 Valentina Lauria	5424 Katrin Schmidt	Nicholas Higgs	5514 Sari Giering	

1230 - 1330	Lunch & Posters 1		Lunch & Posters 1		Lunch & Poster 2	Lunch & Posters 2	
1330 - 1335	Sponsor Introduction						
1335 - 1425	Keynote/Plenary: Physical		Challenger AGM		Early Career Event	Challenger Medal Lecture	
	Emily Shuckburgh						
1430 - 1730	Session 3 Lecture Theatre 1	Session 4 Lecture Theatre 2	Session 7 Lecture Theatre 1	Session 8 Lecture Theatre 2	14:30-Marine Biological Association AGM Citadel Hill, The Hoe	Session 13 Lecture Theatre 1	Session 14 Lecture Theatre 2
	Marine Microbes	Dynamics & connections for coastal oceans	Observations and Modelling	Remote Sensing	14:30-International Indian Ocean Expedition 2, room 206, RLB	Observations and Modelling	Biogeochemical Cycles
Chair	Dr Michael Cunliffe	Dr Joanna Hopkins	Dr Gerard McCarthy	Dr Marie-Fanny Racault	14:30-CTG meeting	Dr Adam Blaker	Dr William Homoky
1430 – 1445	5430 Claire Evans	5319 Berit Rabe	5552 Ric Williams	5315 Kylie Scales		5366 Andrew Meijers	5395 Katsiaryna Pabortsava
1445 – 1500	5388 Joe Taylor	5353 Zhiyu Liu	5342 Zoe Jacobs	5299 Grant Robert Bigg	Social Activities from 14:30	5296 Celine Heuse	5340 Emma Caven
1500 - 1515	5420 Deborah Steele	5361 Karen Guihou	5512 Freya Garry	5402 Dionysios Raitsos		5412 Nicola Howe	5309 Anna Belcher
1515 – 1530	5458 Glen Wheeler	5372 Holly Pelling	5417 Karen Heywood	5320 Jason Hopkins		5399 Adam Blaker	5428 Tom Hull
1530 – 1600	Tea & Posters 1		Tea & Posters 1			Tea & Posters 2	
1600 – 1615	5406 DanielWhite	5433 Danielle Wain	5304 Penny Holliday	5501 Thomas Jackson		5510 Edward Dodderidge	5307 Tom Rippeth
1615 – 1630	5529 Alastair Smith	5437 Carl Spingys	5445 Barbara Berx	5530 Shovonlal Roy		5426 Callum Shakespear	5335 Grigorios Moschonas
1630 – 1645	5339 Garcia Martin	5448 Alan Jamieson	5416 Ben Lincoln	5404 Catherine Mitchell		5436 Megan Stamper	5390 Anouska Panton
1645 – 1700	5507 Stephanie Sargent	5457 Hugh Venables	5350 Rob Hall	5362 Joshua Griffiths		5330 Ben Moat	5455 Ruth Airs
1700 – 1715	5575 Ian Lidbury	5479 Fred Wobus	5374 Anna Rumyantseva	5367 Madihah Jafar-Sidik		5465Peter Davis	5363 Frances Hopkins
1715 - 1730	Rowena Stern-Kluckner	5497 Jaimie Cross	5496 Umberto Binetti	5359 David McKee		5545 Yevgeny Aksenov	5447 Benjamin Butler
Variable timings	19:00 Ice-breaker, National Marine Aquarium		18:00 28 th Annual Marine Science Lecture and Reception Roland Levinsky Building		18:00 Conference Dinner and reception, Plymouth Guild Hall		

Keynote Speaker Information and Abstracts

Emily Shuckburgh, British Antarctic Survey

Title: The Great Planetary Mixer

According to the British Baker Magazine, 'every bakery establishment should have a 20-litre planetary mixer', but they warn that 'the machine will inevitably be mistreated and overloaded'. In this talk I will describe the 10^{18} litre planetary mixer that is the Southern Ocean and will discuss whether it is similarly being mistreated and overloaded. I will focus on presenting some of the results from the DIMES (Diapycnal and Isopycnal Mixing Experiment in the Southern Ocean) campaign, which has been carrying out a series of observational studies in the Drake Passage region over the past 5 years, and I will also discuss some of the climate model results from the CMIP5 archive.

Understanding Southern Ocean mixing is particularly important since it has a key role in driving the global overturning circulation and thereby in regulating the Earth's climate through the uptake of heat and carbon.

There is an open question as to how climate change may be influencing this and whether or not the Southern Ocean will continue to soak up carbon dioxide from the atmosphere to the same extent in the future.

J Icarus Allen, Plymouth Marine Laboratory

Title: Toward Next Generation Ecosystem Models

Marine ecosystems provide a range of important services to mankind including food production, climate regulation through the cycling of carbon and other macronutrients, and a range of cultural values (e.g. recreation, tourism). They are in serious decline, primarily as a result of over-harvesting, pollution, and the direct and indirect impacts of climate change. Dynamic models that link the physical, chemical and biological processes through food web interactions provide a means of understanding how human impacts on different parts of the ecosystem interact and of predicting the consequences of management actions in one sector on other sectors. One challenge is to how to clearly model the scales of interactions and emergent properties ranging from ecosystem processes (e.g. production), through intermediate services (e.g. Nutrient cycling), through to final services (e.g. fisheries). The traditional approach to modelling marine plankton has generally been to build modelling frameworks by coupling bulk biomass functional type (FT) models to 1D and 3D hydrodynamic models. To enhance our capacity to assess trophic and spatial controls on the structure of marine ecosystems requires the improvement of the representation of biodiversity and ecosystem function in model. To achieve this requires the development of a traceable hierarchy of models of different complexity using a modular approach with consistent process descriptions based on size, function (autotrophy, heterotrophy, decomposition), and biological traits (e.g. feeding strategy, motility, physiology). Through species-neutral process descriptions, the approach will allow scalable representation of diversity within and between functionally similar "guilds" of species.

Dr Isabelle Rombouts, Laboratory of Oceanography and Geosciences, Wimereux, France

Title: Pelagic biodiversity: from patterns to emerging processes

In macroecology, statistical patterns in abundance, distribution and diversity are investigated to ultimately understand the structure and functioning of ecosystems. Driven by current anthropogenic impacts and the need for systematic conservation planning, interest in the analyses of diversity patterns at regional to global scales has been surging. For analytical purposes, data from field observations are most currently used but output from modelling analyses and emergent properties from community ecology are also being applied. Classically, biodiversity has been quantified in terms of the number of species present but this focus is gradually shifting to the functional attributes or traits of species. Traits are defined as any morphological, physiological or phenological feature measurable at the individual level. Since ecosystem level processes are affected by functional characteristics of organisms rather than species identity, the functional diversity of a community defined by the range and value of traits can further enhance our mechanistic understanding of ecosystem functioning. Moreover, the potential ecological impacts of diversity loss could be investigated at an ecosystem-level. Ideally, however, a pluralistic approach should be adopted where taxonomic, functional and phylogenetic facets of diversity are considered. Unfortunately, comprehensive datasets to feed these analyses are currently scarce, especially in a pelagic context.

Dr Adrian Glover, Natural History Museum, London

Title: Environmental Futures in the Deep Sea Mining Frontier

The deep oceans contain a vast and untapped wealth of minerals useful to humans. In geological terms, there is much known with regard to the distribution of these minerals at different types of deep-sea environment. The first polymetallic (or manganese) nodules were recovered by the Challenger Expedition in 1873, in the deep Atlantic. In the 1960s, the first estimates were made of the total mineral wealth of the oceans, and the first surveys undertaken. By the late 1970s, the first fully integrated mining trials recovered several hundred tonnes of nodules from the central abyssal Pacific at depths of 5500m; in the preceding year, hydrothermal vents were discovered on the Galapagos rift. Since then, an average of 5 hydrothermal vent fields have been discovered every year, and 19 exploration licences for deep-sea minerals in both nodule and vent environments have been issued by the United Nations International Seabed Authority, 5 of these in 2014 alone. The United Kingdom Government is sponsor to 2 exploration licence claims in the central Pacific covering 267,000 square km, an area larger than the UK itself.

