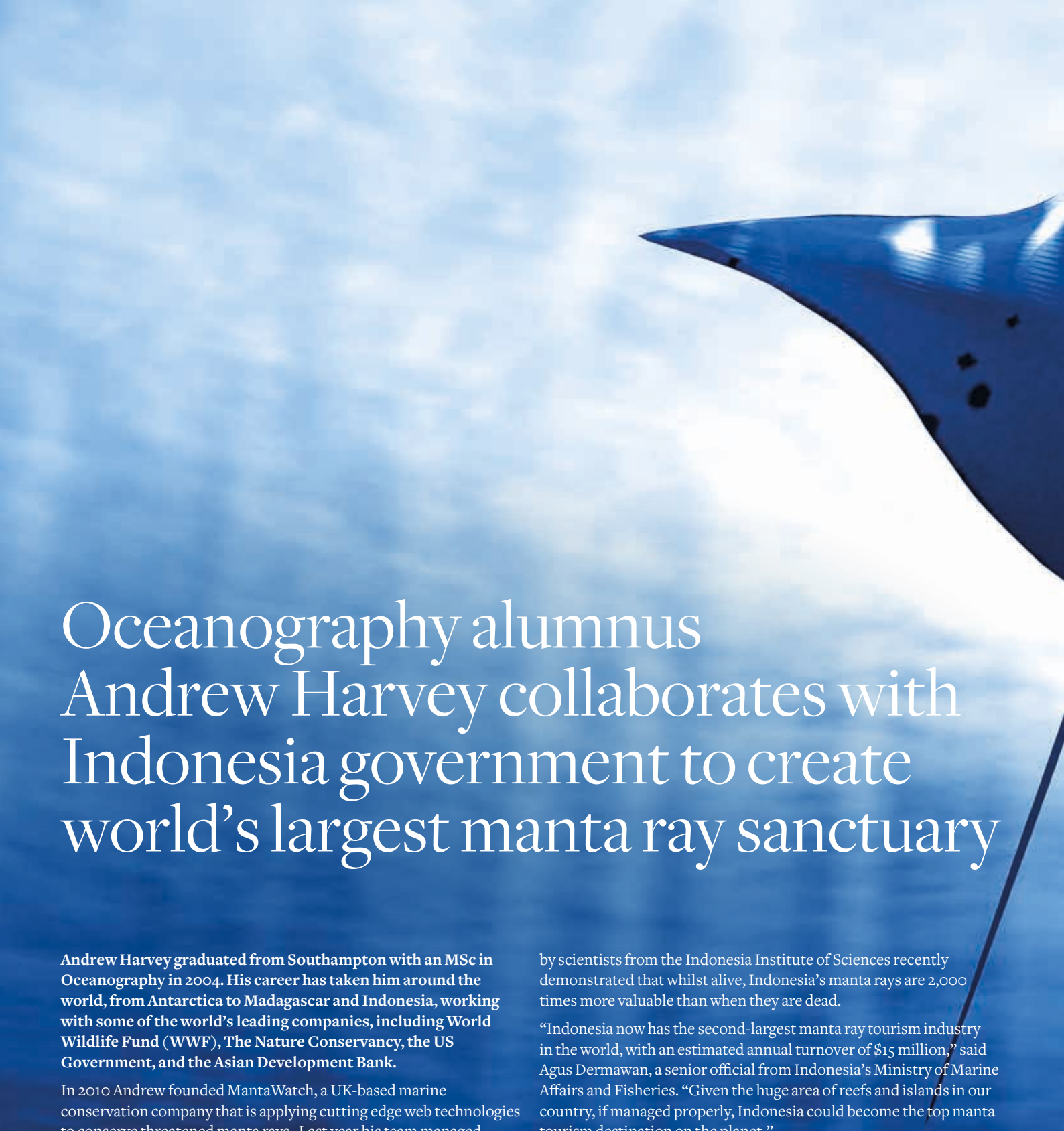
UNIVERSITY OF Southampton

Autumn 2014 | 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!

National Oceanography Centre Southampton



Oceanography alumnus Andrew Harvey collaborates with Indonesia government to create world's largest manta ray sanctuary

Andrew Harvey graduated from Southampton with an MSc in Oceanography in 2004. His career has taken him around the world, from Antarctica to Madagascar and Indonesia, working with some of the world's leading companies, including World Wildlife Fund (WWF), The Nature Conservancy, the US Government, and the Asian Development Bank.

In 2010 Andrew founded MantaWatch, a UK-based marine conservation company that is applying cutting edge web technologies to conserve threatened manta rays. Last year his team managed the creation of a 7,000 km² manta ray and shark sanctuary in eastern Indonesia and in March this year, his organisation played an instrumental role assisting the Government of Indonesia to declare the world's largest manta ray sanctuary.

This new legislation will provide full protection to manta rays throughout Southeast Asia's biggest country, which for years has been the world's largest shark and ray fishery. The sanctuary will span an incredible area of almost 6 million square kilometres.

Killing and harming of both oceanic and reef manta rays, as well as trading of manta ray body parts, is now illegal throughout Indonesia. Violators face a maximum penalty of 1 year in jail or a fine of approximately US$ 25,0000. Furthermore, economic analysis by scientists from the Indonesia Institute of Sciences recently demonstrated that whilst alive, Indonesia's manta rays are 2,000 times more valuable than when they are dead.

"Indonesia now has the second-largest manta ray tourism industry in the world, with an estimated annual turnover of $15 million," said Agus Dermawan, a senior official from Indonesia's Ministry of Marine Affairs and Fisheries. "Given the huge area of reefs and islands in our country, if managed properly, Indonesia could become the top manta tourism destination on the planet."

Divers, snorkelers and ocean lovers have helped to protect manta rays in Indonesia by submitting their manta sightings and photos to Andrew's company MantaWatch through its online manta tracking application, providing critical data to the government. "This is a great example of how governments and the diving industry can work together to achieve positive impacts for the environment and the economy", says Andrew.

MantaWatch also supported the creation of the 7,000 km² West Manggarai and Komodo manta ray sanctuary, one year after the Raja Ampat regional government declared the first manta ray sanctuary in the Coral Triangle.

Andrew commented 'Indonesia now faces the new challenge of effectively managing its manta rays, and enforcing the new regulations when necessary. Urgent research is needed to inform management planning by answering critical questions, such as "how many mantas inhabit Indonesia's waters", "where are the important migratory corridors, and habitats for feeding and breeding", and even "do mantas migrate across Indonesia's borders, where they may be at risk in the unprotected waters of neighbouring countries".'

