

Spring 2016 | Ocean and Earth Science

# SOES News

Welcome to SOES News – the magazine for current and prospective students, alumni and friends of Ocean and Earth Science. We look forward to sharing exciting updates on our world-renowned scientists, features on cutting-edge research, profiles about our talented alumni, and fun stories about our students. Enjoy!

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# Geology graduate strikes gold in his home country

A first class Geology degree from the University of Southampton has been the passport to an exciting career prospecting for gold for 1997 graduate, Dr Kerim Sener.

The Managing Director of Ariana Resources, based in the Australian city of Perth, is now engaged in a promising mining project in his home country of Turkey. Although he relishes getting out into the field when he can, Kerim admits much of his time is now taken up with technical and corporate responsibilities in the offices of the exploration and development company.

“Anyone interested in getting involved with mineral or oil exploration must make the most of their education. Gain a thorough knowledge of geology, of course, and take further degrees as you specialise, but also understand the power of transmitting and sharing information in the most effective manner. Fluency in presentation skills will be vital to your career.”

**Dr Kerim Sener**

He still uses his knowledge of structural geology and mapping skills learned during his BSc degree every day, and remembers his studies with affection: “Perhaps some of my fondest memories of my time at Southampton are those from our field trips in places like Ingleton, Tenby and Carboneras. These were great opportunities to really get to know our fellow students and our lecturers and build lasting relationships.”

Kerim combined his time at Southampton with practical experience: “During

the end of my second year, I went to Zimbabwe to work with one of the then Lonrho subsidiaries on a summer mapping project, experiencing gold exploration and mining for the first time. The next summer, I was back with them in Zimbabwe. This strengthened my desire to work in an industry that had already



Kerim teaching one of their Turkish geologists how to complete structural mapping in the open-pit.

captured my imagination, though I knew I needed to ‘tool up’ for the challenge with a masters in Mineral Exploration and eventually a PhD at the University of Western Australia.

“The jobs market was tough at that time so I bought a one-way ticket to Zimbabwe, figuring that someone, somewhere in the vast continent of Africa may offer me work. As it turned out, only ten days after arriving and after having met with the exploration managers of every major mining company in Harare, I was offered a job at the Shamva gold mine.”

With the support of a few friends, some dating back to Kerim’s time at Southampton, he went on to establish Ariana Resources in 2002 with £5,000 of their own seed capital. In 2005, they listed the company on the Alternative Investment Market (AIM), raising just over £1 million. Eleven years and £14 million of additional capital later, the company has evolved from grassroots exploration, through resource development into mine construction. Later in 2016, Ariana expects to commission its first gold mine.

[www.arianaresources.com](http://www.arianaresources.com)

Front cover image: Ariana’s first trial gold pour.  
Credit: Kerim Sener

Looking out over the Kiziltepe mine site, with drill rig and team operating in the foreground.

Credit: Kerim Sener

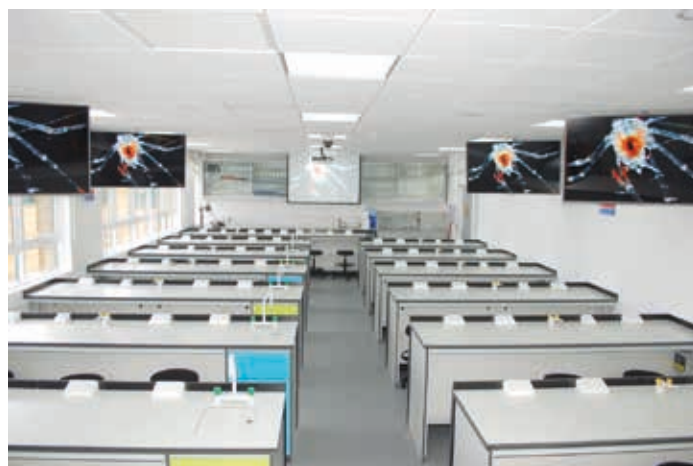


# Inspiring teaching and learning in the lab, on the water and online

Ocean and Earth Science students are enjoying learning in state-of-the-art teaching laboratories after a £2million investment in new facilities. Many of our teaching labs have now been upgraded to give everyone access to the latest equipment, close-up views of experiments and areas for group work.

“Students deserve the best facilities while they are with us and we are confident they will allow teaching staff to inspire our current and prospective students in new ways,” says Professor Rachel Mills, Dean of Natural and Environmental Sciences.

Lecturers are already using the latest technologies to make their sessions inspirational and exciting. Second year marine biologists and oceanographers taking the popular updated Benthic marine ecology module (Ecological Processes in the Marine Benthos) can now put their learning into practice through an online ‘virtual field trip’. It enables them to develop essential career-related skills in analysing real world scientific data alongside understanding current environmental threats to coastal waters and supports their field trips at home and abroad.



“Feedback so far has been very positive,” says Dr Laura Grange. “Students can explore the interactive resources whenever they want and they complement our teaching which now includes a wider range of ‘hands on’ activities.”

“We decided to update the module to make it more contemporary and relevant for our students,” explains Professor Martin Solan. “That means they not only learn the theory of how factors such as climate change, pollution and development affect our coastline, but also use their analytical skills in varied online assignments to gain a full understanding of what is going on. They use real-life datasets to arrive at their own scientific conclusions, make a video documentary about the role species play in the environment and use discussion boards and social media to share ideas.”

The lecturers worked alongside the University’s experts in technology for learning, innovation and development to create an online version of Ocean and Earth Science’s unique research boat, *RV Callista*. It features online sampling equipment, such as a trawl and grab with images from fieldwork, so students can collect virtual specimens for analysis.

