UNIVERSITY OF Southampton
School of Ocean and Earth Science

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SOES News

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

National Oceanography Centre, Southampton
UNIVERSITY OF SOUTHAMPTON AND NATURAL ENVIRONMENT RESEARCH COUNCIL

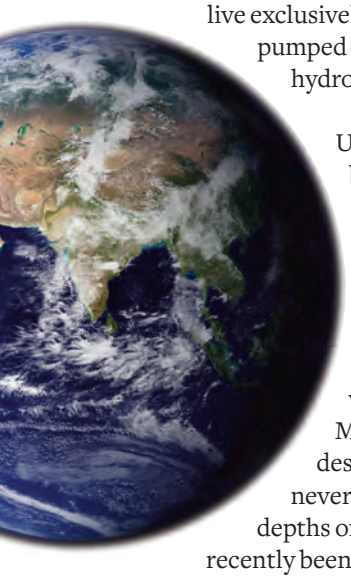
Ocean Space - the final frontier

As we recognise the achievements of the moon landing in 1969 it might be worth noting that next year will be the 50 year anniversary of Picard and Walsh's descent into the Challenger Deep – the lowest point on the Earth's surface at 11,000 metres, nearly seven miles.

Twelve men have walked on the moon: Neil Armstrong, Buzz Aldrin, Pete Conrad, Alan Bean, Alan Shepard, Edgar Mitchell, David Scott, James Irwin, John W. Young, Charles Duke, Eugene Cernan, and Harrison Schmitt - but no one has ever walked on the deep-ocean floor.

More is known about the surface of the moon than the surface of the Earth – 70 % of the Earth's surface lies under water. The moon's surface has been mapped and photographed from every angle. Less than 1% of the deep ocean has been investigated in detail.

However, in the decades before and since the first moon landing no new life forms have been discovered in space - but thousands have been found in our deep oceans. Even whole new ecosystems – for example the communities of animals that live exclusively on the chemicals pumped out at hydrothermal vents.



Using the bathysphere *Trieste*, Jaques Picard and Navy Lieutenant Don Walsh descended 10,915 metres into the Challenger Deep, which lies in the Mariana Trench. This descent by man has never been repeated. The depths of the trench have recently been revisited by the HROV *Nereus* - a dive to 10,902m on 31 May 2009. But still no can set foot there - the deepest diving suit will only get you to 610m, that would still be 6.5 miles short of the bottom!

Front page photo: Paul Tyler in Antarctica on one of his many research cruises.

SOES welcomes its 10th graduating class

On 22nd July, 2009, the School of Ocean and Earth Science welcomed its 10th graduating class. Natalie Ludgate earned her Master of Geology from SOES and was one of the hundreds who celebrated the important milestone.

I became interested in geology while studying the subject at A-Level. I loved learning about our planet, so it was a natural choice for further education. When I was investigating the universities that taught geology, I looked at the University of Southampton website and fell in love with the Waterfront Campus. Who wouldn't? As I read more about the campus and the facilities, I became excited about becoming part of the scientific community.

The graduation ceremony had the very grandeur and prestige I expected from such a high calibre university. The tradition made all the graduands feel that they had achieved a lot more in the years here than just a grade and a piece of paper. We became part of something larger and now this is where life starts.

The School of Ocean and Earth Science is based in a brilliant location and has encouraged me to push myself as a young scientist and achieve goals I never thought possible. It has not been easy. The lecturers were tough and challenged us to work hard, but it was worth it. There were many occasions where my classmates and I just didn't think we had any more to give. Through the moral support and the careful guiding of staff however, we always managed to find a bit more energy and push our marks up just a few percent each time.

I enjoyed many of the modules during my time here; a few that stand out include Environmental Geology and Palaeoclimate Change. These courses were particularly interesting as they looked at how understanding geology can affect our lives and the world we live in. They offered inspiration and confirmed that I wish to carry on my education after Southampton and complete a PhD. Because of the knowledge, skills and opportunities Southampton has offered, I now have a fully funded place lined up for next October.