MantaWatch protects threatened manta rays through the application of technology and education to support local conservation actions. The company launched the world's first social web application dedicated to open, transparent and participative marine conservation, enabling anyone to play an important role in monitoring and protecting manta populations by simply visiting mantawatch.com. They also run the annual MantaWatch Internship Program—a professional manta ray research and conservation training program for students in developing countries. MantaWatch is a not-for-profit marine conservation company based in London, United Kingdom.

Follow MantaWatch on Twitter: @mantawatch
To find out more about our MSc Oceanography visit **www.southampton.ac.uk/postgraduate**

Professor Rachel Mills welcomes the new academic year

In July this year, Professor Rachel Mills was appointed Head of Ocean and Earth Science. She heads a team of over 65 academics who carry out cutting-edge research across a spectrum of subjects including oceanography, marine biology, ecology, geology and geophysics.

"It is an exciting time to take the helm at the Waterfront Campus," she says. "Many new academic staff have joined us over the last few years, significantly expanding our areas of expertise, and I am looking forward to working together to enhance our education delivery and develop new areas of research."

Rachel has many years' experience at the University of Southampton; she first arrived to study a BSc in Chemistry with Oceanography as the minor subject but enjoyed learning about the oceans so much, she decided to focus on Oceanography instead, graduating with first class honours in 1988. Rachel went on to study for a PhD and carry out postdoctoral research at the University of Cambridge, exploring deep sea hydrothermal vents along the mid-Atlantic ridge and gaining first-hand experience through taking part in research cruises and diving to the seafloor in submersibles.

In recent years Rachel has been involved in the Athena SWAN initiative which encourages universities to address issues of gender diversity and enables more women researchers to achieve their potential. "Too many women are still leaving academia at postdoc level but there is a recent step change in the number of female academics appointed to Ocean and Earth Science and, together with colleagues across the University, we are committed to making career progression more equitable," she says.

Alex (front right) on her first drilling project - in Trinidad.

Hitting 'black gold' in Trinidad

After having completed the Basin Analysis and AAPG Barrel Award and been part of the Bronze medal-winning Barrel team who represented Ocean and Earth Science in the 2013 European finals in Prague, Alex Cookson graduated from her MSci Geology degree and secured a job with Leni Oil and Gas plc (LGO), where fellow University of Southampton alumnus (1977) Neil Ritson is CEO. Since working for LGO, Alex has been involved in hydrocarbon exploration in Spain and Trinidad, and here recounts her experiences in Trinidad and the impact she has already had working in industry.

"It's been a year almost to the day since my first day at LGO. In some ways it feels like it was only yesterday, but at the same time I've learnt and experienced so much in a year. The learning curve has definitely been an exponential one. So sitting here in Trinidad I can't think of a more appropriate way to spend my work anniversary than going to the well site for the first time and getting involved in operations I have not experienced yet.

In many respects, that has generally been the story of my industry experience so far. The biggest perk of working in a small junior oil company is that you get exposure to almost everything this business involves ("whether you like it or not" as one of my colleagues once said) and I am surrounded by people with decades of experience.

A noticeable difference between my University of Southampton experience and the exploration and production (E&P) industry is that in academia there was a distinctive lack of the "P" - Production. Understandably during academic exercises the focus is generally on the geology and exploration potential. However, it turns out the geology is such a small yet very important part of the E&P business. In the world of a junior market-listed oil & gas company the major driving factors are production and as with the rest of the world - money.

With that in mind LGO has started a drilling campaign to increase production in the Goudron field, Trinidad. My first day at our current well site was in one word 'noisy'.

"Quite some accolade to have hit black gold on your first well! I think Alex's story exemplifies the success that can come in a relatively short period of time with hard work and dedication - there are not many recently graduated geologists given this degree of responsibility."

Dr Ian Harding,
Geology Lecturer

It sounds obvious but you don't really get the scale of it until you are there. All the machines are working continuously as are the two crews work in alternate 12hr shifts 24/7 drilling. Walking up to the rig floor to stand only feet from the rotary table, the vibrations are enough to shake your bones. I was given a tour of the rig site from the mud pumps to the mud pits. But as a geologist what I was most interested in was the cuttings coming over the shakers. We were drilling through the reservoir section at the time and it is difficult to describe the feeling of seeing the oil and gas over the shakers of a well I had planned.

Although infill drilling is significantly derisked by surrounding wells nothing is certain so when you plan locations and well paths there is always risk however small. Sometimes you can liken the industry to very sophisticated gambling and seeing oil is like cashing in on a bet. For an oil & gas geo if you don't get excited by finding oil where you predicted it would be you're in the wrong job."

Alex Cookson,
MSci Geology, 2013

To find out more about our Geology degrees visit: **www.southampton.ac.uk/oes/geology**

From the North Sea to the Southern Baltic. A year in industry

Having always been a bit more industry focused than academic I decided it would really benefit my career to take a year off my studies in BSc Oceanography and organise a work placement. I decided the best fit for my planned career pathway would be to apply to work for a hydrographic surveying company.

After applying to several companies I got only one interview and was fortunate enough to receive an offer to work for Swedish company, MMT as an intern for 9 months. I had a week's induction where I had training in programs such as Qinsy, Flaedermaus, Caris and PosPac. Though the training was straightforward, learning in the comfort of an office didn't prepare me for my first job offshore. Using software first hand, on a constantly moving boat that was small enough that any hint of weather meant motion was an issue, as well as being under pressure to control the flow of data meant that the learning curve was relatively steep.

After a while my understanding of the software was diverse enough that I became proficient in acquiring and cleaning multi beam bathymetric data. My other tasks included operating winches, deploying towed equipment, conducting oceanographic measurements, fixing and fault finding in both hydrographic equipment and computer systems. This role required me to develop a variety of vital key skills from soldering to computer literacy, as well as being easily adaptable to any given environment and having a strong can-do attitude.

The work led me across Europe, from the English Channel to the North and West North Sea, as well as waters around Helgoland off of Germany and the Southern Baltic. This was a great opportunity but you certainly have to have a sense of adventure. Although the company covers the cost of travel, the rota is designed so that you work a month, and then come home for one month. Being away for a month at time can be extremely difficult.