Despite our accumulated knowledge of the mineral wealth of deep-sea ecosystems, our biological data remains extremely patchy. The central Pacific nodule regions have been well-sampled for nodules, but the majority of species are undescribed and fundamental questions such as the biogeographic distributions of animals unstudied. The diversity and ecological resilience of species to disturbance regimes are largely untested. At hydrothermal vents, critical data such as degrees of endemism and gene-flow between vent fields is lacking. A major advance in our fundamental academic understanding of deep-sea biology is required in areas of interest to deep-sea mining; this will enable best practice environmental management of these regions in the future. This can only be achieved through a combination of independent government-funded, academia-led research programs alongside industry-sponsored and regulator-assessed baseline and environmental impact assessment.

Title: Ecosystem effects of ocean acidification

Pressures on ocean systems have ramped up dramatically since the Challenger Expedition. 'Ocean acidification' is a new kid on the block - where does it sit amongst issues we have grappled with since Victorian times, like pollution, overfishing and habitat destruction? Here I review analogues for ocean acidification, such as upwelling areas and estuarine gradients in pH, then describe underwater volcanoes where carbon dioxide bubbles up like a jacuzzi, acidifying large areas for 100s of years. Early work off Ischia Island near Vesuvius (2008-12) showed which types of organisms can survive and what coastal habitats might look like due to acidification in the coming years. This work is now being repeated at volcanoes in the Atlantic and Pacific Oceans and consistently shows that as carbon dioxide levels increase this causes marine biodiversity loss, both in temperate and in tropical systems. Key groups, like coralline algae, are outcompeted as the water becomes corrosive and fish reproduction is disrupted. Some organisms adapt to the effects of long-term acidification but species interactions are disrupted; invasive species of algae and jellyfish do especially well. Organisms with an outer layer of protective tissue, such as Porites corals in the tropics and Mytilus mussels in temperate areas, are more carbon dioxide tolerant but they only survive if they are not stressed by other factors. The combination of acidification and rising temperatures kills -off most corals and shellfish and reduces biodiversity across-the-board, from simple organisms (such as bacteria and microalgae), to flora (like seaweeds and seagrasses), and fauna (such as sea urchins and molluscs). Given that attempts to reduce CO₂ emissions have so far failed I think we need marine protected areas more than ever before. They help provide resilience to ocean acidification, as unstressed systems are more resilient than stressed ones, and they help us deal with pressing environmental issues that we have known about since the 1870s.

Plymouth University Accommodation

For delegates who have booked Plymouth University accommodation, your accommodation will be based at Astor House, Plymouth.

How do I get to Astor House?

Astor House is located between the historic and picturesque area of Plymouth known as the Barbican and the City Centre.

Astor House

163 Notte Street
Plymouth, Devon, PL1 2AQ

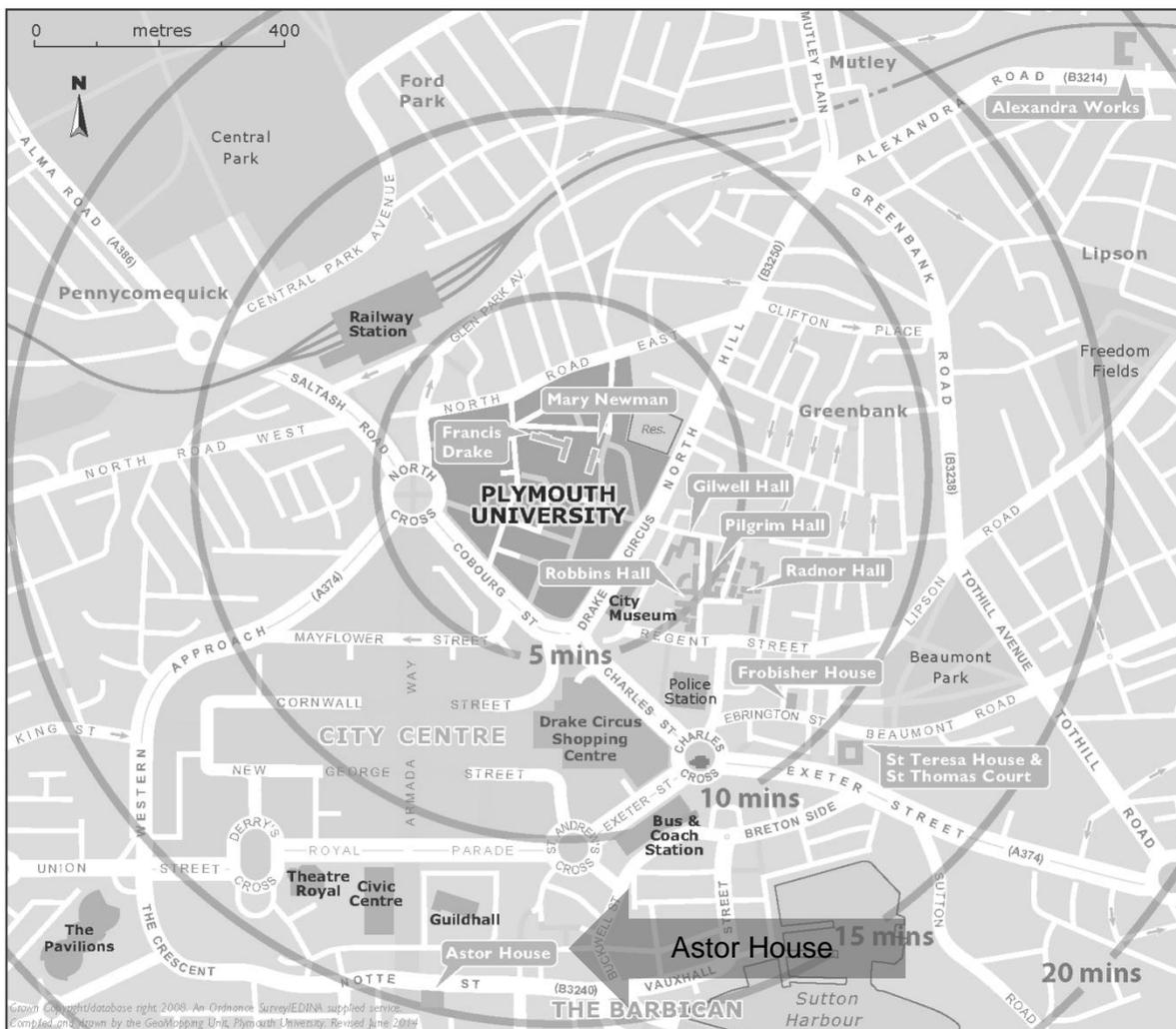
<http://thestudenthousingcompany.com/locations/plymouth/astor-house/>

01752 531030

Email: astorhouse@thestudenthousingcompany.com

Check-in

Astor House is manned 24 hours a day, however, we would ask if possible please that you check in before 2300. If you arrive outside of these hours, please call **01752 233210** to be let into the building. Please remember to bring your online booking receipt with you.



Scheduled Events at a Glance

Icebreaker Reception - National Marine Aquarium Monday 8th September, 1900

Please join us at 1900 for the Challenger 2014 Icebreaker Reception taking place on Monday 8th September, at the National Marine Aquarium, the UK's biggest aquarium.

Here you will have a chance to look around various areas of the Aquarium from 1900 until 2000 and enjoy an evening reception and buffet.

<http://www.national-aquarium.co.uk/>

National Marine Aquarium

Rope Walk

Coxside

PL4 0DX

Challenger AGM - Lecture Theatre 1, Roland Levinsky Building Tuesday 9th September, 1330



ANNUAL GENERAL MEETING

Lecture Theatre 1, Roland Levinsky Building, Plymouth University
Tuesday 9th September 2014 at 1330

AGENDA

1. Apologies for absence
2. Approval of minutes of AGM of Thursday 8th September 2013
3. Matters arising from the minutes of 2013 AGM
4. Secretary's Report
5. President's Report
6. Treasurer's Report and Accounts
7. Appointment of auditors
8. Election of new Council Members and Officers
9. Any other business.

28th Annual Marine Science Lecture – Roland Levinsky Building

Tuesday 9th September, 1800

Please join us for the Annual Marine Science Lecture taking place at Roland Levinsky Building on Tuesday 9th September 2014.

The evening will start with a wine reception at 1800, with the Lecture starting at around 1900.