This work is similar to the University’s innovative Massive Online Open Course (MOOC) Exploring Our Oceans, led by Dr Jon Copley and Professor Rachel Mills. This project brought together many of Southampton’s ocean and Earth scientists to advise and contribute to the free web-based course in Oceanography that has already been studied by many thousands of people around the world. The MOOC was Highly Commended in the Projects category of the Ocean Awards 2016 (run by the charity Blue Marine Foundation and Boat International magazine).

Material from the MOOC, including footage shot on a Natural Environment Research Council (NERC) research ship, *RRS Discovery* and from a flying drone, is now also used to inspire first year Oceanography students at NOCS.



Resource development

Credit: Martin Solan, Laura Grange, Sarah Fielding and Mimi Lee.

“Lab M is much improved, with better facilities as well as being far more spacious than before. The addition of multiple screens is especially useful in practical sessions and the new layout makes collaborative work a lot easier.”

**Alexandra Loveridge**

BSc Marine Biology with Oceanography, 2017

# ERASMUS Exchange: a semester of endless possibilities!

The Erasmus Programme (European Region Action Scheme for the Mobility of University Students) is a European Union (EU) student exchange programme. Erasmus students are those that take advantage of the Erasmus exchange programme, a well supported and organised scheme that has been in operation since 1987. It allows students to study at universities in the EU member states for set periods of time. The University of Southampton currently has over 230 links with around 173 Erasmus partner institutions across 24 countries. Ocean and Earth Science has Erasmus agreements with several European Universities including Gothenburg Sweden, Bergen Norway, Bremen Germany, Utrecht Netherlands and Las Palmas Spain.

## Winter semester 2016, Bremen Germany

**I am currently in my third year of the MSci Oceanography degree at Southampton. I decided to do a semester abroad exchange as part of my degree at the start of my second year. My main reasons for applying were to enhance my connections with overseas research institutes and universities.**

I took up my place at the University of Bremen in Northern Germany which collaborates alongside the Alfred Wegner Institute, The ZMT and The Max Planck Institute. The main factor supporting my choice was that the University of Bremen offered a greater number of biology-based marine modules which I wanted to take advantage of, as I wanted to keep my interest in this area whilst also reading about the other aspects of oceanography.

I have found the University to be extremely welcoming, organised and personal. The lectures are very willing to have international students in their classes and have been very cooperative in arranging my assessments. However, the semesters in Bremen are out of sync with Southampton, therefore prior planning is required before you leave and during to ensure that you can complete your exams before you return. This can be a little fiddly but, as I mentioned, the lecturers were very helpful and if you are organised with it you should have no problems. There are student campus halls which are usually first reserved for international students and there is an abundance of housing in the city for good prices.

I am grateful for the amount you learn outside of your studies. The aspects which are different in another country such as the language, culture and lifestyle are fascinating. If you are thinking about studying abroad make sure you are willing to commit and are prepared for some challenges along the way. I highly recommend doing a study abroad placement, the lessons you learn will undoubtedly aid you in the rest of your studies and more.

**Emily Sym**

MSci Oceanography, 2017

Emily on a chilly visit to the Olympiastadion during a study trip to Berlin.

Credit: Ana Popovici





# University of Bergen, Norway

**I spent a semester at the University of Bergen, which was an excellent experience. I study Marine Biology and so took related courses which were all very well taught; Fish Behaviour, Fish Physiology and Palaeoecology. They have quite an interactive way of teaching at Bergen which I liked.**

Bergen is a lovely city, particularly the harbour area and is easy to get to know your way around. I lived in Fantoft which is a large student hostel about a twenty minute tram ride from the centre. It was very affordable and had everything I needed. Most people who are on ERASMUS are allocated these halls so it was great to meet a range of people from all over the world. Socially this was good too.

Bergen is surrounded by seven mountains and so hiking is a common pastime and one I often enjoyed in my spare time. Myself and others organised a few hiking trips to further afield places so that we got to see more of Norway's beautiful scenery. Fantoft's

Tenants' Union rents out camping equipment such as tents and roll mats which made these trips possible and I definitely recommend doing a few. If you are keen on hiking, you can join the University's outdoor club which is called BSI Friluft. They organise hiking trips. They also own a cabin a couple of hours away from Bergen in the mountains which you are able to rent out for a very low cost which was a fun experience.

An organisation called Study Bergen organises a range of activities and trips such as a fjord cruise and a skiing day which they offer at a great price. You can also get discounted student prices at most museums and attractions.

I had an unforgettable time at the University of Bergen. The studying, Norwegian culture, the friends I made and the incredible places I visited made it a very worthwhile semester.

**Eleanor Johnston**

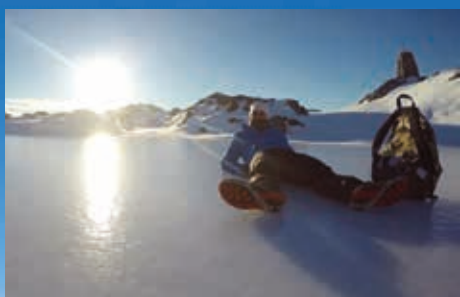
MSc Marine Biology, 2017



Eleanor left with team Great Britain at the Bergen Student Food Competition.

Credit: Study Bergen

**Norway has some unbelievable and invaluable experiences to offer. The places I visited and the like-minded outgoing people I met along the way made the exchange a giant success. If you are willing to throw yourself into the unbelievable number of activities going on daily, I have no doubt you will come away as happy as I am.**



Lunch on ice: Gullfjellet Mountain (987m), the largest in the Bergen Municipality.

Credit: Sam Lindsay

The University of Bergen isn't a campus university like Southampton, yet all buildings are within close proximity. Like all things Norwegian, the facilities are top class, and they don't hold back on anything student related. As an oceanography student, I studied in the Bjerknes Climate science building, which is just one of their flagship buildings, making the experience that little bit more unique. Modules were held in small lecture rooms, giving a personal feel enabling the lecturers to get to know you individually. Undoubtedly, the more personal relationship with my lecturer helped with my studies and drive to excel in my field.