The most interesting places that I worked in were probably Helgoland, which is a tiny tax haven island off Germany in the North Sea. Although it has a small population it is home to countless alcohol, perfume and cigar shops all of which are duty free. There is also one tiny nightclub known as the 'Crabby Disco'.

Karlskrona in Sweden was also exciting. This is the main military port in Sweden and the shipyard houses a secret submarine fleet. Any subs that come in for repair are strictly off limits and there is a strict security cordon. We were in dry-dock for repair and after a small international incident involving Sweden's submarine secrets everyone on our boat who wasn't Swedish, including me, had to be accompanied by guards whenever we left our vessel, even for showers and bathroom trips.

Overall the opportunity I had was an incredible experience. I have met a lot of people from all walks of life and I have been to some amazing places. I would recommend it to anybody, it was definitely a year well spent.

Eddy Kirk,
BSc Oceanography

To find out more about our Oceanography degrees visit: **www.southampton.ac.uk/oes/oceanography**

Eddy Kirk working offshore

A vulnerable predator

"I was following a two metre long lemon shark on a dive when suddenly it turned round and headed for me. I flattened myself against a rock, it swam slowly past and stared at me, then turned round, swam back looking at me again and went on its way."

The close encounter while working in the mangrove swamps at the Bimini Biological Field Station didn't put Christopher Bird off studying 'the ultimate predator'; he has now embarked on a postgraduate research degree at Ocean and Earth Science Southampton.

Looking back to his childhood, Chris recalls he was always fascinated by wildlife and especially sharks. After A levels in maths, physics, chemistry and biology, he headed to the University of Manchester to study biology but soon switched to zoology. The highlight of his BSc was two months in the rainforest of Ecuador and another close encounter with wildlife in the Payamino River, a tributary of the Amazon: "We were in the water examining amazing species of fish when another student called from the bank that we should get out, she could see this large snake heading for us. It's fortunate she saw it, it turned out to be one of the most dangerous in the region."

Following graduation with first class honours and a dissertation on the metabolic rate of rainbow trout, Chris decided to train for his diving qualifications and spent some time in Egypt before putting his skills to good use at the Bimini Biological Field Station, Bahamas. Whilst there, he found out about a masters research degree in Marine Biology just about to start at Plymouth University, where he could specialise in sharks for the first time. "I ended up studying with some of the most important researchers in shark ecology, Professor David Sims, who also has links with Southampton, and Dr Nuno Queiroz who's based in Portugal. We investigated how environmental conditions such as ocean fronts could affect shark movements," he says.

As he finished his MSc, Chris seized another opportunity: "I had an idyllic month in the Seychelles tagging sharks for a project to track their movements around a remote atoll. We caught about 50, embedded the devices under their skin and then released them, we then set up beacons to work out where they were."

By now, he had realised his future lay in understanding more about these amazing creatures through a PhD. With two offers, he decided his love of sharks was what he wanted to pursue. "I knew NOCS was one of the best places in the world for marine biology so I choose Ocean and Earth Science Southampton."

Chris realises not everyone is as keen on sharks as he is and is passionate about spreading the word about the perils they face. He encountered the shark finning industry for himself while in the Seychelles and was disgusted by the practice of catching sharks, slicing off their fins for the profitable shark fin soup trade and throwing the creatures overboard to die. He is also concerned about trawling methods that scrape the sea bed removing all living things including deep sea sharks "like a bulldozer through the rain forest." Chris writes a blog and uses social media to get the conservation message across. "I want to explain why we need sharks. They play a crucial role in many food chains and are powerful predators, but their populations are extremely fragile and vulnerable. If shark populations are significantly reduced by extensive fishing, this could have significant consequences on the stability and health of many marine ecosystems. Our research at Southampton will tell us more about them and that's important."

Chris works with Dr Clive Trueman in the Marine Isotope & Ecology Lab (SUMIE), and he will be investigating the trophic and spatial ecology of deep-water sharks and chimaera living between 500m and 2000m in the North Atlantic Ocean. Using a wide range of techniques and natural tracers, Chris's research aims to uncover some of the mysteries surrounding shark species that we know relatively little about. Keep an eye out for their website which will be live very soon.

Christopher Bird,
PhD Student

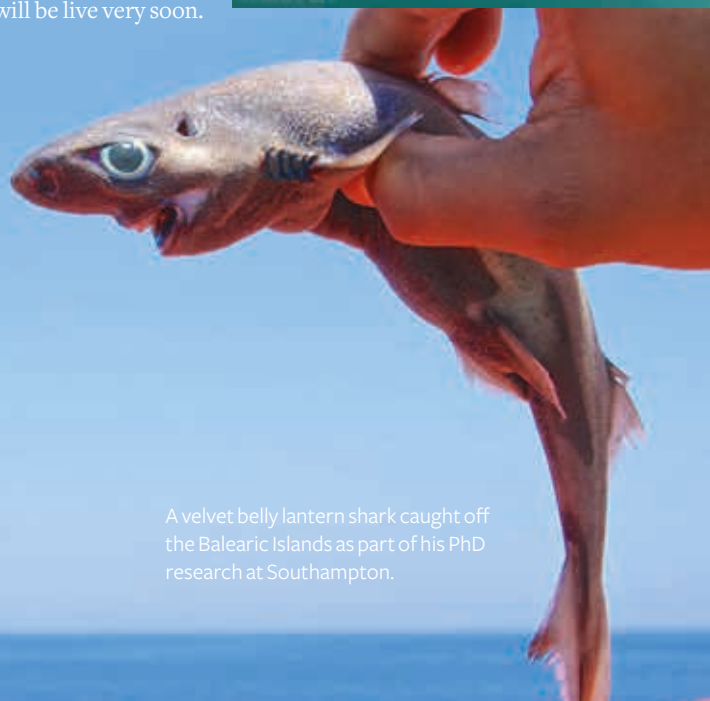
Follow Chris on Twitter: @SharkDevocean

Or follow his blog: **http://sharkdevocean.wordpress.com**

Did you know?

- There are over 500 species of shark in the world
- "Sharks" first appeared around 420 million years ago
- Sharks have two extra senses
  1. Mechanosensory – detect hydrodynamic processes through their lateral line
  2. Electrosensory – possess specialised organs (ampullae of Lorenzini) around mouth and head that are able to detect tiny electric signals given off by other fish

After tagging, Chris removes the hook from a sicklefin lemon shark in the Seychelles.



A velvet belly lantern shark caught off the Balearic Islands as part of his PhD research at Southampton.

Dinosaur lineage into birds.