Professor Ian Boyd
Chief Scientific Adviser to the Government's
Department for Environment, Food and Rural Affairs

Title: 'Creating a storm or calming the waters – a view from a Chief Scientific Adviser'

Biography

Professor Boyd is the Chief Scientific Adviser to the UK Government on Environment, Food and Rural Affairs. In the past he has been Director of the Scottish Oceans Institute at the University of St Andrews and the Sea Mammal Research Unit, a partner institute of the Natural Environment Research Council since 2001. He is also currently an adviser to the Principal's Office at the University of St Andrews focussing upon commercialisation and knowledge exchange. He is on the Board of Reviewing Editors of Science and is a former Editor-in-Chief of the Journal of Zoology. He was responsible for creating several companies that are owned by the University of St Andrews and these now have international subsidiaries in the USA, Canada and Hong Kong.

He has BSc and DSc degrees from the University of Aberdeen, a PhD from Cambridge University and has received prizes for his research including the Scientific Medal of the Zoological Society of London and the Bruce Medal for Polar Science from the Royal Society of Edinburgh. He is also a Fellow of the Royal Society of Edinburgh and of the Society of Biology.

Social Activities - Wednesday 10th September

We are pleased to announce the following social activities taking place on Wednesday 10th September. Please check the social activities map for locations. To attend activities 1-4, you would have needed to have pre-booked prior to the Challenger2014 Conference through the online questionnaire as spaces are limited. If you wish to attend any of the pre-booked activities, and have not registered, please enquire at the Conference Registration Desk.



1 National Marine Aquarium behind the scenes guided tour

Free, limited to 24 spaces. If you have not pre-booked to attend, please enquire at the Conference Registration Desk.

<http://www.national-aquarium.co.uk/>

Rope Walk, Coxside, Plymouth PL4 0LF
0844 893 7938

Meet at 3pm, National Marine Aquarium. Please refer to activities map for location.

Visit the UK's largest Aquarium and be amazed by our fascinating underwater world and how we all play a part in conserving it. Your journey will take you across the world's oceans, from the shores of Plymouth to the coral reefs of the tropics.



2 Plymouth Gin Distillery Guided Tour

£7, pay on arrival, limited to 20 spaces. If you have not pre-booked to attend, please enquire at the Conference Registration Desk.

<http://www.plymouthdivingcentre.co.uk/>

Black Friars Distillery, 60 Southside Street, Plymouth PL1 2LQ
01752 665292

Meet at 3.30pm, Plymouth Gin Distillery. Please refer to activities map for location.

This tour provides a fascinating 40-minute overview of the history of the Distillery as well as an introduction to how Plymouth Gin is made.



3 Plymouth Dive Centre

£25, limited to 12 spaces. If you have not pre-booked to attend, please enquire at the Conference Registration Desk.

<http://www.plymouthdivingcentre.co.uk/>

Plymouth Diving Centre, Queen Annes Battery Marina
4 Lyhner Building, Plymouth , PL4 0LP, 01752 263900

Meet at 3.00pm, Plymouth Dive Centre. Please refer to activities map for location. You will be sent a questionnaire by the dive centre to assess your suitability. Please wear sensible clothing and all diving gear will be provided. Immerse yourself in a fantastic underwater world, diving from a 10M Rib in Plymouth Sound.



4 Plymouth Indoor Climbing Centre

£10, limited to 16 spaces. If you have not pre-booked to attend, please enquire at the Conference Registration Desk.

http://www.high-sports.co.uk/sites/plymouth/contact/#contact_details

Plymouth Life Centre, Mayflower Dr, Plymouth
PL2 3DG · 01752 607206

Meet at 3 pm. Please join us at the Plymouth Indoor Climbing Centre for Rockwall and Bouldering at Plymouth Life Centre. Please refer to activities map for location. Please wear sensible clothing, and all climbing gear will be provided.



5 Pub Crawl, pub on the Hoe, Plymouth Barbican

Free, no limit on numbers. Start at 1900

<http://www.pubonplymouthhoe.co.uk/location.htm>

159 Citadel Road, The Hoe, Plymouth, Devon, PL1 2HU
01752 202405

Meet at 7pm, Pub on the Hoe, formally known as The Yard Arm, Plymouth Barbican. Please refer to activities map for location. Please join us for a memorable visit to some of the more historic pubs on Plymouth Barbican including The Minerva Inn, Plymouth's oldest serving public house, circa 1540. The pub is timber framed and a lot of the timber is from the Spanish Armada Fleet.



6 Cawsand to Mount Edgumbe Walk

Free apart from ferry costs. No limit on numbers

<http://www.southwestcoastpath.com/walksdb/printable-walk/135/>

Depart: Cawsands Ferry
Plymouth Boat Trips, 2-5 Commercial Wharf,
Barbican, Plymouth, Devon, PL1 2NX, 01752 253153

Return: Cremyll Ferry Office, Cremyll, Torpoint, Cornwall, PL10
1HX, 0774 6199508

Ferry to Cawsand leaves 2.30 pm, Commercial Wharf, Plymouth Barbican. £4 per person, single.

<http://www.cawsandferry.co.uk/>

Ferry from Mt Edgumbe to Plymouth, on the hour and half past the hour, last ferry from Cremyll departing at 2030. £1.30 per person, single.

<http://www.cremyll-ferry.co.uk/>

Departing by Ferry to Cawsand from Plymouth Barbican, a breath-taking tour around the waterside perimeter of the Mount Edgumbe estate, with views across Plymouth Sound and a host of 18th Century follies, seats and shelters along the path. Please note this is a long walk and you will need to wear sensible footwear. If you engage in this walk, you agree to do so at your own risk, and are voluntarily participating in this activity.

Planet Ocean Ltd

- Met-Ocean Data Buoys
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- Nitrates
- Phosphate
- Transmissometers
- Turbidity
- LISST Particle analysers
- Mooring recovery Systems
- CO2
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- ARGO Floats
- Absorption and Beam Attenuation
- Spectrophotometers
- CTD - Multi-parameter systems
- Miniature Data loggers
- Ice keel Profilers
- Water Column Profiler
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- Mooring Beacons
- Tracking Beacons
- Deep Mooring Swivels
- Seabed Frames
- Smart Hydrophones
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www.planet-ocean.co.uk
T: +44 (0)845 108 1457 E: sales@planet-ocean.co.uk

Suggested Social Activities

Please note these are suggested activities only, and will not be accompanied by Challenger2014 Conference staff.



7

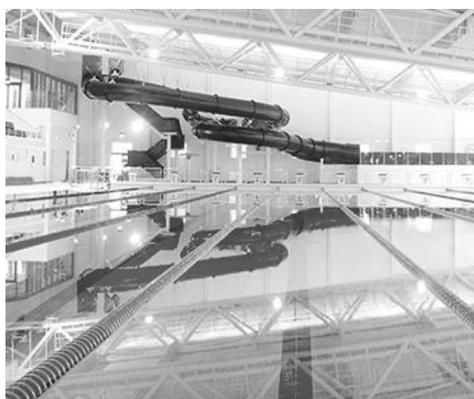
Plymouth Bike Hire from the Bike Bus

£15 for adults, please book in advance by debit card on 07577 279928.

www.plymouthbikehire.co.uk/home

Coypool Park and Ride, PL7 4TB
07577 279928

Hire a bike from the bike bus, and blast through the new woodland and valley trails at Plymbridge.



8

Plymouth Life Centre

Prices variable dependant on activity.

<http://www.everyoneactive.com/Centre/Plymouth-Life-Centre/72/Home>

Mayflower Dr, Plymouth PL2 3DG
01752 606900

The Life Centre, has three swimming pools, flumes, diving boards, a 12 court sports hall, an eight lane indoor bowls centre, a climbing zone, and a 150 station gym. Please visit their website for timetables and activities.



9

Plymouth Boat Trips

Prices variable dependant on trip. Please refer to website.

<http://www.tamarcruising.com/index.htm>

2-5, Commercial Wharf, Madeira Rd, Plymouth, Devon PL1 2NX,
07971 208381

Plymouth Boat Trips run scenic and naval harbour cruises, and the connecting ferries to Mt Edgcumbe and Cawsand. For full details of boat trips available, please refer to the Tamar Cruising Website.