I would recommend staying in Fantoft Student halls. These are around 20 minutes from the city centre, and are about 100 metres walk to the tram, which leaves regularly.

Seventy percent of the people staying in the halls are on exchange. This means endless activities: planning weekend trips into the mountains/fjords or city breaks, exploring the seven mountains that surround Bergen city (if you are brave you can hike all seven in one day!) and maybe even going for the occasional pint or two.

Student exchanges in Norway come with very little cons, but unfortunately the cost of living is one thing you will battle. The price of food, drink and travel can come at a higher cost than in the UK. Truthfully though, the unique experiences Norway has to offer makes it thoroughly worth it!


**Sam Lindsay**

MSc Oceanography, 2017

Background image: Bergen from the top of Ulriken, 643m.

Credit: Sam Lindsay





# Good things come to those who work hard: An update from Mozambique

It has been an extremely successful first year for my marine conservation organisation Love The Oceans. I am an MSc Marine Biology graduate, and set up my non-profit in the last year of my master's. It has been the best thing I've ever done. Don't get me wrong, it was a lot of work, but it has been incredibly rewarding.

Love The Oceans is based in Mozambique and we recruit volunteers to form our research and education teams. Our research involves both shark fisheries data collection on land, and coral reef and biodiversity surveys underwater. Volunteers particularly enjoyed the diving fieldwork with some spectacular sightings of manta rays, whale sharks and humpback whales! We ran two programs in 2015, with most of our volunteers being students from the marine or environmental fields looking at conservation as a possible future career.

Thanks to all the hard work from the individuals behind the organisation and our volunteers, we now have strong seasonal 2015 data sets as well as huge progress at the local school. Our volunteers have built an entire new classroom at Guinjata Escola, meaning we now have a total of four classrooms that can now be used by the 900 students that attend. The volunteers also taught marine conservation at the school – targeting the next generation of fishermen. We wrote a syllabus based around marine animals, conservation and sea safety. The children are so enthusiastic; they are a pleasure to teach and they love to learn. The volunteers said painting the school with murals of marine scenes was a rewarding experience as many of the children were naming the sea creatures as they painted, demonstrating their learning ability. We also had an amazing response from the teachers – on some occasions they came along to lessons so they could learn about the marine conservation too.



The 2016 recruitment process is now well underway. Our project has been met with a welcoming response from students as we offer affordable field experience with shark fisheries in an amazing location.

#### Find out more:

If you would like to volunteer in 2016, email [lovethеоceans@outlook.com](mailto:lovethеоceans@outlook.com) or visit [lovethеоceans.org](http://lovethеоceans.org)

**Francesca Trotman**

MSc Marine Biology, 2015



# Explosive volcanism drove major changes in ‘Snowball Earth’ ocean chemistry

Around 720-640 million years ago, much of the Earth’s surface was covered in ice during a glaciation that lasted millions of years. Explosive underwater volcanoes were a major feature of this ‘Snowball Earth’, according to new research led by Dr Tom Gernon, lecturer, Ocean and Earth Science.



Under a glacier  
in an ice cave.

Many aspects of this extreme glaciation remain uncertain, but it is widely thought that the breakup of the supercontinent Rodinia resulted in increased river discharge into the ocean. This changed ocean chemistry and reduced atmospheric CO<sub>2</sub> levels, which increased global ice coverage and propelled Earth into severe icehouse conditions.

Because the land surface was then largely covered in ice, continental weathering effectively ceased. This locked the planet into a ‘Snowball Earth’ state until carbon dioxide released from ongoing volcanic activity warmed the atmosphere sufficiently to rapidly melt the ice cover. This model does not, however, explain one of the most puzzling features of this rapid deglaciation; namely the global formation of hundreds of metres thick deposits known as ‘cap carbonates’ in warm waters after Snowball Earth events.

The Southampton-led research, published in *Nature Geoscience*, now offers an explanation for these major changes in ocean chemistry.

Lead author of the study, Dr Tom Gernon, Lecturer in Earth Science at the University of Southampton, said: “When volcanic material

is deposited in the oceans it undergoes very rapid and profound chemical alteration that impacts the biogeochemistry of the oceans. We find that many geological and geochemical phenomena associated with Snowball Earth are consistent with extensive submarine volcanism along shallow mid-ocean ridges.”

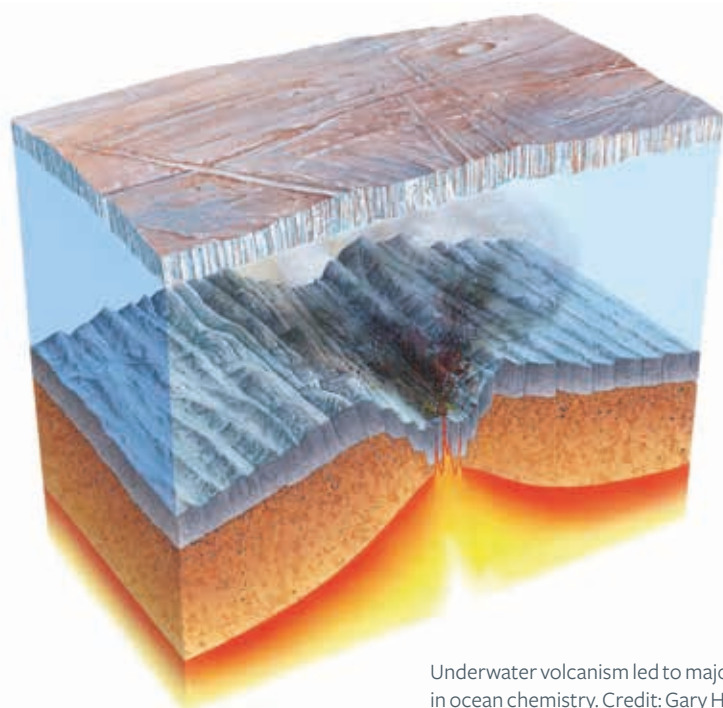
During the breakup of Rodinia, tens of thousands of kilometres of mid-ocean ridges were formed over tens of millions of years. The lava erupted explosively in shallow waters producing large volumes of a glassy pyroclastic rock called hyaloclastite. As these deposits piled up on the sea floor, rapid

chemical changes released massive amounts of calcium, magnesium and phosphorus into the ocean.