Image by Davide Bonnadonna

Shrinking dinosaurs evolved into flying birds

A study involving Dr Gareth Dyke and Darren Naish has revealed how massive, meat-eating, ground-dwelling dinosaurs evolved into agile flying birds over a period of 50 million years.

The researchers presented a detailed family tree of dinosaurs and their bird descendants, which maps out this unlikely transformation. They showed that the branch of theropod dinosaurs, which gave rise to modern birds, were the only dinosaurs that kept getting inexorably smaller.

"These bird ancestors' evolved new adaptations, such as feathers, wishbones and wings, four times faster than other dinosaurs," says Darren Naish, Vertebrate Palaeontologist at the University of Southampton.

"Birds evolved through a unique phase of sustained miniaturisation in dinosaurs," says lead author Associate Professor Michael Lee, from the University of Adelaide's School of Earth and Environmental Sciences and the South Australian Museum.

"Being smaller and lighter, with rapidly evolving anatomical adaptations, provided these bird ancestors with new ecological opportunities, such as the ability to climb trees, glide and fly. Ultimately, this evolutionary flexibility helped birds survive the deadly meteorite impact which killed off all their dinosaurian cousins."

Gareth Dyke, Associate Professor and programme leader of the unique MRes Vertebrate Palaeontology postgraduate degree at OES adds: "The dinosaurs most closely related to birds are all small, such as the aptly named Microraptor and had some ability to climb and glide." The study examined over 1,500 anatomical traits of dinosaurs to reconstruct their family tree using sophisticated mathematical modelling to trace evolving adaptions and changing body size over time and across dinosaur branches. The international team also included Andrea Cau, from the University of Bologna and Museo Geologico Giovanni Capellini. The study concluded that the branch of dinosaurs leading to birds was more evolutionary innovative than other dinosaur lineages. Birds out-shrank and out-evolved their dinosaurian ancestors.

To find out more about our postgraduate degrees visit: **www.southampton.ac.uk/oes/postgraduate**

Waterfront Campus, National Oceanography Centre Southampton

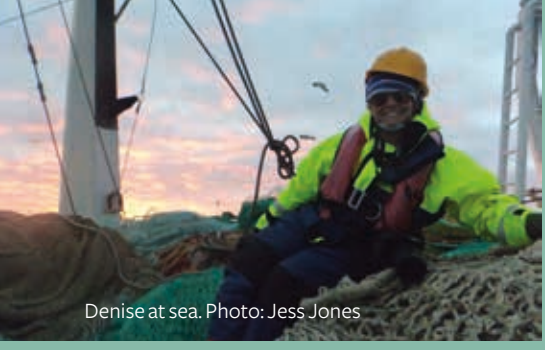
Ocean and Earth Science. Virtual Open Day and film

We are very pleased to be able to share with you our Virtual Open Day where you can explore our unique Waterfront Campus at the National Oceanography Centre Southampton (NOCS).

Via this virtual tour we welcome you through our doors to explore and discover our campus, the teaching areas, labs, the world-renowned National Oceanographic Library, our great waterfront café, and our Research Vessel *Callista*.

There is also a great Open Day tour film hosted by one of our own students, Ruth Davey, which will give you an insight into the great opportunities at Ocean and Earth Science, how employable our graduates are and find out what it is like to be a student at our Waterfront Campus.

www.southampton.ac.uk/oes



Denise at sea. Photo: Jess Jones

Life as a Fisheries Observer in the Falklands

Having graduated with an MSci degree in Marine Biology, Denise, like most of her course mates was busy searching for work after graduation. With a keen interest in fisheries and the right skill set gained during her years at Ocean and Earth Science, she applied for a job in the Falkland Islands as a Scientific Fisheries Observer. Denise gives us an insight into her life in the Falklands.

Life as a Fisheries Observer down in the Falkland Islands is both rewarding and exhilarating. With up to five-week-long trips on fishing vessels, followed by ten days to two weeks on land this job is full on for fun and work.

I guess the most exciting thing is that no day is ever quite the same and unexpected events lurk around every corner. You plan your days around sampling two trawls but you are never sure what the trawls will bring.

The excitement of rare catches some which are familiar faces from Ocean and Earth Science modules, is probably my favourite part. Trying to then explain to the crew some fun facts on these animals in sign language and broken Spanish never ceases to amuse both parties, especially when this is then relayed to other colleagues at sea over the radio.

When on land the vast array of local wildlife becomes apparent. With weekend trips out to camp (the local's name for the countryside) and hiking along some of the most unspoilt beaches in the world, life down here satisfies everyone's desire for nature. Add to this the large amounts of laboratory work in the office and every young marine biologist's dream is fulfilled.

Denise Herrera,
MSci Marine Biology, 2013

To find out more about our Marine Biology degrees visit: **www.southampton.ac.uk/oes/marinebiology**

My journey to becoming a geophysicist

Whilst at university, Emma Chambers, who graduated in July 2014 with a MSci in Geophysics, used her time at university to gain valuable skills and experiences which ultimately led to her becoming a very employable graduate. Here she tells us about the choices she made and how the experience she gained helped her in her career plans.

Whilst at university it soon became clear that I had 2 distinct interests: Seismic processing and research of earthquakes. I knew I needed to get more information about both sides before deciding on my career.

The summer of my second year I volunteered to work with Derek Keir as my supervisor, on 2 projects focusing on the research side of seismicity. The main project was based on seismicity within Cameroon in order to gain a better understanding of the Cameroon volcanic line. This later became my Masters dissertation. This experience gave me the opportunity to use programs that are not widely available to students in core modules, especially working with the UNIX PCs. It also taught me how a PhD student would work. This included gathering data, processing, interpreting and eventually publishing a collaborative research paper with Imperial College London and Bristol University in the Journal of Geophysical Research.

In my third year, the ProMAX module, was my main introduction to the industrial world of seismic processing. Simple modules to remove multiples, ghosting and basic quality control were the core parts which, although basic, were the building blocks for a job in this industry. The ability to transform an indistinguishable image into a clearer picture of the subsurface particularly intrigued me and seemed an interesting career path as you never know what you might find.

To pursue this further I decided to apply for an internship in seismic processing. The summer before my Masters year I wrote to several companies asking if I could carry out a summer internship with them. The companies I corresponded with all came into the university to talk to students either at the dedicated careers fair, held at our Waterfront Campus, or individually. A company called ION GXT took me on despite never having taken an intern before. From this 4 month placement, I was involved in many of the tasks and processes that a junior time processing geophysicist in the company would undertake. At the end of the internship they offered me a job within the company. At this point I decided that seismic processing in industry was the direction I want to take my career and I am pleased to say I am now enjoying working with ION GXT.