Annual General Meeting of the Marine Biological Association

Wednesday 10th September, 1430



The Annual General Meeting of the Marine Biological Association will be held in the Common Room of the Citadel Hill Laboratory, Plymouth, on Wednesday 10th September 2014, starting at 1430 pm.

The AGM will be followed by a Reception in the Common Room as part of the Challenger Society programme, and the Marine Biological Association warmly invites all members as well as delegates of the Challenger Society Conference to participate.”

Guided Tours of Sir Alister Hardy Foundation for Ocean Science and Plymouth Marine Laboratory

Wednesday 10th September, 1500 – 1600

On Wednesday 10th September, there will be an opportunity to tour the superb facilities offered by the Sir Alister Hardy Foundation for Ocean Science and Plymouth Marine Laboratory.

Spaces are limited to 10 places, and in order to attend either of the two tours available, you would have needed to pre-book during the registration process. If you haven't pre-booked and wish to attend, please enquire at the Conference Registration Desk.

Sir Alister Hardy Foundation for Ocean Science



The Laboratory

Citadel Hill
Plymouth
PL1 2PB
Tel: 01752 633242



Plymouth Marine Laboratory



Prospect Place

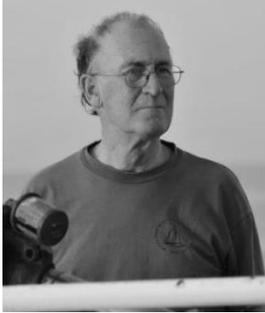
The Hoe
Plymouth
PL1 3DH
01752 633100



Challenger Medal Lecture - Lecture Theatre 1, Roland Levinsky Building

Thursday 11th September, 1335 - 1425

Please join us for the Challenger Medal Lecture taking place at Lecture Theatre 1, Roland Levinsky Building on Tuesday 9th September 2014.



Prof. Harry L. Bryden
Ocean and Earth Science, University of Southampton

Title: Advances in Ocean Circulation: Longer time scales and smaller spatial scales

Sustained ocean observing programmes with open access to the observations offer remarkable opportunities for understanding the origin of interannual ocean climate variability and its impact on atmospheric climate. At the same time, the sustained observations on smaller spatial scales allow assessments of how changes in ocean circulation affect regional climate as well as how small scale processes affect the large-scale properties of the circulation. We illustrate these opportunities using selected results from the decade-long rapid monitoring of the Atlantic circulation and from contributions to sustained observing programmes detailed in a new volume organised and produced through efforts of the Challenger Society for Marine Science.

Biography

Prof. Bryden received his Ph.D. in 1975 from the Massachusetts Institute of Technology and Woods Hole Oceanographic Institution Joint Program for research on the kinematics and dynamics of mid ocean eddies. He spent two years at Oregon State University as a Postdoctoral Research Associate working on the dynamics and energetics of the Antarctic Circumpolar Current and then returned to Woods Hole Oceanographic Institution for a series of studies on ocean heat transport. He moved to Southampton in 1992, crisscrossing the Pacific, Indian and Atlantic Oceans as part of the global hydrographic survey during the World Ocean Circulation Experiment while working initially in the James Rennell Centre, next in the Southampton Oceanography Centre and now in Ocean and Earth Science, University of Southampton. His recent research has focussed on ocean climate change, monitoring the Atlantic meridional overturning circulation, the role of ocean heat and freshwater transports in maintaining the global climate system, the structure and energetics of western boundary currents and the dynamics of the flow through the Strait of Gibraltar and its control of the circulation in the Mediterranean Sea. He was awarded the Henry Stommel Research Medal by the American Meteorological Society in 2003 and was elected a Fellow of the Royal Society in 2005. He is a Fellow of the American Geophysical Union and Honorary Fellow of the Royal Meteorological Society. He was awarded the Prince Albert I Medal by the International Association for the Physical Sciences of the Ocean in 2009 and the Fridtjof Nansen Medal by the European Geosciences Union in 2013.

Lord Mayor's Reception - Plymouth Council House

Thursday 11th September, 1800



If you have registered and paid to attend the Challenger Dinner please join us for a complimentary welcome drink at the Lord Mayor's Conference Dinner Reception prior to the Conference Dinner, being held at the Council House, next to Plymouth Civic Centre on Royal Parade, opposite the Conference Dinner venue.

Please aim to arrive at 1800. There is limited capacity, when this is reached delegates will be directed to the Guildhall

Council House, Armada Way, Plymouth PL1 2EW

Conference Dinner - Plymouth Guildhall

Thursday 11th September, 1900 for 1930



For delegates who have registered and paid to attend, the Challenger 2014 official Conference Dinner is taking place at Plymouth Guildhall. Entertainment will be provided by the band 'Covered' and a disco

The bar will be open from 1830, followed by a sit down 3-course dinner at 1930.

Plymouth Guildhall, Armada Way, Plymouth, PL1 2EW



Starter

Mediterranean sharing platter, consisting of humous, olives, feta cheese, antipasti meats, pitta breads, salad garnish & bite size quiches

Main Course

Garlic & herb chicken breast, dauphinoise potatoes, braised leek, trio of veg served with chicken gravy

(v) Mushroom & spinach wellington served with dauphinoise potatoes with trio of veg

Dessert

Lemon tart served with clotted cream & mango coulis

Chocolate tart served with raspberries & cream

Special Interest Group Meetings

There are individual meetings being held by various groups on Wednesday 10th and Friday 12th September details of which are outlined below.

Marine Biogeochemistry Special Interest Group

We would like to invite you and your colleagues to a Town Hall meeting for the UK Marine Biogeochemistry community organised by the Challenger Society Marine Biogeochemistry Special Interest group. The rationale for this is that NERC has just changed the way it awards strategic programme funding to a model where the community needs to identify priorities for consideration by SPAG. NERC RP funding has been very important for UK Marine Biogeochemistry via a long series of programmes including Ocean Acidification, Shelf Seas Biogeochemistry, Greenhouse Gases and Macronutrient Cycles. Therefore to maintain the strong vibrant community that currently exists we need to stimulate NERC into considering the important role marine biogeochemical cycles play in regulating climate and delivering services. To do this we feel that we need to produce a document describing clearly the key issues that the community feels are most pressing. Please come along and participate in the discussion on **Friday, 9:00-12:00 Room 206 & 207, Roland Levinsky Building**.

Meeting of the Marine Optics Special Interest Group (MOSIG)

Members of the Marine Optics Special Interest Group (MOSIG), and scientists interested in joining the MOSIG, are invited to attend an annual MOSIG meeting on **Friday 12th September 1000 (Room 209)**. The purpose of the meeting is to: i) update MOSIG on recent developments within the SIG; ii) exchange relevant information related to the SIG; and iii) discuss plans for the SIG in over the next two years, including organising a 2-day meeting in 2015.

International Indian Ocean Expedition 2 : how can the UK contribute?

This informal town meeting will take place on **Wednesday afternoon at 1430 (Room 206)**. It is designed to raise awareness in the UK marine community of plans led by SCOR and IOC to bring a concerted international effort to bear on the scientific issues of the Indian Ocean, in part to celebrate 50 years since the first International Indian Ocean Expedition. SCOR is leading the international research plan for IIOE-2 and a draft should be available by September. This meeting will discuss the international framework, present the report from an exploratory UK workshop on Indian Ocean science held earlier this year at Dartington Hall, and discuss how we can all get involved. Everyone is invited to participate. We hope that the outcomes will include development of future collaborations, opportunities and plans for research led by UK scientists. For further information contact Professor Karen Heywood, Chair of the UK SCOR committee, k.heywood@uea.ac.uk

Chelsea Instruments Workshop

Using Fast Repetition Rate fluorometry to generate relative Photosynthesis – Photon irradiance (rPE) data.

Kevin Oxborough *et al.* are presenting a poster at this meeting, which addresses 'The potential for combining Fast Repetition Rate (FRR) fluorometry data from Fluorescence Light Curves (FLCs) and continuous dark measurements to estimate Gross Primary Production (GPP) on wide spatial and temporal scales'. This workshop will cover some of the technical details of this approach to GPP analysis and will provide a practical demonstration of CTG's FastOcean FRRf sensor, FastAct laboratory system and FastPro8 GUI. This combination allows the user to run continuous FLCs and perform real time data analysis to generate relative Photosynthesis / Photon Irradiance (rPE) curves. An overview of CTG's ongoing hardware and software developments in this area will also be presented. **Taking place on Wednesday 1430 (Room 209)**.