Dr Gernon explained: “We calculated that, over the course of a Snowball glaciation, this chemical build-up is sufficient to explain the thick cap carbonates formed at the end of the Snowball event.

“This process also helps explain the unusually high oceanic phosphorus levels, thought to be the catalyst for the origin of animal life on Earth.”

[www.southampton.ac.uk/oes/research/staff](http://www.southampton.ac.uk/oes/research/staff)



Underwater volcanism led to major changes in ocean chemistry. Credit: Gary Hincks



Drone aerial view of the underwater volcano area off Taiwan.

# Southampton alumnus to investigate underwater volcanoes off Taiwan

University of Southampton alumnus, marine biologist Dr Mario Lebrato is planning an exciting research voyage to study hydrothermal vents from underwater volcanoes off Taiwan in 2016. Large numbers of bacteria thrive in these waters, despite the high concentrations of sulphur and carbon dioxide at temperatures of more than 100 celsius, and learning more about this extreme and acidic environment could hold clues to the origins of life on Earth.

“Underwater volcanoes are a great place to help us to understand how life evolved on our planet and perhaps even beyond Earth,” he explains. “Volcanoes combining CO<sub>2</sub> and sulphur fluxes are unique environments where organisms are exposed to sub-lethal conditions. We need to know more about this ecosystem and how crabs and corals manage to live there. More generally, volcanoes can tell us a great deal about the composition of the upper Earth layers, down to where the seawater penetrates below the seafloor. We can also find out how heavy and trace metals spread in the ecosystem in volcanic areas, it’s a great place for scientists to carry out our work.”

Mario co-manages a three year project in Kiel funded by the German Ministry of Research and Education (BMBF) to carry out research around the Kueishantao volcano. The forthcoming expedition will involve hydrographic surveys to examine seawater carbonate chemistry, measure heavy and trace metals both in the underwater volcano and vent mouth, and study the biology of organisms in the area. His project is already attracting worldwide attention. Video footage of ‘white plumes’ of bacteria around the vents shot by a drone from Wildblue Expeditions has been featured in a New York Times article on the research, bringing the excitement of scientific research to a wide audience.

Growing up in northern Spain, Mario always wanted to work on projects related to the ocean: “It wasn’t easy to study the subject at home so I did some research, thought the UK was a good place to choose and found out about the Ocean and Earth Science at the University of Southampton based at the National Oceanography Centre Southampton (NOCS). I started off studying Oceanography with French but changed to a Masters in Science (MSci) Marine Biology. Southampton turned out to be the best possible place I could study.



Credit: Mario Lebrato

Yellow and White vents expelling sulphur and CO<sub>2</sub> at 16m depth.

“In Southampton, I learnt to live alone, outside of my comfort zone I made hundreds of friends there together with lots of connections that helped me later in my research. Studying at Ocean and Earth Science has helped my international career and has led to contracts at some of the best institutions in the world.”

Alongside his research interests, Mario flies drones, taking film for videos, and is also involved in organising tourism expeditions to remote places on Earth. He finds combining his passion for the world’s oceans with scientific research very satisfying. “My ambition is to maintain a balanced lifestyle of working and researching the things I love, spending my free time enjoying a lifestyle that allows me to do this for the years to come.”

[www.facebook.com/whitevolcanomystery](https://www.facebook.com/whitevolcanomystery)

“Studying at Ocean and Earth Science at Southampton has helped my international career and has led to contracts at some of the best institutions in the world.”

Dr Mario Lebrato

Kueishantao Volcano,  
GUEISHAN ISLAND.  
Filmed by Dr Mario Lebrato





# Getting hands-on experience with unique specimens collected by scientists at NOCS

Ocean and Earth Science students can share in the thrill of working with amazing specimens from around the world alongside their studies at Ocean and Earth Science based at the National Oceanography Centre Southampton (NOCS).

In recent years, some students have joined Dr Jon Copley, Associate Professor of Marine Ecology, on research expeditions to the ocean depths. In 2013, Jon led an expedition that collected a previously unknown species of eelpout fish from an active hydrothermal vent 2,300 metres beneath the Caribbean Sea. MSci Marine Biology student Russell Somerville analysed the creature for his fourth year research project and was a co-author of the scientific paper formally describing the new species and naming it *Pachycara caribbaeum*. Former students Leigh Marsh and Diva Amon were then aboard another research expedition the following year that found juveniles of the species at a methane seep 1,050 metres deep near Tobago. This fish was the 12th new species discovered and described from deep-sea vents and seeps in recent years by teams including Southampton marine biologists.

Meanwhile, around 20 current Ocean and Earth Science students are volunteering to help catalogue some of the pioneering samples gathered from the deep ocean which belong to National Oceanography Centre Southampton (NOCS) unique Discovery Collection.