Studying at Southampton has been amazing, I made brilliant friends and as the saying goes "had the time of my life". But most of all, studying here has been an investment, ensuring I have a successful career and a positive future.

SOES offers its congratulations and best wishes to the Class of 2009.

Photo: Barry Marsh

2009 Graduates. Natalie Ludgate on far right

The king crab *Lithodes confundens* from the southwest Atlantic

King crabs go deep to avoid hot water

Photo: Sven Thatje

Transport of king crab *Lithodes santolla* from South America to Europe onboard RV *Polarstern*

Researchers at NOCS have drawn together 200 years' worth of oceanographic knowledge to investigate the notorious deep-sea giant – the king crab. The results, published in the *Journal of Biogeography*, reveal temperature as a driving force behind the divergence of a major seafloor predator; globally, and over tens of millions of years of Earth's history.

In deep seas all over the world, around 100 species of king crabs live largely undiscovered. The fraction that have been found includes some weird and wonderful examples - *Paralomis seagrantii* has its eight walking legs and claws entirely covered in long fur-like setae; while related group *Lithodes megacanthus* grows to lengths of 1.5 metres, and has 15-20-cm long defensive spines covering its body. At temperatures of around 1- 4°C, these crabs thrive in some of the colder waters on Earth; living and growing very slowly, probably to very old ages. Only in the cooler water towards the poles are king crabs found near the water surface – though temperatures found around some parts of the Antarctic (below 1°C) are too extreme for their survival.

A paper, published 15 years ago in *Nature* is thought to show that king crabs evolved from shell-bound hermit crabs – similar to the familiar shoreline animals. Soft-bodied, but shell-free intermediate forms are found only in the shallow waters off Japan, Alaska, and Western Canada.

By looking at 200 years' worth of records from scientific cruises and museum collections, Sally Hall and Dr Sven Thatje from SOES discovered that the soft-bodied forms can live at temperatures about ten degrees higher than the hard-bodied forms, but that both groups can only reproduce when temperature is between 1°C up to 13-15°C.

"It seems that most shallow-water representatives of this family are trapped in the coastal regions of the North Pacific because the higher sea surface temperatures further south prevent them from reproducing successfully and spreading," said Dr Thatje.

In order to leave this geographic bottleneck and spread around the world, the shallow water ancestors of current deep-sea groups had to go deep and adapt to the challenges of life in the deep sea. The process of adaptation to constant low temperatures (1-4°C) prevailing in the deep sea seems to have narrowed the temperature tolerance range of the crabs where they have emerged to the surface waters in the Southern Hemisphere.

This study reveals temperature as a driving force behind the speciation and radiation of a major seafloor predator globally and over tens of millions of years of Earth's history.

A day in the life at sea

Professor Paul Tyler is a deep sea marine biologist at NOCS. His contributions to the field have firmly established the importance of the deep sea and the incredible biodiversity of life within it.

Our efforts to research one of the planet's least understood, most biologically diverse, and the deepest and least explored place on Earth will help us understand how we can protect and preserve this increasingly vulnerable, yet vital resource.

With more than 60 cruises under his belt during his career, we invited Professor Tyler to shares a typical day in the life of a marine biologist at sea.

The sound of a voice over the RRS *James Cook's* tannoy system wakes me. The voice is encouraging me to use less water and to switch off taps when not in use or when I am cleaning my teeth. The use of fresh water is a constant worry on research ships but is rarely in short supply. It's 10.30am and the reason it seems late is that I am on the 12 hour watch from 4pm to 4 am and only got to bed at 4.15am. I slept well because the gentle rocking of the ship lulled me to sleep, although it's a different story during storms.