The *Challenger Society* is the UK's premier society for promoting interest in Marine Science and all matters relating to the world's oceans

The Society's objectives are:

- To advance the study of Marine Science through research and education
- To disseminate knowledge of Marine Science with a view to encouraging a wider interest in the study of the world's oceans and an awareness of the need for their proper management
- To contribute to public debate on the development of Marine Science

The Society aims to achieve these objectives through a range of activities:

- Holding regular scientific meetings covering all aspects of Marine Science
- Supporting specialist groups to provide a forum for discussion
- Publication of a range of documents dealing with various aspects of Marine Science
- Fostering links with other groups and societies throughout Europe and the rest of the world

Membership of the *Challenger Society* provides the following benefits:

- An opportunity to attend, at reduced rates, the biennial four day UK Oceanography Conference and a range of other scientific meetings supported by the Society
- Monthly Newsletter (*Challenger Wave*) providing details of the Society's activities, news of Conferences, meetings and seminars in addition to the Society's magazine *Ocean Challenge*

Why not join the Society and play an active part in the promotion of Marine Science in Europe?

- Find out about people, news, events and career opportunities in Marine Science. Read informal articles on topical issues
- Contribute to the public debate concerning our use of the world's seas and oceans and the need for their proper management
- Find out what's going on in 'inner space' and the exciting scientific discoveries that have radically altered our view of the oceans and the part they play in our lives
- Find out how interdisciplinary teams of marine scientists are studying critical issues such as the impact of human activity on global climate, rises in sea level and pollution control.

Email: membership@challenger-society.org.uk

Web: www.challenger-society.org.uk

Application for Membership

If you would like to become a member please complete the form below and return it to:

Jennifer Jones Executive Secretary
Challenger Society for Marine Science
c/o National Oceanography Centre, Southampton
Waterfront Campus
Southampton SO14 3ZH

Full Membership £40 Student Membership £20 Retired Membership £20

Overseas Membership at full rate only

I HEREBY APPLY to become a member of the Challenger Society for Marine Science and agree to abide by the Memorandum and Articles of Association and any bylaws or regulations made thereunder.

I enclose a cheque payable to the Challenger Society for Marine Science.

Amount: £ _____ Signature: _____

Date: _____

Title: _____ Name: _____

Address: _____

Tel No: _____ E-Mail: _____

Marine Interests: _____

Alternatively you may pay by credit card. *(Please quote card number and add a signature)*

Amount £ _____ Expiry Date _____ 3 Digit Security Code _____

Card Number

Name as it appears on card: _____ Signature: _____

If you wish to pay by Standing Order, please complete the section below

To: _____ Bank plc

Sort Code

Bank Address: _____

Applicant's Name: _____

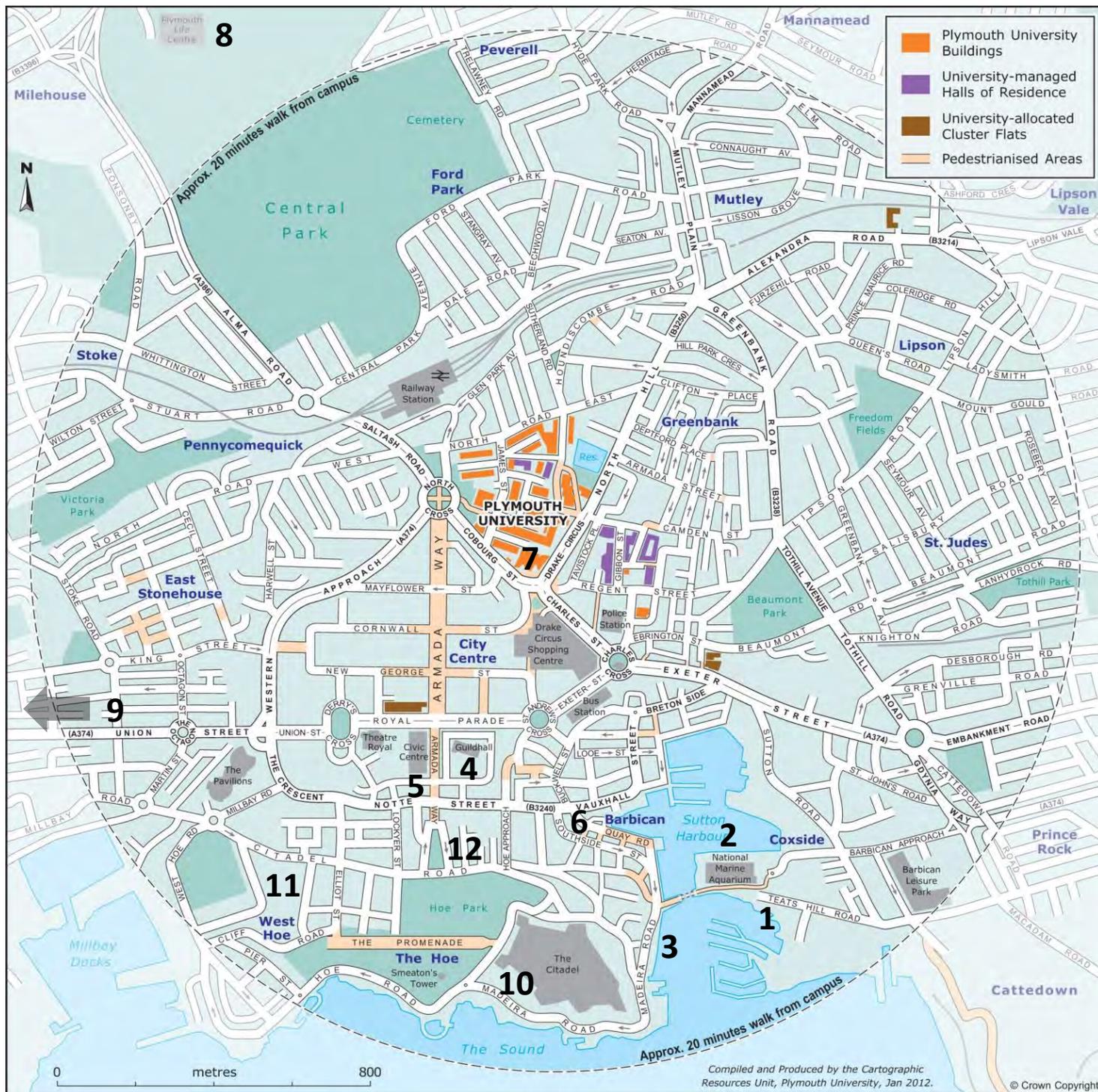
Account Number: _____

Please pay the account of the Challenger Society for Marine Science,(A/c No. 60246778) Barclays Bank (20- 35- 35),Godalming Branch, 87 High Street, GODALMING Surrey GU7 1AP

The sum of £..... on receipt of this order and thereafter on the 1st January of every year until further notice

Signed: _____ Date: _____

Activity Location Map



1.	Plymouth Dive Centre , Queen Annes Battery Marina, 4 Lyhner Building, Plymouth , PL4 0LP, 01752 263900
2.	National Marine Aquarium , Rope Walk, Coxside, Plymouth PL4 0LF, 0844 893 7938
3.	Ferry to Cawsand , 2-5 Commercial Wharf, Barbican, Plymouth, Devon, PL1 2NX, 01752 253153
4.	Plymouth Guildhall , Plymouth Guildhall, Plymouth City Council, Plymouth, PL1 2AA, 01752 307764
5.	Plymouth Council House , Lord Mayors Reception, Plymouth City Council, Plymouth, PL1 2AA, 01752 307764
6.	Plymouth Gin Distillery , 60 Southside Street, Plymouth PL1 2LQ, 01752 665292
7.	Roland Levinsky Building , Plymouth University, PL4 8AA, 01752 588946
8.	Plymouth Life Centre , Mayflower Dr, Plymouth PL2 3DG, 01752 606900
9.	Cremyl Ferry , Admirals Hard Plymouth, Torpoint, Cornwall PL10 1HX, 01752 822105
10.	SAHFOS and the Marine Biological Association , The Laboratory, Citadel Hill, Plymouth PL1 2PB, 01752 633207
11.	Plymouth Marine Laboratory , Prospect Pl, Plymouth, Devon PL1 3DH, 01752 633100
12.	Plymouth University Accommodation , 163 Notte Street, Plymouth, PL1 2AQ, 01752 531030

Restaurants Offering a 10% Discount for Conference Delegates

These restaurants are within a few minutes' walk of the conference venue and accommodation and offer good food at reasonable prices.