First year students Ellie Ward and Lik Theng Ho are working with specimens including amphipods, small shrimp-like crustaceans taken from the Atlantic Ocean. “I was inspired to get involved after seeing these creatures as



part of our Marine Ecology module. Although we use a great deal of online resources in our studies, there’s nothing like getting hands-on with specimens collected by scientists in the last century,” says Ellie who is helping produce searchable spreadsheets of the samples. Fellow student Lik adds: “I enjoy helping to curate these extremely rare samples. It gives me an amazing insight into the history of scientific discovery.”

There are more than 68,000 jars of exhibits in this internationally important collection of specimens of marine invertebrates from the deep sea owned by the Natural Environment Research Council (NERC). The first samples were collected in the Southern Ocean in 1925 by scientists on board Captain Robert Scott’s ship *Discovery*; the majority of these early finds are now housed in London’s Natural History Museum. Later samples from the

North Atlantic, collected since 1975, are at NOCS. It all started as an investigation into whale biology, funded by a levy on whale oil processing in the Falkland Islands, in the early 20th century.

There is material here to interest students throughout their academic career. Third year MSci marine biologist Dan Buss is planning to base his final year project on the decapoda (crabs, lobsters and shrimps) within the Collection.

Dr Tammy Horton manages the Discovery Collection at NOCS. “Our specimens are in demand by visiting scholars but we actively use them in our teaching at undergraduate level and our masters and PhD students also use them in their research,” she explains.

Although items are continually added to the Collection, many of the samples come from the Porcupine Abyssal Plain in the eastern North Atlantic (a marine geological feature named after the ship that took the first researchers to the area in the 19th century) where a great deal of research is still underway.

“Our students are very lucky because very few universities around the world have such a resource on hand.”

Dr Tammy Horton



# Southampton graduate researches blue whales in Patagonia

## Ocean and Earth Science students learn latest analytical techniques

**Students at Ocean and Earth Science will be getting an insight into one of the latest technologies for mapping the seabed, thanks to links with market leading software company CARIS.**

Up to 100 undergraduate and Masters students of Geophysics, Geology, Oceanography and Marine Biology will now be able to use the system to understand the topography of seas and oceans around the world, developing analytical skills that will be invaluable in their future careers. CARIS has now granted 100 licences to the University so large groups of students can work together.

Third year BSc Geophysics student, Matt Hollinrake is using CARIS in his dissertation. "I am researching shipwrecks around Lundy Island in the Bristol Channel and find the software invaluable to see the area in 3D, details include the track of the ships. I'm sure knowing how to use CARIS will help me when I start looking for a job as a marine surveyor after graduation."

"There are many job opportunities around the world for graduates skilled in this technology, including in offshore windpower projects, oil and gas rig decommissioning and applications in navigation, maritime conservation and the military," explains Dr Justin Dix, Associate Professor in Marine Geophysics. "Our ten year collaboration with CARIS now enables even more of our students to learn this industry-standard system and get a head start in the job market after graduation."

**Oceanography alumna Dr Susannah Buchan has achieved a childhood ambition to study whales for a career. She is now based in Chile investigating the bioacoustics and ecology of blue whales in Patagonia, an area with one of the least-studied populations of these iconic animals in the world.**

Susannah graduated in 2005 with BSc Oceanography with French, studying at Bordeaux for a year, then went on to take a masters at the University of St Andrews and a PhD at the University of Concepción in Chile. She is now Associate Researcher at the Center for the Oceanographic Research in the Eastern South Pacific's Sur-Austral programme ([www.sur-austral.cl](http://www.sur-austral.cl)) at the University of Concepción and has spent nine years in Chile.

"I was fortunate enough to spend my summers as a child at my grandparents' house on the Bay of Fundy in Canada and went out to watch whales from an early age. I was immediately fascinated, and went on to study Oceanography at Southampton to follow this passion," she says. "After working in other places in the UK and around the world, I have realised just how lucky I was to study at Southampton. All of my close friends have gone on to do fascinating things in oceanography, marine conservation, or even photography and filmmaking."

Susannah is researching the role of whales within ocean systems and believes understanding their relationship with their environment can give new insights into how productive pelagic systems work. Whale feeding grounds are often sites for important commercial fisheries so knowing more about the 'whale food chain' could contribute to understanding, protecting and managing these systems.

"It is astounding that there is so much left for us to know about the ocean. For me, the ocean is a constant source of mystery and fascination, and that keeps me asking questions that only science can answer. In one way or another, I think that is what drives every oceanographer."

“The facilities that were available to me as an undergraduate student were world class.”

**Dr Susannah Buchan**







Networking with Careers Day exhibitors

# The importance of engaging with industry

To ensure we continue to add value to our students and their need to engage with industry, we hold a subject specific careers day for our students every year at our waterfront campus based at the National Oceanography Centre Southampton (NOCS).

The 2016 event was held on the 18th February, with 27 exhibitors in attendance and participation from over 200 students. The objective of the event is to enable all students to network with industry professionals, discuss potential career pathways and seek internships, placements and employment opportunities.

The day included a career talk which was styled as a chat show to promote discussion. Five alumni panellists took part from a varied range of industry sectors, including Alison Houghton from Red Penguin Associates and David Lambkin from ABPmer. There was some great advice for students on how to prepare for their future career and they were encouraged to focus on transferable skills. New to the event was the University of Southampton's Careers and Employability Team who provided a CV checking service to over 30 students.

This year's event attracted seven new organisations including Wavepower, MarineSpace and TeachFirst. The day was a great success and students enjoyed networking. The exhibitors all commented on the quality of the student cohort and the success of the event.



Panellists from L-R, David Lambkin, Phoebe Bailey, Alison Houghton, Danny Hyam, James Rouse with the panel chair, Professor Jörg Wiedenmann.

"Try to find work that interests you – you will likely be happier, more productive and benefit more from the experience."