Emma Chambers,
MSci Geophysics, 2014

To find out more about our Geophysics degrees visit: **www.southampton.ac.uk/oes/geophysics**

Emma on a third year field trip to Tenerife.

Lake Tanganyika Seismic Deployment

Dr. Derek Keir and PhD student Ryan Gallacher have recently completed a two and a half week seismic deployment around the South of Lake Tanganyika in Tanzania. This work was completed in collaboration with Beach Petroleum (Tanzania) Ltd. and the University of Rochester (USA) with the approval of the Tanzania Petroleum Development Corporation. The project "Kinematics of Rifting in the Southern Tanganyika Rift" aims to record deep seismicity that we can use to probe the geometry and kinematics of extensional fault systems through the entire crust, and to understand the distribution of strain between large offset border fault systems and intra-basinal faults.

The southern Tanganyika rift zone in southern Tanzania is the ideal setting to understand a tectonically-active crustal-scale fault system since it has the highest seismicity rate within East Africa. The project has the potential to significantly deepen our understanding of how faults evolve in extensional tectonic settings and will therefore inform generally on models of fault growth. In addition, the project entails the investigation of deformation on large fault networks that sometimes generate magnitude seven earthquakes and hence will be of use in assessing seismic hazards in the region.

A total of 13 seismometers from the SEIS-UK geophysical equipment store were deployed, with 7 instruments along the immediate lakeshore and a further 6 instruments 50-100 km located inland. The seismometers used were four 3ESPDs and nine 6TDs. The work consisted of two teams operating simultaneously with one team deploying the lakeshore instruments by boat, while the other team deployed the inland stations by car. A standard deployment involved burying both the seismic instrument and associated cables, with the GPS (used for accurate timing) and solar panel (providing power) remaining above ground.

A service run to the region is planned for November 2014. This will involve visiting the site of each seismometer deployment to extract the seismic data recorded over the past 4 months. All seismometers are tested to ensure the continued recording of data with any faults investigated and fixed. In the event of a major fault the seismometer will be extracted and shipped back to the UK for repair. Once the service run is completed the data is brought back to the UK and work on earthquake relocation and active fault identification can begin. A new PhD student Alex Stokes will be joining the team for this service run team prior to beginning the data processing for this project.

See more at:
http://blog.soton.ac.uk/ggblog/2014/07/lake-tanganyika-seismic-deployment

Local expert Khalfan Mtelela (University of Dar es Salaam) and Paul Faustine (Tanzania Petroleum Development Corporation) start to seal the bucket containing the battery and cables, while students look on.

Typical finished site for seismometer deployment. The rocks show the location of the seismometer, the twigs show the battery bucket location and the solar panel and GPS sensor stay above ground.

Oceanography students on the Falmouth Field course. Photo: John Davis

Oceanography. Investigating our blue planet

The oceans cover over 70 per cent of the Earth's surface. Almost half of the primary production on Planet Earth occurs in the ocean; driven by tiny plankton floating in the surface waters. The oceans impact our everyday lives and are vital to the existence and future of the human race. They hold many of the answers to the evolution of our planet and are an invaluable and increasingly important source of food, energy and minerals.

Ocean circulation controls both the long-term climate and the local weather patterns on Earth. Our oceans store heat and carbon dioxide that are continuously increasing and the future climate will be determined by how the oceans respond to these changes. Oceanography involves study of these processes; the transport and cycles of heat and materials and the composition of the oceans through time.

The ocean is the Earth's largest ecosystem. Most of the ocean is in perpetual darkness and our knowledge of how this complex ecosystem works is often limited to the shallow and accessible regions; much of the deep ocean is unexplored. Life flourishes on Earth, even in the most extreme regions such as hot vents and freezing polar oceans. We as oceanographers study the global ocean ecosystem using observations from ships, underwater vehicles and satellites. At Ocean and Earth Science we have access to these facilities and equipment and our waterfront location at the National Oceanography Centre Southampton allows us unique opportunities not usually found in traditional university environments.

> Oceanography is a diverse and exciting science that can lead you into a variety of career pathways across the world

Oceanography also involves the study of extreme events such as storm surges and tidal waves that threaten our coastal regions. It involves the study of sediments and beach erosion and the interaction between offshore engineering and our coastal environment. The oceans are an important resource to humankind and our students study the sustainable exploitation of living and mineral resources and the responsible management and stewardship of our planet.

As you can imagine the study of Oceanography involves many different subjects, linked together in an interdisciplinary way: Physics, chemistry, biology, geology, mathematics, engineering, maritime and international law, environmental policy and marine archaeology. All of which are covered in our degree programmes. This interdisciplinary approach underpins our teaching and research at Ocean and Earth Science and we offer our students unique opportunities and exciting pathways into successful careers in the ocean industry, environmental management and research.

Oceanography is an fascinating science that offers a wide spectrum of career pathways and global opportunities. If you want to study oceanography you will need a strong background in at least two science subjects and we would encourage you to further develop your expertise in these subjects while learning about the breadth of oceanography. You will need to have a keen sense of how your chosen subjects link to other disciplines and a passion for exploration, understanding and managing the future of the oceans.

Waterfront Campus, National Oceanography Centre Southampton

As one of the world leading Oceanography Centres, we attract prominent researchers and educators from around the globe. Our students are taught by, and work alongside these world-leading experts who can provide life-long links to the global marine science community and maritime industry. Studying oceanography with us at Ocean and Earth Science could be your first step on this journey to being part of our global community.

To find out more about our Oceanography degrees visit: **www.southampton.ac.uk/oes/oceanography**

"The National Oceanography Centre Southampton (NOCS) has some of the best scientific facilities and resources in Europe. It is so exciting as an undergraduate to be in such close proximity to truly novel and pertinent research."

Zachary Mazlan,
MSci Oceanography with study abroad, 2014

The perfect escape. A student impact story

Naomi Hyland and Vicki Gravestock, both graduates from Ocean and Earth Science at the University of Southampton, designed, developed and trialed a new device for improving the selectivity of fishing pots as part of their master's dissertation projects.