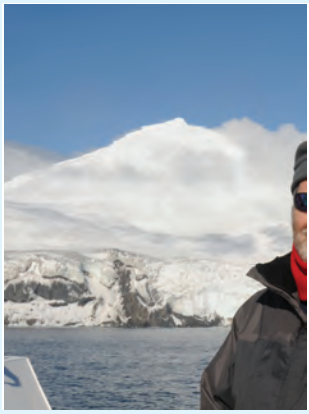
I shower, dress and walk to the main lab to check the progress of the science programme. A special corer called a megacore is on its way to the seabed 3600m below and will take 2 hours to get there. The activity is monitored by the day watch crew, many of whom are bleary-eyed having been up since 3.45am to start their watch at 4am. Tiredness is one thing we all suffer from and as the cruise progresses, we never seem to get enough sleep. Power naps are important for restoring energy.

Lunch is a full meal at 11.30 in the self-service cafeteria. You will not starve on a British research vessel and it is a constant battle not to put on weight at sea. After lunch I check email. Communication has changed phenomenally since I first went to the deep sea in the late 1970s. At the time, the only communication between ship and shore was radio telephone through one of the coastguard stations. Today, there is constant access to e-mail via the communications satellite. The downside of this is that all the work from base follows you to sea. By mid-afternoon the corer is back on deck and the day watch takes the samples to the sieving table to wash away the mud and to collect the small organisms that live in it. It is only in the last 20 years that have we recognised that the deep sea has a biodiversity equal to the tropical rain forest. The sievers take great care as an organism they collect may never have been seen before and will be new to science. Because a tiny percentage of the deep sea has ever been explored, we are constantly discovering new life forms and incredible finds during our dives.

We have a short 2 hour steam to the next station where we will dive at 2500m depth with the ROV *Isis*. *Isis* is a sophisticated underwater vehicle tethered to our ship by a fibreoptic cable capable of sending real time images and collecting samples at the seabed. *Isis* has transformed our ability to survey and study the deep sea. The scientific watch changes and my watch is now officially working. The ROV team run a series of pre-dive checks on the ROV and the scientists get ready for their watch.

The control van of the ROV may not be 'Houston' but it is very impressive. All along one wall are five 42 inch video screens that show all of the imagery from the various cameras on *Isis* (pilot's camera, science camera, high resolution camera and a stills camera). Below, there are 7 smaller screens with all of the navigation information, forward facing sonar and position of the ROV and the ship. We sit behind the pilots and have our own suite of screens for event logging, navigation and readouts of other ROV instrumentation such as salinity, temperature and depth.

Once the ROV is in the water, it takes 2 hours to reach the seabed. After all of these years, 'Seabed in sight' still raises the excitement level in me as you have no idea what might be there. We have dinner while the ROV is descending. This is the main meal of the day and often consists of four courses. There is discussion over dinner between the different watches and exchanges of information and dive requests.



Photos from top to bottom
Pteraster at the seabed and *Isi*

: The control van for *Isis*; Prof Paul Tyler in Antarctica; Example of
s being deployed off the RRS *James Cook*.

Back in the ROV control van, we are at the seabed and there are a series of checks. At 2500m the ROV is under 250 atmospheres of pressure. The ROV pilots check all the technical and recording equipment. The commands we give on the joystick are transmitted instantaneously to the ROV nearly two miles away.

The object of this dive is to carry out a video transect up the side of a canyon from 2500 to 1500 metres. The submarine canyons walls are steep and rugged and are very difficult to sample from surface ships. The ROV is perfect for such study. Our watch is divided into shifts so that each scientist can get a break in their 12 hour watch, but such is the enthusiasm amongst my colleagues that the control van is nearly always full.

It is early evening and the dive is due to finish early morning tomorrow. We set off up the slope recording the animals we see and collecting some so we can identify them accurately. With the advent of molecular methods, we can now 'barcode' each species as well as having morphological descriptions. The survey is almost a routine now and there is both scientific discussion and banter between the pilots and the scientists. At one point we stop as we want to collect an animal. This means setting the ROV on the seabed using the two manipulator arms to pick up the animal and place it in the biobox for transport back to the surface. Some of the organisms at the seabed are so small they are collected by using a pushcore, a hollow cylinder of plastic that is pushed into the sediment and pulled out and placed in a quiver on the front of the ROV. The ROV pilots are very experienced at this and it takes only about 2 minutes to get a push core.

