

Challenger Wave



Monthly newsletter of the Challenger Society for Marine Science (CSMS)

NEWS

In memory of Professor Paul Somerfield, PML Ecologist

Insatiably curious and passionate about all aspects of marine life, Paul joined PML in 1991 as a Higher Scientific Officer (HSO), initially working on the identification and taxonomy of meiofauna, then going on to lead numerous



projects on a wide variety of marine topics; from bacteria to sharks. Prior to arriving in Plymouth, Paul completed his PhD on marine mites at the University of Dublin's Trinity College and

then spent time in Australia and South-East Asia pursuing his love of the underwater world through scuba diving (he would later become PML's Diving Officer), and even working in a travelling circus.

Over the past three decades, Paul became a highly-respected and popular senior member of staff, serving on numerous international and national panels, committees and working groups and known by those he worked alongside for his impressive breadth of knowledge and inquisitive approach to solving problems.

An accomplished writer, a skilled taxonomist and guru of statistical analysis, Paul's initial work at PML was alongside his colleague, Dr Mike Gee, and focused on the study of benthic meiofauna, assessing the impacts of different types of pollution in UK coastal waters. Primarily working in PML's Community Ecology group, which later became the Biodiversity group, Paul also worked

alongside Professor Bob Clarke and Professor Richard Warwick, becoming heavily involved in the "Plymouth Routines in Multivariate Ecological Research" or PRIMER-e software and methods which are now well-established for statistical research in more than 130 countries globally.

In later years, Paul became renowned for his teaching on numerous PRIMER-e courses, www.primere.com/, giving his time generously to help participants explore and publish their data long after the courses had ended. Hundreds experienced first-hand his interest in all aspects of marine biology and his genuine love of helping people. Paul took great joy in helping others achieve their ambitions.

Paul's research predominantly investigated the distribution and functioning of biodiversity, particularly through the novel integration and analysis of compiled data to understand large-scale and long-term processes, and their implications for the ways in which we understand and model systems. This deep knowledge of biodiversity and commitment to doing science for a purpose saw him become PML's inaugural Biodiversity Science-to-Impact Challenge Coordinator. He was regarded as an international expert on both meiofauna and on the application of non-parametric multivariate analysis, and his legacy includes the authoring and co-authoring of more than 150 peer-reviewed papers, in addition to a number of books and chapters.

As impressive as his scientific legacy is, Paul will be remembered at PML, and beyond, for the thousands of inspirational interactions and personal acts of mentoring he has provided to his peers over the years. Paul often gave without taking and his desire to put the science ahead of his own ego was hugely admired. After more than three decades at PML, Paul's academic DNA and approach to doing science are inseparably intertwined with those of the organisation. His work impacted right across the

laboratory and his sad loss will be felt in every corner of PML. Paul is survived by his wife Tina and his daughter Annabel, to whom we extend our deepest sympathies.

'Extraordinary' temperatures spark heat wave investigation

Scottish Association for Marine Science (SAMS) scientists are using data from underwater robots to investigate what they describe as an 'extraordinary' marine heat wave event in the Atlantic Ocean, west of Scotland. Satellites revealed record sea surface temperatures in the region in mid-June, but data from an autonomous underwater vehicle, known as a glider, operated by SAMS has given further insight into the warming event. The glider operates in the open ocean for months at a time, collecting oceanographic measurements down to 1,000 metres and resurfacing every few hours to report back its findings. It revealed that the extreme sea temperatures were in the first 20 metres of the ocean, with relatively typical temperatures below that.



Recovery of a glider vehicle SAMS scientists use to measure temperature and other oceanographic properties in the deep ocean.

SAMS oceanographers believe this top layer of extremely warm water could have profound effects on ocean systems that dictate our climate. "It's like nothing we've seen before," said SAMS oceanographer Dr Neil Fraser, www.sams.ac.uk/people/researchers/fraser-dr-neil/. "The peak sea surface temperature is the hottest on record and up to 5 °C warmer than the average for June. To put it into context, the seasonal sea surface temperature peak is not usually until August."

SAMS has operated gliders in the north-east Atlantic since 2010 but has had near continuous glider data collection for the past 10 years. Over

that time, the gliders have been on 29 missions, travelling a combined 65,000 kilometres. This continuity is giving scientists new insights into warming events and the glider's ability to make regular measurements through the water column is filling in crucial data gaps.