We recommend you book a table as some of these restaurants are quite small and busy.

Terms and Conditions of the offer.

- Available only on the dates 7th to 11th September inclusive.
- 10% discount applies only to food.
- Cannot be used with any other offer.
- Please take this booklet with you as proof of eligibility.



A. Barbican BurgerBar

Newly opened American style burger bar.
60 Notte Street,
The Barbican, Plymouth.
(Sorry No QR Code)



B. Meze Grill

As you might expect from the name, a Greek Restaurant.

Sutton Harbour, Plymouth PL4 0DW
01752 674633



C. Lorenzos

Spanish and Mediterranean restaurant
Nick Owens' favourite restaurant in Plymouth!

Athenaeum Place, 01752 201522



D. Bar Rakuda

1 Quay Rd, Plymouth, Devon, PL1 2JZ
01752 221155
(Sorry No QR Code)

Seafood & Pasta Bar

E. Does what it says on the sign!
Alfresco dining by the harbour.
10 Quay Rd, The Barbican, Plymouth



F. Pizza Express

Surely, no more information needed?
Please note, this offer applies only to this branch:
17 Derrys Cross, Plymouth, 01752 229413



G. The Spice Well

Fine Indian Restaurant. Another one of
Nick's Favourites!
18 Buckwell St, Plymouth, Devon PL1 2DA
01752 226333



H. ZUZIMO!

Bar-Kitchen-Tapas from around the world.
Newish to our restaurant critic but recommended!
153 Vauxhall St. 01752 651300



Some other suggestions for eating and drinking venues not offering discounts

9. Pub on the Hoe - 159 Citadel Road. 01752 202405

For those who know Plymouth this was, until a recent rebranding, the Yard Arm. It is close to the MBA , SAHFOS and PML. As well as serving OK conventional pub meals in the evenings it serves breakfasts commencing at 0700, starting at £2.99 for a full English. It is just around the corner from Astor House, the University accommodation, so for those of you staying there it might be just what you need to set you up for the day. Your discerning restaurant critic hasn't tried the breakfasts so don't shoot the messenger; but it is a pub we all use.



10. Cap'n Jaspers - Old Fishmarket, the Barbican

To describe Cap'n Jaspers as a burger-bar shack would be like describing Concorde as an aeroplane; yes, it plainly was and Cap'n Jaspers sells food and drink from what is essentially a shack. But, as with Concorde, Cap'n Jaspers is simply sublime. But thankfully it is still going strong! Cap'n Jaspers is known worldwide for its fast food, largely meat based, although vegetarians are catered for. It is quirky, it is fun and unique to Plymouth. Located in the centre of the Barbican in a prime site, give it a visit. Although seating is outside it is covered, you also get the cheapest cup of coffee or tea anywhere in Plymouth and if you wish to give your mug back (rather than 'nick it') you can donate your 20p deposit to the Seaman's Mission charity. You'll be passing pretty close - by on your way to and from the Icebreaker at the Aquarium – so give it a go.



11. The Dolphin - The Barbican

No visit to Plymouth would be complete without a visit to Plymouth's iconic pub, the Dolphin. Set in the heart of the Barbican, there is nothing pretentious about the Dolphin. What you get is an excellent range of cask beers, several served straight from the barrel without pumps, an open fire on all but the hottest days of the year, and a clientele from judges, fisher and yachts people, business folk, locals and even the occasional marine scientist. Highly recommended for at least one visit. You'll likely pass by the front door on your way to or from the Icebreaker at the Aquarium.



The Dolphin was a favourite haunt of the artist Beryll Cook and she produced some wonderful paintings of the clientele. I'm pleased to say the place hasn't changed much in over 30 years of my acquaintance with the place!

12. The Minerva Pub - 21 Looe Street

Plymouth's oldest pub, reputedly established in 1540. This was a bad year for Henry VIII's 4th wife, Anne of Cleves, who was banished after only 6 months of marriage. It turned out worse for Thomas Cromwell, Henry's previously trusted advisor, who was beheaded in July 1540. There are even some artefacts from the wrecks of the Spanish Armada in the pub, allegedly. I wonder how much of all this history has been talked about in this atmospheric pub? Great beers, well worth a visit.



Restaurants Offering a 10% Discount Location Map



Please take your handbook to receive a 10% discount

A	Barbican Burger Bar , 60 Notte Street, The Barbican, Plymouth, PL1 1AG
B	Meze Grill , Sutton Harbour, Plymouth, PL4 ODW, 01752 674633
C	Lorenzo's , Atheneum Place, Plymouth, 01752 201522
D	Bar Rakuda , 1 Quay Road, Plymouth, PL1 2JZ, 01752 221155
E	Seafood and Pasta Bar , 10 Quay Road, Plymouth, 01752 260717
F	Pizza Express , 17 Derry's Cross, Plymouth, 01752 229413
G	The Spice Well , 18 Buckwell Street, Plymouth, 01752 226333
H	ZUZiMO! , 153 Vauxhall St, Plymouth, Plymouth, 01752 651300

Some other suggestions and other venues not offering discounts

I	Pub on the Hoe , 159 Citadel Road, Plymouth, 01752 202405
J	Cap'n Jaspers , Old Fish Market, The Barbican, Plymouth
K	The Dolphin , 14, The Barbican, Plymouth, 01752 660876
L	The Minerva Pub , 31 Looe Street, Plymouth, PL4 0EA

PLYMOUTH GOOD FOOD



Lunch menu



Evening menu



Special diets catered for



Organic



Fairtrade



Takeaway



Disabled access



Family friendly



Dogs welcome



Free Wi-Fi

1 The Artillery Durnford St, PL1 3QR
www.artillerytower.co.uk / 01752 257610 / @artillerycook



2 Barbican Kitchen 60 Southside Street, PL1 2LQ
www.barbicankitchen.com / 01752 604448 / @barbicankitchen



3 The B-bar Barbican Theatre, Castle Street, PL12NJ
www.b-bar.co.uk / 07786 808807 / @BBarPlymouth



4 Bistro One 68 Ebrington Street, Charles Cross PL4 9AQ
www.bistro-one.co.uk / 01752 313315 / @BistroWineMan



5 The Chancel 2 St Andrew St, PL1 2AH
www.thechancel.co.uk / 01752 226264 / @TheChancel



6 Chloes Restaurant 23 Princess St, PL1 2EX
www.chloesrestaurant.co.uk / 01752 201523



7 Dolphin House Brazzerie Sutton Harbour, PL4 0DW
www.dolphinhousebrazzerie.co.uk / 01752 254879 / @DolphinHouseBra



8 Drakes Plymouth University, Drakes Circus, PL4 8AA
www.plymouth.ac.uk / 01752 600600



9 Fishbones Future Inns, 1 William Prance Rd, PL6 5ZD
www.futureinns.co.uk / 01752 701000 / @FutureInns



10 Fisherman's Arms 31 Lambhay Street, The Barbican, PL1 2NN
www.thefishermansarms.com / 01752 661457 / @Fishermansarms



11 Himalayan Spice 31 New Street Barbican, PL1 2NA
www.himalayanspice.net / 01752 252211



12 JD's Grill 17 Derrys Cross, PL1 2SW
www.jds-grill.co.uk / 01752 601605 / @JDsGrill



13 Lemon Tree Café Bistro 2 Haye Road South, Elburton PL9 8HJ
www.lemontreecafe.co.uk / 01752 481117 / @lemontreecafebr



14 Loafers New York Deli Plymouth University, Drakes Circus, PL4 8AA
www.plymouth.ac.uk / 01752 600600



15 National Marine Aquarium Rope Walk, Coxside, PL4 0LF
www.national-aquarium.co.uk / 01752 275 205 / @NMAPlymouth



16 Plymouth Arts Centre Food 38 Looe Street, PL4 0EB
www.plymouthartscentre.org / 01752 206114 / @PlymArtsCentre



17 Quay 33 33 Southside St, PL1 2LE
www.quay33.co.uk / 01752 229345



18 Reservoir Café Plymouth University, Drakes Circus, PL4 8AA
www.plymouth.ac.uk / 01752 600600



19 River Cottage Canteen & Deli Royal William Yard, PL1 3QQ
www.rivercottage.net/plymouth / 01752 252702 / @plymouthcanteen