Every so often there is a 'tea call' and someone goes off to make a tray of tea and raid the biscuits to bring them back to the van. Work does not stop and tea is drunk 'on the hoof'. At midnight the ROV pilot watches change. The pilots are also doing 12h watches but change at midday and midnight. There is about 10mins of discussion during which there is an exchange of a huge amount of technical information before one ROV watch leaves and the other settles in for the night.

As we approach the early hours of the morning there are fewer people about and we settle down again to the routine of videoing, recording and sampling. At 2 am I often start to feel a bit sleepy and will go for a short walk round the ship just to wake up again. At 3.45 am the watch leader of the day watch will come into the ROV control van and we will discuss the dive, progress made and what still needs to be done. At 4am our watch is relieved and we leave the van. Some go for a cup of tea but I tend to go to bed. I am usually in bed by 4.15 but the irony is that often I cannot sleep because of the excitement of observing the seabed for the last few hours. However, I am usually asleep by 4.30 and wake naturally about 10.30 to start another day.

Alumni reunite at Ocean and Earth Day 2010

Please mark your calendars for Saturday 20th March 2010 when the National Oceanography Centre, Southampton will be holding its annual Ocean and Earth Day.

This is NOCS largest annual public event and a great opportunity to explore the UK's # 1 centre for marine and Earth science.

We plan to have an Alumni presence at the event and hope you can join us to reconnect with old friends and tutors.

Please save the date and we look forward to seeing you in March!

Photo: Barry Marsh

SOES alumni panellists

Photo: Andy Vowles

Is there "life after graduation?"

With news about the economy ever present and always changing, it is no wonder that current students and new graduates are taking life after graduation very seriously. On 22nd April, eight SOES alumni returned to the University to participate as panellists on the SOES "Life After Graduation Panel." Over 100 students and staff attended the "Geology and Geophysics" and "Marine Biology and Oceanography" panels at NOCS to hear alumni speak candidly about their path since graduation and their tips for getting a job. Students also had the chance to network with alumni during lunch and to foster links with a variety of companies.

"It gave a realistic view of what work was available along with very sound, genuine advice," said one student. "It showed there is work out there for people who apply themselves." Student feedback particularly favoured the honest advice on how to write a CV to how to best prepare for an interview.

"I thought it was a very well organised day and was glad to hear it topped the tables for attendance" said Master of Geology panellist Rob Cooper. "I thoroughly enjoyed it too and would be pleased to be involved again!"

The event was fully funded by the University's Learning Teaching Enhancement Fund to help promote links between Alumni, Career Services, current students and employability efforts. Students especially were consulted during the planning to ensure their questions were addressed. "Will I like my job?" "what do employers want?" "what modules make the difference?" and "how much will I earn?" were all unanimous questions on the minds of current students.

Employability is a priority for the University and SOES graduates are highly regarded in a number of industries and fields. During this economic downturn and feeling of uncertainty, the panel provided constructive advice on career prospects to students and promoted the important role companies can play in supporting employability efforts. The feedback from participants and alumni has been positive and we plan to host another event in 2010.

A lasting legacy for a geologist and friend

In 1999, members of the Geology class of 1965 established the Brian Sedgwick Oversby prize to recognise their late friend's passion for geology. Peter Dolan, a donor to the prize and member of the class of Geology 1965 reflects on his memories of Brian.

Brian Oversby was a field geologist par excellence. He grew up in the Lake District and by his early teenage years was a compulsive rock hound, particularly interested in fossils. He was known at school as Cass (from Cassius of the lean and hungry look) since he did his 'geologising' by hiking and cycling the hills on his Hercules bicycle which he'd been given for passing his 11+ examinations.