The device, known as an escape gap, is a rigid panel attached to fishing pots or traps, which allows the release of small and immature crabs and lobsters that fishermen are not allowed to legally catch. Escape gaps are an important fisheries management tool as they allow the return of small and immature lobsters and crabs to the sea floor, rather than being thrown overboard which can increase chances of predation and injury. Pot fishermen within the Southern IFCA district have reported that up to 80% of their catch is returned overboard.

Naomi, who graduated in 2012 in MSc Marine Resource Management and now works as an Environment Officer for the Port of London Authority, started initial research into an escape gap design suitable for the Southern Inshore Fishery and Conservation Authority (IFCA) in 2011. Within the Southern IFCA, there is a pot fishery for European lobster, edible crab and velvet swimming crab. Naomi's research concentrated on testing the effectiveness of existing escape gap designs currently in use in the UK, mainly aimed at releasing edible crab and lobster. Results revealed current designs were biased in the release of lobsters over edible crabs. By lengthening the escape gap, Naomi found the release of edible crabs could be drastically improved.

Further testing of this design through aquarium trials and field trials, formed the basis of Vicki's dissertation thesis, which she completed for her MSci masters dissertation in 2014. Vicki, who graduated in July and now works as a Project Officer for a local fisheries consultancy, confirmed the effectiveness of the new design recommended by Naomi's research, in addition to trying to establish a design suitable for all three species. The successful results of the field trials were presented to the Southern IFCA, who agreed to conduct a district wide trial of the new design. In July, the Southern IFCA funded the purchase of 1000 escape gaps of the design determined from Naomi Hylands project, which have now been distributed to inshore fishermen throughout the district.

Preliminary feedback from fishermen has been positive and the change in opinion of fishermen participating in the trial is due to be quantified by the Southern IFCA using a 'before' and 'after' questionnaire.

Research into the 'perfect' escape gap which will accommodate all three species which make up the Southern IFCA crustacean fishery, is being continued by Chloe Smith, a current MSci Marine Biology student, to establish whether an escape gap can be created.

A video from Naomi's project can be seen here: **http://youtu.be/GMk7eHdJc_4**

Photo: Simon Pengelley, IFCA


Naomi Hyland working with lobsters.
Photo: Naomi Hyland


Lobster pot showing 'Escape Gap' design.
Photo: IFCA

Sam Newby in Svalbard

Life in Svalbard. A year abroad

Sam Newby an MSci Marine Biology with Study Abroad student, gives us his account of his year abroad.

Caitlin and I arrived at Longyearbyen airport at midnight on the 18th of July last year to begin our year abroad. It was foggy and cloudy as we flew over the Svalbard, or Spitsbergen, archipelago. On our approach we'd only caught brief glimpses of the glacial landscape below. Snow and ice dominate the landscape all year round and glaciers cover 60% of the landmass. When we arrived patches of snow remained on the mountainsides, even though the sun had not set for the past 3 months.

The four main settlements on Svalbard are not connected by road and can only be accessed by sea or air, or in the winter 'by snow'. In fact the total length of roads inside coal mines far exceeds that outside, and the airport bus is the only public bus route in Svalbard. This bus took us to our new accommodation the former coal miners' barracks on the edge of town. At our new front door we were greeted by the unusual sight of a wild reindeer munching its way around snowmobiles, which were parked on pallets for the summer.

The first impressions I had when I arrived were that this was a place of mystery and adventure. As the clouds and fog lifted the next morning, these impressions were reinforced. Our 'barracks' were nestled in a glacial valley with steep sided mountains on two sides and two glaciers behind. 2kms North lay UNIS, the University Centre in Svalbard, and 1300km beyond that, without a soul in between, lay the North pole. And if you turned your head a little to the left, you could see huge glaciers, resting amongst snow capped peaks just over 1000m high, 40km away on the other side of 'Isfjorden', the ice fjord.

Living in Svalbard was unlike anything I had ever done before. You really don't need to struggle to find adventure. In my first couple of months there I learnt how to use a rifle for protection against polar bears, camped on mountain plateaus near my new home, hiked on glaciers, drank glacial melt water, waded up to my thighs across a freezing cold river, went on two scientific cruises, hunted a reindeer, climbed bird cliffs to study the plants, saw arctic foxes, went kayaking amongst beluga whales, herded geese for a bird researcher and so much more. Imagine what we got up to in a whole year...

On top of this I found it very interesting to study animals, plants and ecosystems that I'd never come across before, and which there is still so much for us to learn. For example, my master's project is on the diet of Svalbard fish during the polar night, a subject on which so far only one introductory study has ever been done. It was an incredible experience and one that I would take again.

Sam Newby,
MSci Marine Biology, 4th yr

To find out more about our Marine Biology degrees visit: **www.southampton.ac.uk/oes/marinebiology**

A new perspective: the Virtual Fieldwork Project

Nothing can replace the experience and rewards gained from geological fieldwork. Indeed many graduating students comment that some of their best and "life-forming" experiences were created during residential field courses and independent mapping.

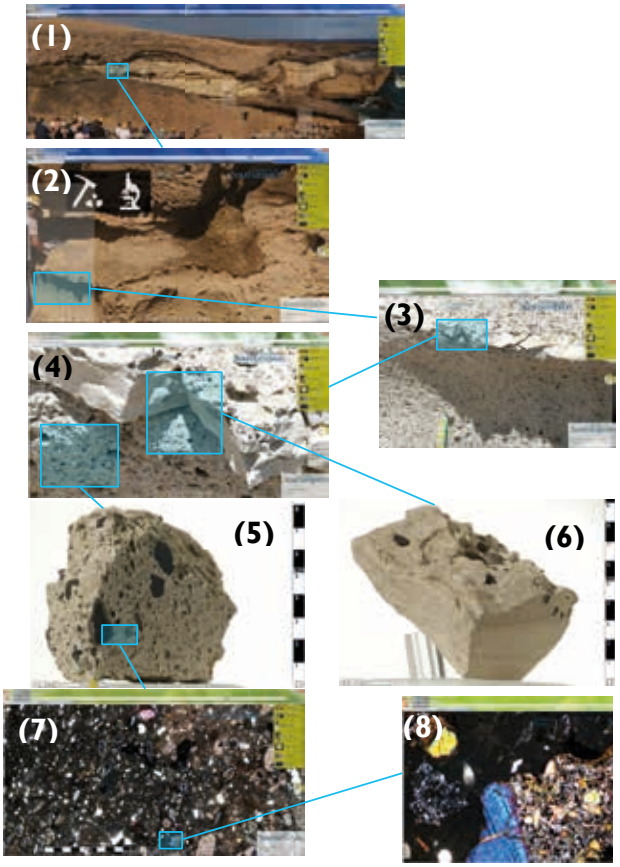
Ocean and Earth Science is duly proud of the field skills evident in our graduates. However, not wishing to stand still, we have developed an additional innovative facet to the field programme: the Virtual Fieldwork Project.