**David Lambkin**

ABPmer, Principle Marine Environmental Research Consultant

"Keep a broad and flexible perspective on your career options."

**Alison Houghton**

RedPenguin Associates Ltd, Oceanographer

"Make plans for your future, but be flexible, otherwise opportunities can be missed!"

**James Rouse**

St. Anne's Catholic School and Sixth Form College, Deputy Headteacher

"When you get a job you will find that work is as much about relationships, networking and who you are as it is about what you know."

**Danny Hyam**

Ordnance Survey, Operations Manager

"Spend some time to ask people about formatting a CV, and what they would like to see."

**Phoebe Bailey**

Bibby HydroMap, Logistics Coordinator

For more information about careers day email, [oescareers@soton.ac.uk](mailto:oescareers@soton.ac.uk)

# Man-made underwater sound may have wider ecosystem effects than previously thought

**Underwater sound linked to human activity could alter the behaviour of seabed creatures that play a vital role in marine ecosystems, according to new research from the University of Southampton.**

The study, reported in the journal *Scientific Reports* published by Nature, found that exposure to sounds that resemble shipping traffic and offshore construction activities results in behavioural responses in certain invertebrate species that live in the marine sediment.

These species make a crucial contribution to the seabed ecosystem as their burrowing and bioirrigation activities (how much the organism moves water in and out of the sediment by its actions) are crucial in nutrient recycling and carbon storage.

The study showed that some man-made sounds can cause certain species to reduce irrigation and sediment turnover. Such reductions can lead to the formation of compacted sediments that suffer reduced oxygen, potentially becoming anoxic (depleted of dissolved oxygen and a more severe condition of hypoxia), which may have an impact on seabed productivity, sediment biodiversity and also fisheries production.

Lead author Martin Solan, Professor in Marine Ecology, said: “Coastal and shelf environments support high levels of biodiversity that are vital in mediating ecosystem processes, but they are also subject to noise associated with increasing levels of offshore human activity. Previous work has almost exclusively focussed on direct physiological or behavioural responses in marine mammals and fish, and has not previously addressed the indirect impacts of sound on ecosystem properties.”

“Our study provides evidence that exposing coastal environments to anthropogenic sound fields is likely to have much wider ecosystem consequences than are presently understood.”

The Southampton researchers exposed three species – the langoustine (*Nephrops norvegicus*), a slim, orange-pink lobster which grows up to 25 cm long, the Manila clam



(*Ruditapes philippinarum*) and the brittlestar *Amphiura filiformis* – to two different types of underwater sound fields: continuous broadband noise (CBN) that mimics shipping traffic and intermittent broadband noise (IBN) reflecting marine construction activity.

The sounds were reproduced in controlled test tanks and experiments were run on one species at a time. For CBN, a recording (one minute duration, continuously looped) of a ship made in the English Channel at a distance of around 100 metres was used. For IBN, a recording (two minutes duration, continuously looped) of a wind farm in the North Sea at a distance of about 60 metres was used.

The results showed that the sounds could alter the way these species behaved when interacting with their environments.

With the langoustine, which disturbs the sediment to create burrows in which it lives, the researchers saw a reduction in the depth of sediment redistribution (how much of the surface sediment was overturned into the deeper layers) with exposure to IBN or CBN. Under CBN and IBN there was evidence that bioirrigation increased.

The Manila clam, a commercial fishery species in Europe that lives in the sediment and connects to the overlying water through a retractable siphon, reduced its surface activity under CBN, which affected the surface roughness of the sediment. Bioirrigation, which is strongly influenced by clam behaviour and the activity of the siphon, was markedly reduced by CBN and slightly reduced under IBN.

However, the sound fields had little impact on the brittlestar.

Co-author Dr Chris Hauton, Associate Professor in Invertebrate Ecophysiology and Immune Function, said: “I think these findings raise the prospect that anthropogenic sounds in the marine environment are impacting marine invertebrate species in ways that have not been previously anticipated. The potential effects of anthropogenic noise on ecosystem function, mediated through changes in organism behaviour merits further study as, in the long term, it may identify impacts to the productivity of seabed systems that have, to date, not really been constrained.”

Tim Leighton, Professor of Ultrasonics and Underwater Acoustics and study co-author, added: “There has been much discussion over the last decade of the extent to which whales, dolphins and fish stocks, might be disturbed by the sounds from shipping, windfarms and their construction, seismic exploration etc. However, one set of ocean denizens has until now been ignored, and unlike these other classes, they cannot easily move away from loud man-made sound sources. These are the bottom feeders, such as crabs, shellfish and invertebrates similar to the ones in our study, which are crucial to healthy and commercially successful oceans because they form the bottom of the food chain.”



Essential reading for graduate students, *Stressors in the Marine Environment*, edited by Martin Solan and Nia Whiteley, synthesises the combined expertise of a range of international researchers, providing a truly interdisciplinary and accessible summary of the field.



# Seismic deployment in the Main Ethiopian Rift



Last checks during a station deployment, University of Hawassa campus.

Credit: Finn Illsley-Kemp

**As part of the RiftVole project aiming to understand magmatism and rifting in the East African Rift System, Dr Derek Keir and two PhD students, Finn Illsley-Kemp and Aude Lavayssiere, went to Ethiopia last month to deploy seismic stations.**

RiftVole is a project that started in September 2014 in collaboration with many universities, including Southampton, Bristol, Edinburgh, and Addis Ababa. The University of Southampton leads the seismology part of this project, focusing on past and current volcanism in the East African Rift.

The purpose of the February field trip was to install seismic stations to study the seismicity of several volcanoes located in the Main Ethiopian Rift. The data will then be used for micro-seismicity analysis and seismic imaging in order to understand magma pathways, interaction with faults and to image the subsurface.