20 Rockfish Sutton Harbour, 3 Rope Walk, PL4 0LB
www.rockfishdevon.co.uk / 01752 255974 / @rockfishplym



21 Rock Salt Café & Brasserie 31 Stonehouse Street, PL1 3PE
www.rocksaltcafe.co.uk / 01752 225522 / @rocksaltcafeuk



22 Samphire Brasserie 111 Mayflower Street, PL1 1SD
www.samphirebrasserie.com / 01752 263116 / @VegSamphire



23 Sprouts 104 Union Street PL1 3HL
www.sproutsplymouth.weebly.com / 01752 225873 / @SproutsP



24 Tanners Restaurant Prysten House, Finewell Street, PL12AE
www.tannersrestaurant.com / 01752 252001 / @TannersPlymouth



25 The Treasury The Old Treasury Building, Catherine Street, PL1 2AD
www.thetreasurybar.co.uk / 01752 672121 / @TheTreasuryBar



26 Tudor Rose Tearoom 36 New Street, The Barbican PL1 2NA
www.tudorros-tearoom.co.uk / 01752 255502



27 Vauxhall Quay Little Vauxhall Quay, The Barbican, PL4 0EY
www.thevauxhallquay.com / 01752 252110 / @TheVauxhallQuay



28 Veggie Perrin's 97 Mayflower Street, PL1 1SD
www.veggieperrin.co.uk / 01752 252888





CREATING A SUSTAINABLE FOOD CITY
www.foodplymouth.org



Did you know that?
 Plymouth's schools are served Gold Catering Mark standard meals by the Plymouth City Council Meals Service, the first Local Authority in-house caterer in England to receive this coveted award.

Did you know that Plymouth University catering outlets are open to the public? Loafers and Drakes are certified to Bronze Food For Life Catering Mark in recognition of their use of fresh and local ingredients!



c. 2000ft
 c. 500m

INDEPENDENT CAFÉS, RESTAURANTS & PUBS SERVING LOCAL FOOD WITH CLEAR PROVENANCE

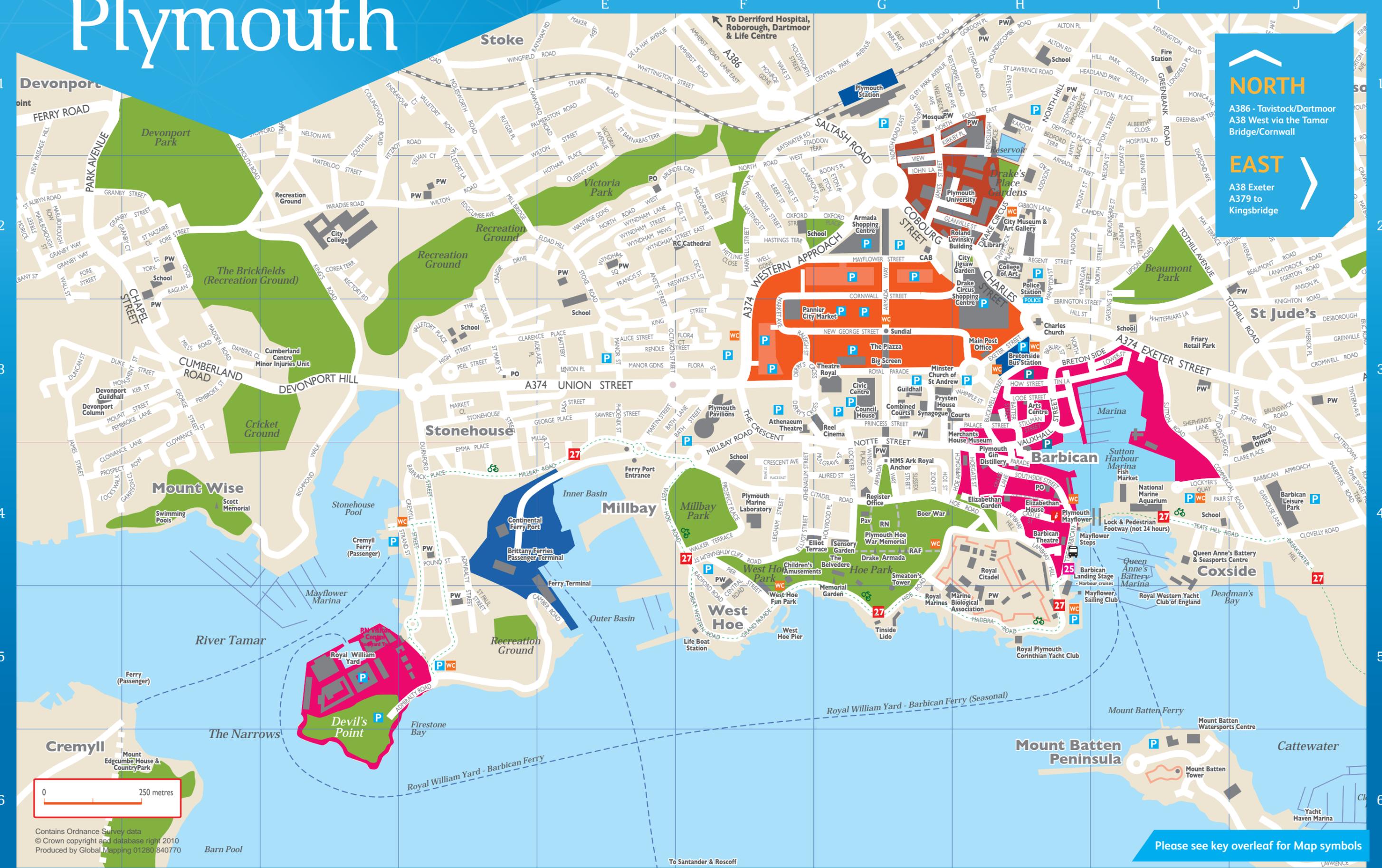
Good Food location points are approximate according to the centre of the postcode.

Welcome to Plymouth

- | | | | | |
|------------------------|---|-------------------------|-----------------------------------|--|
| F3 City Pannier Market | I4 National Marine Aquarium | H3 Plymouth Arts Centre | G3 Theatre Royal | G5 Tinside Lido Open-air Pool |
| B6 Mount Edgcombe | H4 Plymouth Gin Distillery | B4 Scott Memorial | H4 Royal Citadel | H2 Roland Levinsky Building (Peninsula Arts) |
| H4 Mayflower Steps | H2 Plymouth City Museum and Art Gallery | G4 Smeaton's Tower | C5 The Royal Naval Visitor Centre | |

NORTH
 A386 - Tavistock/Dartmoor
 A38 West via the Tamar Bridge/Cornwall

EAST
 A38 Exeter
 A379 to Kingsbridge



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Please see key overleaf for Map symbols

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38	International Ocean Systems
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Autonomous Surface Vehicles (ASV) Ltd design, build and operate unmanned marine systems. ASV's diverse fleet of Unmanned Surface Vehicles (USVs) serve industries across the globe in achieving unmanned operations at sea. At the forefront of autonomous research and development, ASV continue to provide solutions to international security and defence, oil and gas and environmental industries. In just four years, ASV has supplied over 50 unmanned systems including marine target drones, mine countermeasure vehicles, long endurance survey catamarans, oil field services vehicles and station keeping buoys. Equipped with a 12,000 sq. ft. design, build and maintenance facility in Portchester UK, ASV pride themselves on providing full package autonomous solutions.