Brian came to the Geology Department at Southampton in 1962, where he joined eight other freshers, all of whom were somewhat in awe of this rather private and sometimes gruff 19th Century character. It didn't take long for them to realise his exceptional independence and commitment to geology, notably field mapping which he undertook in wooden soled clogs!

After graduating in 1965 Brian went to Columbia (New York) where he earned a Ph.D before moving to Australia . He had a distinguished career working for the BMR (Bureau of Mineral Resources) mapping vast swathes of mainly igneous and metamorphic terrains in the outback. Upon his retirement, Brian continued his active life style, including mountain trekking in the Himalayas. It was on one such trip in 1999 that he was taken ill and could not be medevaced to safety before he died.

The Class of '65 were moved to start a small fund in Brian's memory, with the inspiration being to assist a worthy second year undergraduate to hone their skills in 'hard rock' field mapping. In 2009 it was decided to recognise the 10th anniversary of Brian's passing and to put the funding on a more sustainable basis through the establishment of the Brian Oversby Endowment Fund. The fund will continue to encourage field mapping proficiency. We are sure that Brian would approve and look forward to the impact the prize will have for future "Oversby Scholars."

'65 Geology mates and donors to the Oversby prize

Create an opportunity and make a lasting difference to your School

As a SOES alumnus, you will have experienced firsthand the School's commitment to innovative excellence in teaching and research. The goal of our undergraduate programmes is to produce the best and brightest graduates who are well equipped to enter the world of employment in not only a wide range of ocean and Earth sciences or Earth system science professions, but also in other spheres. Our courses are constructed around this goal, with emphasis being given both to academic merit and the skills and qualities sought out by employers. In order to create these opportunities and inspire ambition in our students we need to provide specialist equipment, first rate facilities and top class fieldwork opportunities. As an alumnus you can play a role in providing our students with the opportunity to make a lasting global impact on the world around them by joining our community of donors.

A gift of any size today makes an instant yet lasting difference at SOES, and you can be reassured that you are helping to transform lives and investing in the next generation of great thinkers. Your gift will be matched under the Government matched funding scheme and gift aided so your support can go further than ever before.

We need your support to help others follow in your footsteps. Please consider making a gift to SOES today and help support the exciting teaching and research opportunities that make our School life changing.

Photo: Clive Boulter

New Head of School for SOES

Professor Tim Minshull is the new Head of School of SOES. Tim joined SOES in 1999 from Cambridge as a Royal Society Research Fellow. We talked to Tim about his new role and his scientific background.

Q: *Why is what we do as a centre and within SOES so important? How is our science making a difference?*

Our research and education at NOCS is focused on the processes occurring on and near the surface of the planet we inhabit and the consequences of those processes, for example for the earth's climate, for life within the oceans, for the resources our planet can provide and the hazards that can be generated. These processes impact everyone, and the broad interest in and impact of our science is demonstrated by the regular appearance of NOCS scientists in national and international media.

Q: *What do you see as the key challenges and opportunities of your new role?*

The anticipated increase or removal of the cap on top-up-fees will present us with tough decisions about how we position ourselves in the future. Financially, things will be difficult, although I think SOES will benefit from the strong RAE result. We welcome a new Vice Chancellor to the University in Autumn 2009 and one of my early tasks will be to give him a "state of the nation" overview of SOES and our ambitions. Longer term I would like to see a bigger NOCS Graduate School that is attracting more international students. The School is also recruiting new academic posts which will be crucial to our future success. We need to set the bar high to help raise our standards.

Q: *What is your research background?*

I am a marine geophysicist, which means that my research is focused on the solid earth beneath the oceans – on its structure and the processes that form and shape it. I first went to sea on a research vessel as a new graduate student in 1986 and found the experience of collecting new information about an unknown region of the Earth buried beneath several kilometres of water incredibly stimulating. Since then I have been to sea on large ocean-going research vessels 19 times and also worked on smaller boats.

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