Welcome to the autumn edition of the Marine Science newsletter

It is the start of a new academic year and we have been busy inducting all of our new Marine Science students and welcoming back those returning from their summer activities. Autumn is now well and truly upon us with the first named storms hitting our shores in recent weeks.

We hope you enjoy this latest insight into the activities of the Plymouth University Marine Science community.

Dr Tim Scott

Follow us! @MarineSciPlym
Students wanting to pursue a career in the marine sciences now have greater opportunity to get a first-rate education after Plymouth University launched four new degree programmes.

The courses, now open for applications with the first intake in September 2015, are designed to enhance the University’s contribution to the UK’s marine science sector.

There will be three three-year BSc programmes: Ocean Exploration and Surveying, Oceanography and Coastal Processes, and Ocean Science and Marine Conservation, alongside a four-year MSci programme in Ocean Science.

The programmes deal with conventional topics such as oceanography and ocean exploration, but also address current issues such as marine ecosystem functioning, coastal processes and management, and human interactions with the marine environment.

The Marine Science group at Plymouth University comprises world-leading researchers addressing a wide range of issues in the marine environment, including ocean mixing, marine renewable energy, storm impacts, coastal erosion, ocean exploration, coastal zone management and marine conservation.

Dr Tim O’Hare, Marine Science Admissions Tutor, says:

“This is an exciting time to be starting a career in the marine sciences, which represent a growing market due to increased pressures and opportunities in coastal, ocean and marine environments. The UK Marine Science Strategy 2010-2025 highlighted the importance of the sector in terms of its significant role in employing Marine Science graduates and postgraduates. But it also indicated one of the key barriers to growth for the sector was skills shortages in science graduates, which our new courses are specifically designed to

Dr Sarah Bass, Marine Science undergraduate scheme manager, added:

“As Britain’s Ocean City, Plymouth provides an unrivalled location for studying in the marine sciences. Our brand new £4.85 million Marine Station, located right on the shores of Plymouth Sound, provides the only waterfront campus of its kind in the UK, housing laboratories, state-of-the-art oceanographic equipment and an academic diving centre. The University’s flagship oceanographic teaching and research vessel, the Falcon Spirit, also operates from the Marine Station so students can take their samples from the boat straight into the laboratory for analysis.”

Professor Gerd Masselink, Head of Marine Science at Plymouth University, said:

“The issues we are addressing are all of great societal significance, and incorporating this material into the new degree courses makes them cutting edge, as well as highly relevant. The overarching aim of the new set of degree programmes is to produce highly-skilled and employable graduates with the knowledge and expertise to sustainably manage marine environments. We place great emphasis on learning by doing and, in fact, a third of our modules are practically-based, using Plymouth Sound and the southwest coast of England as a natural laboratory for many of our field-based activities.”
Plymouth University’s brand-new £4.85m Marine Station was handed-over by the building contractor on Friday 14th November. Located on our waterfront campus at Cosside, between the National Aquarium and Queen Anne’s Battery, it is only 20 minutes’ walk from the Main Campus through the historic Barbican area of Plymouth.

Fully operational by Christmas, the Marine Station will provide excellent facilities to support marine-related teaching and research. It will also act as the shore-side base for our fleet, marine field equipment and professional dive team.

The upstairs classrooms and roof terrace have an amazing view out across the Plymouth Sound Special Area of Conservation (SAC), whilst downstairs there is a Wet Lab, seawater Aquarium and changing facilities.

All boat-based practical work throughout the Marine courses will use the Marine Station as an operating base, and the facilities will also be available to support student project work. Some of the core modules within the new programmes will be based at the Marine Station.

Follow further updates on the new facility on Facebook @ MarineStationPlymUni
STUDENT INDUCTION

September saw a new cohort of Marine Science students arrive to join the Plymouth University community. Induction week ended with a splash this year with a range of activities during the week culminating in a trip to the Adventure Centre near Tavistock where the students tried their hand at archery, canoeing, climbing and raft building... an action packed day was had by all. The Plymouth University Marine Science community welcomes you all and we hope you are beginning to feel at home here in Plymouth, finding your way around, meeting new friends and getting stuck in to your studies.

BRITISH ANTARCTIC SURVEY DIVERS

Plymouth’s association with Antarctic exploration continues. Not only is Plymouth the birthplace of Robert Falcon Scott, it’s also where the British Antarctic Survey divers come for their pre-deployment training. Four divers from BAS recently headed down to the not-so sunny South West for some last minute dive training before heading off for 18 months of diving at the Rothera Research Station on the Antarctic Peninsula.