"Satellites are great at measuring the sea surface 'skin' over a large area and the shallowest fixed mooring sensors we have are about 50 metres' depth, so gliders are really coming into their own," said Dr Fraser.

"It's like having a mobile thermometer in the ocean. Another advantage is the gliders can inform us of such heat wave events as they are happening. Over time, they might also be able to tell us where this heat goes.



Will it mix into the ocean, or will it be absorbed into the atmosphere?"

Scientists hypothesise that the cause of the recent marine heat wave could be a shifting and weakening of the trade winds, which would normally cool the sea surface. By examining glider data in more detail, they aim to investigate the causes of the marine heat wave and the implications for the deeper ocean. SAMS gliders continually monitor the north-east Atlantic, where the exchange between the salty and relatively warm Atlantic water and the colder, fresher Arctic Ocean plays a major role in global climate.

A large system of ocean currents, known as the Atlantic Meridional Overturning Circulation (AMOC) transports warm surface waters from the tropics northward towards the sub-polar and Arctic regions. There, the waters cool, become denser and sink before returning southward at depth. In doing so, this vast 'conveyor belt' movement of water is a major factor in controlling global heat distribution, regional sea level changes, the ocean's absorption of carbon and European weather. SAMS oceanographer Prof Stuart Cunningham, www.sams.ac.uk/people/researchers/cunningham-professor-stuart/, said: "While the AMOC is not likely to have been the driver of this recent heat wave, we are very interested to find out whether these extraordinary sea surface temperatures will have an effect on

the system. Often described as Europe's central heating system, the AMOC relies on the water being much cooler in the global north. If the water is too warm, this can inhibit the dense water formation which drives the AMOC, and that could have profound effects on global climate and weather."



Royal Meteorological Society Awards

The National Oceanography Centre's (NOC) Dr Svetlana Jevrejeva received the prestigious 'International Journal of Climatology Editors' Award alongside Mr Mike Kendon (Met Office), Dr Mark McCarthy (Met Office), Professor Tim Sparks (Volunteer with the Woodland Trust) and co-authors. This Award recognises the team of authors who annually produce the State of the



UK Climate reports. These have been published as a Special Supplement to the International Journal of Climatology since 2017.

The team's acceptance message read: "We are delighted to accept the International Journal of Climatology Editors' Award for the annual State of UK Climate reports. These are intended to provide an authoritative up-to-date assessment of the UK's climate and how it is changing: if we are to understand our climate of the future, first we must understand our current climate and how it has changed in the past. The reports represent a culmination of a much wider team effort, so we wish to accept this award on behalf of all contributors. We especially acknowledge the work of members of the Met Office National Climate Information Centre team. Monitoring the UK's climate requires persistence and commitment, with the integrity of the science at the core of what we do

As an island nation with many thousands of miles of coastline, including major coastal cities, coastal erosion, flood risk and rising sea levels are a threat in many areas, and it is important

these are carefully monitored. Similarly, it is vital that we understand how the natural world is responding to our changing climate. We are therefore pleased that this report also pulls together sections on sea level and phenology in one collaborative effort.

A common theme through all sections of the report are the observations, without which a report like this would simply not be possible. We are lucky in the UK to have many observations from professional and volunteer observers collected over decades, sometimes over centuries. We are grateful for these contributions, for the hard work of teams maintaining the observing networks, and ongoing efforts to rescue and digitize historical observations. But nothing should be taken for granted: above all, this report highlights the importance of adequately maintaining our observation networks into the future. We are grateful for the recognition this award brings. Thank you."

Dr Svetlana Jevrejeva is a sea level scientist working at the Marine Systems Modelling group at NOC. She specialises in the synthesis of observations and models to develop our understanding of physical mechanisms for global and regional sea level rise and variability, their impact in coastal areas, changes in tropical cyclones in warming climate and extreme sea levels.

Also part of the team of authors is Dr Andy Matthews, a Sea Level Data Manager and the Technical Lead for the Permanent Service for Mean Sea Level (PSMSL), working in the Marine Physics and Ocean Climate (MPOC) group at NOC. For the last 6 years, he has been responsible for processing the UK sea level trends data in the State of UK Climate reports. He is an expert in recovering, quality controlling, archiving and distributing sea level data measured at tide gauges across the world. To read the full list of winners and acceptance messages visit www.rmets.org/award-winners-2022.