After a week in Addis Ababa taking the seismometers out of customs, testing them, adapting ourselves to the heat and Ethiopian food, and

meeting new people from Addis Ababa University, we started the fieldwork at Corbetti volcano, ~200km south of Addis in the Rift Valley.

Corbetti is a stratovolcano with a 15km wide caldera where many villages and even an airport are installed. Eight stations have been installed inside the volcano and six others in the surrounding area.

We then left Corbetti volcano to go North in Ziway; a town located between Aluto and Bora volcanoes.

These volcanoes, and especially Aluto, have been more studied than Corbetti so we chose to install fewer stations on them: five around Aluto, four around Bora and one in between.

Aluto is a stratovolcano with multiple vents and several obsidian lava flows, the last known eruption occurred 50 BCE. Bora, one of the youngest volcanoes in the Rift Valley, is associated with another pyroclastic cone named Bericicio. Fumarole activities still take place in this area.

The next step of the trip was to go back to Addis Ababa to take 12 other seismometers out of customs. We had to stay longer than expected there because, of course, everything is closed over the weekend!

We then headed to the East side of the rift. After arriving in Itteyyaa we split again into different teams to install six stations along the border faults, including one in Anole, in a museum acting as a memorial to a battle between the Emperor Menelik and the local tribe, which is conveniently located next to a border fault.

This concluded our field trip, and, if you have counted correctly, it means we have six spare seismometers that we are going to use to replace some if there is an issue after the 1st service run, or to deploy them along a profile perpendicular to the rift, or to deploy them in case of an unexpected activity.

We will head back again to Ethiopia in six months to collect the first data set, and maybe take the opportunity to team up with geologists to sample the volcanic rocks.

**Aude Lavayssiere and Finn Illsley-Kemp.**

Inside the Corbetti caldera.

Credit: Aude Lavayssiere



# Ground-breaking carbon capture and storage project

The University of Southampton is to play a major role in the world's first 'real world' deep-water controlled experiment simulating emission from a submerged carbon dioxide storage reservoir.

The experiment is to take place in the North Sea, with the aim of further verifying the safety of offshore carbon dioxide (CO<sub>2</sub>) capture and storage (CCS). This work will help provide greater reassurance around the safety of CCS operations in the future.

Small quantities of CO<sub>2</sub> will be injected into mud on the sea floor in the North Sea, 100km North East of Aberdeen. This site is in the vicinity of a depleted gas field and is a typical location that could be used for carbon dioxide storage.

Southampton is a key partner in this ground-breaking experiment, due to take place in 2018. The €16m STEMM-CCS (STrategies for the Environmental Monitoring of Marine CCS) project, co-ordinated by the National Oceanography Centre (NOC), will enable scientists to develop a system for detecting and quantifying the volume of any CO<sub>2</sub> released.

University of Southampton lead scientist Professor Jonathan Bull said: "A key focus will be developing techniques that will allow the identification and quantification of any CO<sub>2</sub> release from an underwater storage site (whether in gaseous or dissolved form). This project is a really exciting opportunity to develop innovative technology to address these problems."

In order to 'listen' for the released CO<sub>2</sub>, the project partners will be developing acoustic and chemical sensors that can be fitted into robot-sub. Automated photographic analysis software will also be developed to enable the detection of any visual changes at the release site. Additional technology used by this project will include devices in the water and on the seabed to monitor changes in the chemistry, temperature, salinity and currents in the water.

All this technology will be launched at the site in Scotland a year before the controlled release in order to acquire an in-depth picture of the natural variability of the environment on a daily, weekly and seasonal timescale. This information will enable scientists to better differentiate natural changes from those resulting from the controlled release.

“The STEMM-CCS project will increase confidence in our ability to monitor marine CCS operations in marine environments. The project will also develop new technologies to allow us to cost effectively monitor large areas of the seafloor.”

Dr Doug Connelly, Project Coordinator

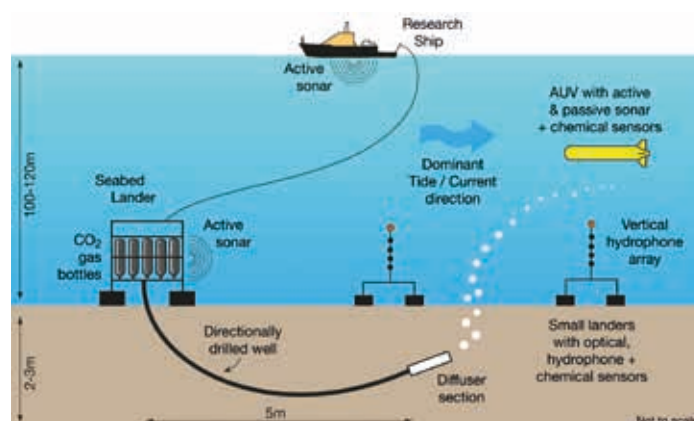


CCS infographic from Shell

The STEMM-CCS project, has received funding from the European Union's Horizon 2020 project under the grant agreement number 654462. In addition to the industry partner Shell, this project will bring together the universities of Southampton and Heriot Watt, National Oceanography Centre, Plymouth Marine Laboratory, GEOMAR and MPI from Germany, NIVA, Uni Research and the universities of Bergen and Tromsø from Norway, the Technical University of Graz from Austria and Seascope Consultants Ltd.

University of Southampton scientists involved include: Professors Jonathan Bull, Rachael James, Tim Minshull, Dr Juerg Matter, Dr Romina Gehrman, Dr Tom Gernon from Ocean and Earth Science and Professors Tim Leighton and Paul White from the Institute of Sound and Vibration Research. The University will receive €2.457m funding as part of the project, which runs from March 2016 to March 2020.