Over the course of the week with Plymouth University, the intrepid team had a chance to try out the dive equipment they will be using and get to grips with some of the camera systems used to record the marine life and scientific experiments. The divers, who will be diving throughout the Antarctic winter, will face temperatures as low as minus 30 degrees, sea ice metres thick and some rather inquisitive wildlife all in the name of science.

For more information on diving with Plymouth University contact marinestation@plymouth.ac.uk

THE IRONMAN

Congratulations to Dr Mark Davidson, for achieving a lifelong ambition of qualifying for, competing in, and finishing the 2014 Kona Ironman World Championships in Hawaii. The gruelling race brings triathalons best athletes together from around the world and involves a 3.86 km open water swim, a 180.2 km cycle and a 42.2 km run (marathon). If that sounds exhausting enough, the race was held in temperatures in the high 30s with strong gusting winds.

Mark, who is a Reader in Coastal Processes and Programme leader for the Applied Marine Science Masters Degree here at Plymouth University, completed the race in an impressive 26th place in his division with a time of 10:29:33. Good effort Mark!
As part of ongoing research into the physical dynamics of marginally stratified shelf seas, members of the Marine Physics Research Group (MPRG) conducted four days of sampling offshore of the north Cornwall coast during August 2014. The aim of the field work was to establish the water movement and mixing characteristics in the region where a sea surface temperature front appears in summer and separates two distinct turbulent mixing regimes. Offshore, in the deeper water, the water column is stratified near the sea surface due to warming by sunshine. Turbulence generated by tidal currents flowing along the rough seabed mixes the water column closer to the bottom but dies away further from the bed, allowing the development of the seasonal thermocline. Inshore where the water is shallower, the turbulence generated by the tides can extend across the entire water column with the consequence that the thermocline is destroyed as the water warmed by sunshine is mixed with the underlying colder water. The transition between these two regimes is characterised by the shelf sea front depicted in Figure 1, and is also recognized as an area of increased primary productivity which is important for a healthy shelf sea ecosystem.

The field work included measuring the current speeds using a vessel-mounted ADCP (Acoustic Doppler Current Profiler). We also measured the temperature and salinity of the water column using a Conductivity-Temperature-Depth (CTD) sensor, and most interestingly, tracked the water using an inert, green-coloured, dye called fluorescein (Figure 2). We were able to track the dye in four dimensions - three spatial dimensions and through time - in order to obtain a time-evolving pattern of the dye patch. The instrument we used to measure the dye is called a fluorometer and measures the amount of light emitted at a specific wavelength by the fluoroscein after being excited by a light source on the fluorometer. The 4D maps were obtained by mounting the CTD and fluorometer on a vehicle that undulates between the sea surface and mid depth whilst being towed by the ship.

This work forms part of an ongoing project that aims to quantify the mixing processes along particular shelf sea fronts where the input of energy at or near the sea surface provides a large proportion of the mechanical energy available for mixing - such as the front off north Cornwall.

Follow the activities of the Marine Physics Research Group at:
www.marinephysics.org 
@MarinePhysics

Figure 1: Schematic of a typical shelf sea front showing the temperature cross section. On the LHS cooler, well-mixed, waters are present up to the surface. On the RHS stratified conditions exist with warmer waters near the surface and cooler waters below.

Figure 2: The inert dye provides an impressive sight which can be tracked by eye – although a more robust, scientific method requires a fluorometer!

Figure 3: PhD student and former Plymouth undergraduate (Marine Biology and Oceanography) Marcus Zanacchi at the start of a vertical profile using the RBR Concerto CTD.
Plymouth University’s Marine Institute was created in 2006 to bring together the University’s marine and maritime expertise to help provide practical solutions for a sustainable marine future. The Marine Institute aims to do this through an integrated, multidisciplinary approach to marine research, education and innovation. The Institute hosts a number of events throughout the year and there are some events for the diary in December:

**Marine Institute Christmas Lecture by Maya Plass (Marine Educator).**
13:00 Wednesday 10th December (venue TBC; check MI website for updates www1.plymouth.ac.uk/marine). This lecture will be primarily aimed at students, giving an insight into Maya’s work in marine education since graduating from Plymouth University.

**Marine Institute Student Lectures - Life in Plymouth Sound.**
18:30 Wednesday 17th December, Devonport Lecture Theatre, Portland Square Building.