An initial objective of this project was to produce an image and specimen-based learning/reference tool for geological and archaeological fieldwork. As the material is laboratory-based, it is ideal for students who have difficulties accessing particular locations to gather the experience and learning outcomes provided by fieldwork. However, there are a number of additional benefits of the Virtual Fieldwork environment. In particular, students have an opportunity to see the localities and examine the rocks prior to trips and hence maximising the benefits of their time in the field. On return to Southampton, or indeed in the evenings after field studies, observations and interpretations can be reinforced, and combined with a detailed examination of the rocks on macro- and microscopic scales.

Development of the Virtual Fieldwork Project started in April 2012 with a grant from the University of Southampton Student Centeredness Fund. High-resolution panoramic images, close-up images, rock samples and thin section panoramic photomicrographs were acquired over a two year period. These components were then stitched and melded into a web-based visualisation program. Students were involved at all stages of the development with tasks including photographic assistant, rock sampling, image stitching, photomicroscopy and assembling the final web portal – ah yes, and inadvertently acting as a scale!

"The attention to detail is spectacular and I found myself often being able to get closer to the rocks than would be possible in the field. Every aspect of the area is covered on a variety of scales - no rock left unturned."

Erik Spink,
Y4 MSci Geology



Starting with the Virtual Tenerife fieldtrip. Two more virtual environments will be activated in November 2014: Virtual Spain and Virtual Tajao. These will be joined by an archaeological visualisation: the Virtual Portus Excavation, Rome.

Dr Rex Taylor
Senior Lecturer in Geochemistry

The Virtual Fieldwork has been developed by Dr Rex N. Taylor, Dr Ian Harding, Dr Tom Gernon and Mr Barry Marsh. Student co-workers were Kim Dunn, Alex Coleman, Ruth Farley and Chiara Marieni.

A trial version of the web site is now active at: **www.southampton.ac.uk/visualisation**

7 levels of visualisation, from panorama view, through a detailed stratigraphy to rotatable-zoomable rocks and photomicrographs:

1. Tajao panorama
2. White highlighted area is a detailed sub-panorama.
3. Detailed sub-panorama showing a contact between ~6cm ash and an overlying a lithic lapilli tuff.
4. Zooming to detail within the ash layer: highlights mark hand specimens samples.
5. and 6. Rock specimens of lapilli tuff (left) and ash (right). Images are rotatable and zoomable, with matching hand specimens.
7. Panoramic photomicrograph of lapilli tuff
8. Zoom to detail in lapilli tuff

By-the-wind sailors

Billions of small, jellyfish-like creatures known as "by-the-wind sailors" were washed ashore all along the west coast of North America this summer, from southern California to British Columbia. Images of vast swarms of electric-blue sails covering the ocean's surface and littering the sand are indeed spectacular, but people might well wonder what exactly these strange-looking beings actually are. And this of course leads to the next question – should we be afraid of them?

Velella velella (to give them their scientific name) are often assumed to be a type of jellyfish but, while biology does lump them in with jellyfish, sea anenomes, and corals in a group known as Cnidaria, Velellas are not all that closely related to the common or moon jellyfish, *Aurelia aurita*.

Cnidarians have two body forms: the umbrella-shaped, tentacle-trailing "medusa", your classic jellyfish; and "polyps" such as seas anemonies that typically live attached to the seabed. *Velella* is a colony of specialised individual polyps, much like their fellow sailors the Portuguese Man o' War. Instead of living attached to rocks on the seabed, the water surface has become its substrate.

The by-the-wind sailor's body is a flat oval disk 6-7 cm in diameter containing a series of air-filled chambers that provide buoyancy. Below hangs a central mouth surrounded by specialised reproductive bodies that produce tiny medusae, little "jellyfish", and stinging tentacles – which are harmless to humans.

Projecting vertically up is a stiff translucent triangular vane made of chitin, a substance derived from glucose that is also used in crab and insect skeletons or squid beaks. This vane acts like a small sail. Interestingly, the sail runs diagonally across the top of the float, so that the individual sails at a 45 degree angle to the prevailing wind, just like a sailing boat.

Another striking feature is the bright blue colour, which is thought to serve as camouflage and/or protection from the sun's rays. Animals that wash up on the beach dry up and become bleached white within a day or two.

Velella velella use their stinging tentacles to capture and feed on small fish larvae and zooplankton – microscopic animals that drift in the sea. But this is not their only source of food. If you look closely, you will also see a golden-brown colour inside the tissues which are zooxanthellae – symbiotic photosynthetic microalgae – that provide the host animal an additional source of nutrition.

By-the-wind sailor is a very common open ocean organism, living in warm to warm-temperate waters throughout the world's oceans. It is thought that there is a difference in preferred sailing direction in the northern and southern hemispheres, and on the eastern and western shores of oceans, but this has been hard to prove.

Nevertheless, research suggests that California *Velella* have a sail which is angled to the right of the main axis. This means that as the wind pushes it along, *Velella* tacks to the right of the northwesterly prevailing wind and so these animals are usually kept offshore. Occasionally winds come from the southwest so that populations get blown ashore, as in the recent cases in the US.

Similarly, there have been years when large numbers were blown onto the southern coast of the UK, particularly following strong southwesterly winds blowing off the Atlantic.

The fact is that every spring and summer, millions of these strange creatures are blown ashore on the west coast of America. But this year, the numbers have been much greater and the strandings even more impressive.

One reason for this is that storms in the eastern Pacific are likely to have blown the

This article featured in *'The Conversation'* in September 2014, receiving over 320,000 views!

Velella on to the beaches. California's beaches recently saw their largest swells since 1997, as surfers rode monster waves caused by tropical storms hundreds of miles out to sea.

Warmer waters associated with a build up to an El Niño year could have stimulated greater production of new baby *Velella* out in the mid ocean. Jellyfish and their relatives are all very flexible and are able to rapidly take advantage of favourable conditions. They are relatively short-lived, less than a year, can grow and reproduce very quickly, and produce large numbers of offspring. Therefore when conditions are ripe – waters are warm and food is plentiful – their numbers can suddenly erupt.