Autonomous Surface Vehicles Ltd
Trafalgar Wharf, Portchester
Hampshire, PO6 4PX, United Kingdom
<http://www.asvglobal.com>



Chelsea Technologies Group (CTG) Ltd provide sensors and systems for measurement of key environmental parameters within the oceanographic, coastal and inland water zones. The range of sensors include Lux fluorometers, for detection of chl-a, cyanobacterias, as well as dyes for tracer studies. The Lux family also include UV fluorometers for detection of Hydrocarbons, CDOM and Effluent / Bacteria. Active fluorescence fluorometers are also provided with the FastOcean range of Fast Repetition Rate fluorometers which allow accurate estimations of Primary Productivity. In addition, sensors to measure temperature, conductivity, depth, turbidity, transmission, PAR, bioluminescence and plankton samplers, as well as an acoustics range of products including Hydrophones, Projectors and communication transducers are also provided. Systems offered include SeaSoar and NuShuttle towed vehicles, as well as Aqualine Ferrybox. CTG Sensors and Systems address the needs of the Research, Operational monitoring, Oil and Gas, Maritime and Defence markets.

Chelsea Technologies Group Ltd
55 Central Avenue
West Molesey
Surrey KT8 2QZ, United Kingdom
<http://www.chelsea.co.uk/>



EdgeTech is a leading manufacturer of underwater technology solutions. The company is known worldwide for its high quality products which include: deep sea acoustic releases, shallow water and long life acoustic releases, transponder beacons, USBL systems, MRUs and customized underwater acoustic command and control systems. In addition, the EdgeTech name is associated with a full line of underwater survey products, including side scan sonars, sub-bottom profilers, bathymetry systems, AUV and ROV-based sonar systems, combined systems and customized solutions.

Massachusetts Office

4 Little Brook Road, West Wareham, MA 02576

<http://www.edgetech.com/>



The Institute of Marine Engineering, Science and Technology (IMarEST) is the leading international membership body and learned society for all marine professionals. It is the first Institute to bring together marine engineers, scientists and technologists into one multi-disciplinary professional body. With 15,000 international members based in over 100 countries, it is the largest marine organisation of its kind.

Working with the global marine community, the IMarEST promotes the scientific development of marine engineering, science and technology, providing opportunities for the exchange of ideas and practices and upholding the status, standards and expertise of marine professionals worldwide.

The IMarEST is a respected authority in every maritime country. It is a Non-Governmental Organisation at the UN International Maritime Organization (IMO), has special consultative status with the Economic and Social Council of the United Nations (ECOSOC) and is a nominated and licensed body of the Engineering Council (UK), a member of the Science Council and has significant links with many other maritime organisations worldwide.

IMarEST also runs a series of industry leading events and conferences as well as publishing internationally recognised titles: Marine Engineers Review (MER); Shipping World & Shipbuilder (SW&SB); Maritime IT and Electronics (MITE); Marine Scientist; and Offshore Technology.

IMarEST

Aldgate House, 33 Aldgate High Street

London, EC3N 1EN, United Kingdom, <http://www.imarest.org/>



International Ocean Systems is a UK-based Diver Group magazine with a bi-monthly circulation in excess of 10,000 worldwide. It serves the commercial oceanography market covering the fields of ocean data gathering, underwater surveying, and instrumentation. Readers are predominantly upper management, designers/engineers and scientists.

8 Mount Mews
Hampton
Middlesex, TW12 2SH, United Kingdom
<http://www.intoceansys.co.uk/>



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E: sales@planet-ocean.co.uk
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RS Aqua are suppliers of oceanographic instrumentation, sensors and accessories to the research, academic, monitoring and survey markets. Product range includes ADCPs, Wave Radars, Wave Buoys, Fluorometers, Surface Gliders, Salinometers, DVLs, PCO2 Detectors, Drifters, Profilers, CTDs, Inductive Modems, Tide Gauges, Buoyancy, Housings, Mooring Markers, Location Beacons, Iridium Telemetry and much more.

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RS Aqua Ltd

Units 4-6 Hurst BarnsPrivett, Alton, Hants, GU34 3PL, UK

www.rsaqua.co.uk



Swale Oceanographic has been supplying a range of quality instrumentation and equipment for over 25 years. Customers include researchers and operators in environmental, engineering, defence, dredging, oil& gas, renewable energy and survey sectors.

We represent manufacturers with an outstanding reputation in the market for functionality, engineering and reliability. These include General Oceanics, LinkQuest, NKE Instrumentation, Ocean Sensor Systems, Sea Sciences, Teledyne Benthos and Teledyne Webb. Swale also manufactures battery packs compatible with a wide range of instruments and equipment.

Our wide product portfolio includes: Acoustic equipment such as modems, hydrophones, pingers, releases and ADCP current profilers & wave sensors. Electromagnetic & mechanical current meters. Data recorders – CTDs, single & multi-parameter probes and altitude sensors. Wave and tide recorders. Databuoys, pop-up buoys, drifters & ARGO profilers. Glass sphere floats and instrument housings. Winches, rosettes & niskin bottles for water sampling. ROVs & towed vehicles. Plankton nets and oil-spill sampling kits. As well as our own custom built battery packs.

Swale Oceanographic

Suite 103, Highview Business Centre
High Street, Bordon, Hants, GU35 0AX

<http://www.swaleocean.co.uk/>



Valeport are the UK's leading manufacturer of Oceanographic and Hydrographic instrumentation which include the world's most accurate Sound Velocity Probes / Sensors, our new Optical sensor range, Altimeters, Radar Level Sensor, Current Meters, Tide Gauges, Wave Recorders, CTD's, Multi-Parameter CTD's and GPS Echo Sounders. Engineered solutions to your monitoring challenge.

Valeport Ltd

St Peter's Quay, Totnes, TQ9 5EW
Devon, United Kingdom
<http://www.valeport.com/>



Xylem Analytics are a major global manufacturer of market leading brands such as YSI, SonTek, Aanderaa, WTW and WaterLog. The groups success is built on innovation & application expertise in water quality and oceanographic instrumentation. Products include:

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- Handheld Water Quality Meters
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- Tide Gauges and Radar Level Gauges
- Sound Velocity Profiler
- Wave Sensors

Xylem Analytics UK Limited

2 Focal Point
Lacerta Court, Works Road
Letchworth, Hertfordshire, SG6 1FJ, United Kingdom
<http://www.xylemanalytics.co.uk/index.php>



MILLENNIUM

HOTELS AND RESORTS

MILLENNIUM ■ COPTHORNE

The Copthorne Hotel Plymouth is situated on the south coast, in the heart of the city of Plymouth and offers spectacular views down Armada Way, towards the historic Barbican and Hoe areas. The hotel has 135 guest rooms and events space suitable for conferences, weddings and civil ceremonies.

Guests can enjoy appetising dishes in the popular Bentley's Brasserie, which specialises in local produce, and can also choose from a fine selection of drinks throughout the day, in the relaxing Gallery Bar.

The Copthorne Hotel Plymouth provides the ideal place for both leisure and business travellers to stay and offers convenient access to the city's shopping and nightlife districts, as well as to Devon and the West Country. The hotel also has a secure underground car park for guests to use.



Following the formal acquisition of the Turnchapel site from the MoD in March, the Yacht Havens Group are developing the site for hi-tech marine commercial use.



~ Commercial Units to Let ~

- 6 hectare site with water frontage on Plymouth's Cattewater which offers ideal opportunities for marine related scientific or research activities.
- A variety of well equipped workshops and laboratory / office space available to let to existing businesses or start-ups.
- Ideal water front location with 180 metres of pontoon space for berthing with deepwater access and a 6 m draft.
- Turnchapel Wharf is already home to marine civil engineers, an offshore renewables consultancy, specialist marine electrical and electronic suppliers and fitters.

For more information on commercial lets, please contact Ryan Bonney
Tel: 01752 492 565 or 07896 794275 Email: ryan@turnchapelwharf.com
Turnchapel Wharf, Barton Road, Turnchapel, Plymouth, PL9 9RJ

Local Useful Contact Numbers

Plymouth University Events Team

Room 001, Hepworth House, Plymouth University
events@plymouth.ac.uk

Plymouth University Security

Operations Room, Portland Square
Plymouth University
01752588400
security@plymouth.ac.uk

Devon-Doctors – Out of Hours

08456710270

Derriford Hospital Emergency Department

The Emergency Department at Derriford Hospital provides 24 hours a day, seven days a week access for patients with a variety of urgent and emergency conditions
Derriford Road, Plymouth, Devon, PL6 8DH
01752202082

Conference Organisers Emergency Number

This telephone number belongs to the Conference Organiser team and will be contactable from 8am-9pm,
07565503285

Notes