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**Graduate profile**

Matthew Palmer

**Physical Oceanographer, NERC National Oceanography Centre**

“Plymouth University introduced me to and educated me in a range of marine science disciplines. This broad range was what first attracted me to the University and has helped me to develop a multidisciplinary aspect to my science.

After graduation I undertook PhD research into oceanic turbulence in shelf seas at Bangor University in North Wales, investigating how mixing helps control the structure of our oceans and linking physics to biological processes that form an important part of the Earth’s carbon cycle.

I now work for the Natural Environment Research Council’s (NERC) National Oceanography Centre (NOC) as a Physical Oceanographer. My current role includes acting as principal scientist on the Irish Sea Observatory project and contributing to NOC research into the horizontal patchiness in vertical mixing, the interaction of topography with stratified flows and linking ocean physics to biological processes. Other recent projects have included investigations into ocean acidification, biogeochemical cycles and freshwater pathways through the coastal system.

The best thing about my work is having the freedom to decide where my research goes next, having access to state-of-the-art technology and numerical models, working in a stimulating environment and being excited about returning to work every Monday.

Although a relatively new university, Plymouth has a long history of marine science and manages to attract excellent research scientists and teaching staff. The University also benefits greatly from its close association with the Plymouth Marine Laboratory and the Marine Biological Association. I would encourage any marine science student who chooses Plymouth to take full advantage of these excellent resources.”
Top tweets

Successful @nercscience #winterstorm recovery bathy survey with @eiml support. #Perranporth

Marine Hydrography students onboard this pm measuring current speed, direction and salinity using a Vaisala meter.

Interesting couple of days testing a turbulence probe on the Arousa Lagoon before a winter deployment.

More shipwreck hunting today with @PlymouthUni students using side-scan sonar and magnetometer.

Leaky day for a bateau survey in glorious sunshine.

MRes students getting ready for balloon-cam habitat mapping - hoping the wind stays low @MarineSciencePym

WASP team on day 2 - all instruments installed and surveyed. Data arriving at night. High tide - less rain wise.

Rainbow over north Hallands - beach looks recovered from winter storms. Good trip with CZM students - wet at start.

MSc Marine Hydrography students preparing work tanks for biofouling with AOGP.

Q&A: Marine Hydrography students prepare work tanks for biofouling with AOGP.

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Life aboard the RRS James Cook

... with Dr Jaimie Cross

Jaimie is a Postdoctoral Research Fellow in the Marine Physics Research Group (see www.marinephysics.org).

I have often heard it described that life aboard a scientific research vessel is not unlike sheltered housing for the young. Whilst certain elements of that statement are correct, there is a little bit of hard work thrown into the mix too - that is if you want to successfully collect the measurements you set out to in the first place.

During July 2013, I embarked on the main research cruise aboard the RRS James Cook for the project on which I am currently employed, Fluxes Across Sloping Topography in the Northeast Atlantic (FASTNet). Our job was to deploy several current meter moorings and to undertake a dye-tracer experiment in the region of the Malin Shelf, around 100km to the Northwest of Ireland. We wanted to observe how a submarine canyon might affect the steady, poleward flow of the Northeast Atlantic slope current.

Battling large waves and storms, we managed to successfully deploy our moorings in between the all-important meal times, which consisted of a fabulous choice of gourmet classics. And dessert. The meals fuelled a four hours on, eight off watch system which really came into its own during the dye-tracer experiment. Tracking the dye meant deploying our trusty Microstructure profiler for a record nine-days in total. Whilst I thought this would give us the most interesting data set, my enthusiasm was not entirely shared by some of my colleagues on the cruise, who by day nine were considering deploying themselves off the back deck of the ship to search for the dye tracer in person.

Off-watch, there was plenty to keep me busy. Aboard outstanding vessels such as the Cook, there is plenty of lab space to crack on with processing data, engage in enlightening and thought-provoking discussion with colleagues, whilst rapidly responding to changeable conditions that could require a change in observational strategy.

We also played a lot of deck cricket. The skill and ingenuity of the lead technician in creating the bat was something to behold. The same cannot be said of my bowling.

Back on dry land, the real work begins as I attempt to make sense of a complex set of data. Processing, analysis and writing up the results take a lot of time. With the end goal of several research papers, it will doubtless be time well spent though, as thoughts already begin to turn to the next adventure at sea for this plucky University post-Doc.

Above right: An example of ocean glider data of the shelf slope current. Below: Jaimie displaying his illegal bowling action!
Undergraduate research projects

What topics have our students been investigating?