[www.stemm-ccs.eu](http://www.stemm-ccs.eu)



Schematic diagram of the shallow sub-surface release of CO<sub>2</sub> gas in sediments.

Graphic credit: K. Davis, Ocean and Earth Science



# The best geologists have seen the most rocks!

“I’m not sure where my Geology degree will take me after graduation, but I’m interested in staying in education to study for a PhD. I knew I wanted to come to Southampton to study after a week sampling science here and it was definitely a good decision.”

Third year Geology undergraduate Mike Sims has proved the point of the old saying by seizing every opportunity to work on all kinds of landscapes at home and abroad through field trips at the University of Southampton.

“We’ve been to Tenby in South Wales, Ingleton in Yorkshire, Tenerife, Bulgaria and Southern Spain and there’ll be a field trip to Cornwall next,” he explains. “That’s the appeal of geology for me, it’s a mixture of everything - going out in the field and working in the lab along with learning in lectures and seminars.”

He also swapped Southampton for Germany last summer after winning an academic exchange scholarship for an internship at GEOMAR Helmholtz Centre for Ocean Research in Kiel. Mike worked on laboratory projects including investigating trace metals emerging from massive underwater sulphide ‘chimneys’ at plate boundaries on the ocean floor then joined his fellow researchers for a week at the Icelandic Geological Survey in Reykjavik.

Mike also developed his interest in the sustainability of the oceans at the Geology for Global Development conference in London and was one of only three undergraduates in the UK to present a poster to delegates.

Mike Sims on fieldwork in Iceland by  
Gunnahver, geothermal springs



## AAPG Imperial Barrel Awards, 2016

The AAPG Imperial Barrel Award is an international competition that involves teams of five working on the interpretation of petroleum systems data from around the world and presenting the findings to a panel of judges. At the University of Southampton, students can opt to take the Barrel Award as a module, where they compete internally.

As part of the 2016 Barrel Award intake, we were given well log, seismic and geochemical data that we interpreted in order to determine the petroleum potential of the Taranaki Basin, New Zealand. After analysing the data, we prepared a 25 minute presentation, which was judged by both lecturers and industry professionals. As winners of Southampton’s internal competition we progressed to the European division of the Barrel Award in Prague, where we were judged by six industry experts and competed against many other teams from various universities and countries across Europe.

The winners of the European division this year were Delft University of Technology from the Netherlands. Despite not placing in the top three, we believe the experience of the Barrel Award competition was invaluable. We have developed many skills such as being able to analyse vast data sets, working efficiently in a team and learning to present confidently to large audiences. We also obtained professional contacts and gained useful insight into the petroleum industry and potentially our future career paths. The experience was incredibly fulfilling and we would highly recommend competing in the AAPG Imperial Barrel Award competition to anyone who has the chance.

**James Panton, David Allsebrook, Cally Spendlove** (MSci Geophysics),  
**Venessa Phan, Christopher Standley** (MSci Geology)





PhD student, Liz Martin at NOCS

## Inspiring curious minds to learn more about fossils

Ocean and Earth Science PhD student of Palaeobiology, Liz Martin, is spreading the word about dinosaurs, fossils and many more fascinating topics through the popular audio podcast series, **Palaeocast**.

Launched in 2012, the shows have already been downloaded 170,000 times; the website received a ScienceSeeker award in 2013 and reached the top ten for education in the 2015 international Podcast Awards. They also have many thousands of friends and followers on Facebook and Twitter.

Alongside founder Dave Marshall from the University of Bristol and the rest of the team, Liz carries out interviews on subjects ranging from pterosaur flight to trilobites and evolution aimed at an educated but non-specialist audience. All material comes from academics directly involved in research so subscribers are always among the first to know of the latest advances in science.

"I'm an enthusiast about science communication, but it's important to get

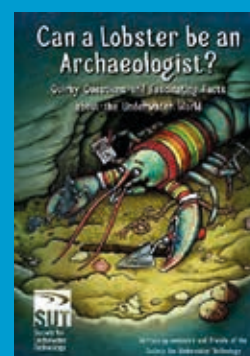
things right and our podcasts are reaching many thousands of people with the latest exciting research," she explains. "Movies such as Jurassic Park can inspire young people to learn more about palaeontology but they need to know what scientists are working on at present.

Liz is now studying biomechanics and she decided to specialise in pterosaurs after seeing the skeleton of one of these giant flying reptiles in a museum in France: "I wanted to understand how such large creatures, with wingspans up to 11 metres long, could actually fly and how their hollow bones helped them get off the ground." She grew up in Alberta in Canada, where frequent important fossil discoveries are made, and studied BSc Palaeontology at the University of Alberta, then took an MSc in the subject in Bristol before moving to Southampton to start her PhD.

[www.palaeocast.com](http://www.palaeocast.com)

## Can a Lobster be an Archaeologist?

At the beginning of 2016 a new book, targeting young scientists in the early years of secondary school, was published by the Society of Underwater Technology (SUT). It looks at the many varied aspects of ocean science, from marine biology in the deep sea to building cities beneath the waves. *Can a Lobster be an Archaeologist* gathered a range of authors from academia, industry and policy making to illustrate the complexity and excitement of discovering our seas. Dr Simon Boxall a lecturer at Ocean and Earth Science, who explores the perils of whirlpools in the book, says that it is part of a wider range of outreach activities that are delivered at Ocean and Earth Science. Publications such as this and the very successful outreach programme Discover Oceanography get young people out into the ocean, either virtually or literally. Simon also works with other projects such as Cape Farewell ([www.capefarewell.com](http://www.capefarewell.com)) and Beagle 3 ([www.beaglethree.com](http://www.beaglethree.com)) which looks at science, society and our rich maritime science heritage. Not only is the book a great read, it is beautifully illustrated and great fun, even for those who left secondary school years ago.



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