The occurrence of "good years" and "bad years" is common across all jelly-like creatures. This year in the UK, for instance, there have been reports of large numbers of barrel jellyfish sightings along the southwest coast. While this is not unique, certainly these sorts of numbers had not been recorded in that part of the English Channel for a considerable number of years. Like *Velella velella*, barrel jellyfish mainly live offshore, and it is thought that the very warm spring and early summer coupled with altered water currents enabled large numbers to move in closer to land.

In the Bering and North Seas, where scientists have recorded jellyfish numbers over time, we know that fluctuations have been caused by changing sea temperatures, food availability and long-term climate cycles. At a global scale, analysis carried out by researchers in the Global Jellyfish Group has also revealed large-scale oscillations in the presence of jellyfish and jellyfish-like creatures over the decades. It's a boom and bust existence.

Many are worried that these "jellyfish" blooms are likely to become more common as a result of human-induced climate change, and there may be some truth in this. Huge blooms of giant jellyfish in Japan, or the mauve stinger in the Mediterranean, have indeed become more frequent in recent years, harming tourism, fisheries and aquaculture, and power plants (jellyfish have a habit of clogging up nuclear reactor cooling pipes). But this is not a universal trend; jellyfish aren't about to take over the world, and neither are their sailor cousins.

Dr Cathy Lucas
Associate Professor in Marine Biology

Professor Martin Palmer receives prestigious fellowship

Professor Martin Palmer was this year presented with a Geochemistry Fellow 2014 award by The Geochemical Society and European Association of Geochemistry.

Professor Palmer, who is Head of the Geochemistry Research Group, received his honour in recognition of over three decades of interdisciplinary research in the geochemistry of Earth surface processes. This has involved studies of volcanism in collisional and subduction zones, submarine and subaerial geothermal activity, ore deposits, marine sedimentary processes, river water chemistry, biomineralisation, sensor development and the impact of subaerial volcanism on the oceans.

For more information visit:
www.southampton.ac.uk/news/july

An honour from the Queen

Ocean and Earth Science Emeritus Professor Paul Tyler was awarded an MBE in the Queen's New Year's Honours. Professor Tyler was awarded the honour as a result of his research into deep-sea biology.

Professor Tyler said "I am surprised and delighted to be receiving an MBE. I have supervised 50 PhD students in my career - of which at least 12 are making their own significant contribution in various research institutes to deep-sea biology. When I started out in this field, I was the only UK academic actively going to sea."

For more information about Professor Tyler's research and his distinguished career visit **www.southampton.ac.uk/news/January**

Professor Paul Wilson receives distinguished Wolfson Merit Award

The Royal Society, the UK's national academy of science, this July, awarded Professor Paul Wilson the 'Wolfson Research Merit Award' for his outstanding research work. Jointly funded by the *Wolfson Foundation* and the *Department for Business, Innovation and Skills* (*BIS*), the 'Royal Society Wolfson Research Merit Award' recognises talented scientists of outstanding achievement and potential.

Professor Wilson, was recognised for his work on 'Perturbations and transitions in Cenozoic climate states'. His research focuses on two questions: "How and why has climate changed through Earth's history?" and "What are the lessons from this palaeo-record for the year 2050 and beyond?"

Professor Wilson says: "I am pleased to have been selected for a Wolfson Research Merit Award. It will help me to break new ground in researching the climate lessons that lurk in the geological record. It's a pressing problem; by the time that my six-year old daughter is my grandmother's age, mankind is on-track to increase carbon dioxide levels in the atmosphere to concentrations that we haven't seen geologically for tens of millions of years. Back then, Earth's climate looked alarmingly different to today. I look forward to driving our work forward together with my students and colleagues and with the support of the Royal Society."

AAPG Imperial Barrel Awards Prague - highest ranking undergraduate team!

This year's AAPG Imperial Barrel Award team - Alice Wenborn, Suzanne Millis, Sam Bunnett, Ben James and Chris Wilkinson, placed 5th in the European Regional Competition in Prague.

In an extremely closely fought competition featuring 26 teams from throughout Europe, the Southampton geology and geophysics MSci students were the highest ranking undergraduate team and were widely praised by both industry representatives in attendance and their peers.

Dr. Mark Vardy who accompanied the team commented 'Ranking so highly amongst teams of specialist petroleum geoscience students is a credit to both, the students for all their hard work and the degree progammes here at Southampton'.

Alumni support

To learn more about how you can support Ocean and Earth Science and the University of Southampton please visit **www.southampton.ac.uk/supportus** or email supportus@southampton.ac.uk

Congratulations to our students!

Sally Stewart-Moore: Tyler Prize for Best MSci Marine Biology project

Alexander Hudson: Micropalaeontological Society Prize for achieving the highest aggregate mark in Microfossils Environments and Time.

Jennifer Saxby: Best Graduating Student Prize for BSc Geology who achieved the highest aggregate degree mark.

Elizabeth Farley:

- Mineralogy Society Award for highest aggregate mark in Igneous and Metamorphic Petrology.
- The D E Wisden Prize 2013-2014 for achieving the highest aggregate examination mark on either BSc or MSci Geophysical Sciences programmes.

Matthew Head: Year 1 Veritas Prize for highest aggregate mark in either BSc/MSci Geophysical Sciences

Eric Joyce: Year 2 Veritas Prize for highest aggregate mark in either BSc/MSci Geophysical Sciences

Victoria Sidwell: Best Graduating Student Prize for BSc Marine Biology with Oceanography for achieving the highest aggregate degree mark.

Lily Bee: Ocean and Earth Science Yr 3 Geophysical Sciences Prize for achieving the highest aggregate mark in BSc Geophysical Sciences.

Alexander Coleman: Best Graduating Student Prize for MSci Geology who achieved the highest aggregate degree mark.

Victoria Gravestock: Best Graduating Student Prize for MSci Marine Biology who achieved the highest aggregate degree mark.

Maddison Dorrell: Ocean and Earth Science Yr 4 MSci Oceanography Prize who achieved the highest aggregate degree mark.

Chanshu Gao: Best Graduating Student Prize for BSc Oceanography who achieved the highest aggregate degree mark.

Suzanne Millis: British Geophysical Association Prize for MSci Geophysics who achieved the highest aggregate degree mark.

www.southampton.ac.uk/oes

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Postgraduate enquiries | gsnocs@southampton.ac.uk
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