New study shows effect of climate change on ocean colour

Scientists from the National Oceanography Centre (NOC) have discovered changes in the

colour of more than half (56%) of the ocean as a result of changes in the plankton communities. The new paper, published in Nature, “Global climate change trends detected in indicators of ocean ecology”, doi.org/10.1038/s41586-023-06321-z, explains that plankton communities in around half of the world’s oceans have been affected by climate change over the past 20 years.

Plankton are tiny organisms that are carried by tides and currents and are often divided into phytoplankton which are small plants and zooplankton which are small animals. The 20-year figure is significant as, prior to this study, the scientific consensus believed that 30 years of satellite data would be needed to detect a climate change trend in chlorophyll. However, for the first time, the paper shows that 20 years is enough time to detect a climate change related change in ocean colour.

Using NASA’s Moderate Resolution Imaging Spectroradiometer (MODIS) onboard the Aqua satellite, scientists analysed measurements of ocean colour. The satellite takes measurements in seven wavelengths including the blue to green ratio that researchers often use to estimate the amount of chlorophyll. This drastically reduces the time required to gather this important information from satellites which is the only way to measure the entire ocean simultaneously. It also means that this monitoring can be conducted in the lifespan of a single satellite as they may not last the full 30 years.

It is expected to spur additional research from multiple satellite missions to create more detailed records of data with a focus on long-term satellite missions rather than the short focus missions that make up the majority of the current research. Dr B. B. Cael, Principal Scientist from the Ocean BioGeosciences group at NOC and lead author of the paper, said. “The satellite data we studied reveal a change in the colour of a massive portion of the ocean, representing an area larger than all the land on Earth. The computer simulations we studied suggested that these



colour changes may be due to climate change. The hope is that this paper will inspire additional work into the causes and effects of these changes.”

The ground-breaking study was by far the largest single detection of climate change affecting ecosystems in terms of the fraction of the earth that was covered, as the entire ocean was observed. A trend of change in the plankton was detected in over half (56%) of the ocean, indicating a tremendous amount of change is underway. Whilst it is too early to determine what the change means for the ocean at large, scientists believe that climate change will drive ecosystems towards dominance by smaller kinds of plankton.

This change to smaller plankton being more dominant could be a potential cause for future concern as it could lead to the ocean having less ability to store carbon. According to the latest data from the Intergovernmental Panel on Climate Change (IPCC), plankton could account for between 5% and 17% of new carbon intake into the ocean by 2100. Smaller plankton have less ability to store this carbon, potentially limiting its effectiveness. The research was funded by the Natural Environment Research Council (NERC), NASA, Innovate UK (Horizon Europe) and Horizon 2020.

Faunal boundary line discovered across the deep Pacific Ocean

A study led by the National Oceanography Centre (NOC) has revealed the existence of a biogeographical boundary at the bottom of the North Pacific Ocean, resembling the ‘Wallace Line’ discovered in 1859 that divides the life of Asia and Oceania, on the sea bed. This new limit separates two distinct biological areas across the Clarion-Clipperton Zone (CCZ), a vast abyssal plain region extending across 5,000 km between Mexico and Kiribati, at depths between 3,500 and 6,000 m, and which is currently targeted for deep-sea mining.

The study also revealed that there is a surprising increase in diversity with depth in this region, challenging the long-held paradigm in deep-sea ecology that biodiversity is limited by the harsher living conditions in deeper areas of the ocean. Dr Erik Simon-Lledó, deep-sea ecologist at NOC and lead author on the paper, said: “We were surprised to find a deep province so clearly

dominated by soft anemones and sea cucumbers and a shallow-abyssal where suddenly soft corals and brittle stars were everywhere”.



The study suggests water chemistry, in the form of calcium carbonate (CaCO_3 - the mineral that forms the shells and skeletons of many animals) saturation, might be an overlooked element in delineating this boundary and therefore key in shaping biodiversity across this vast area. Dr Simon-Lledó added: “Muddy abyssal seafloors were initially considered to be almost ‘marine deserts’ when first explored many decades ago, given the extreme conditions for life there - with a lack of food, high pressure, and extremely low temperature. But as deep exploration and technology progressed, these ecosystems keep unveiling a large biodiversity, comparable to that in shallow water ecosystems, only found on a much wider spatial spread.”

Dr Adrian Glover, principal scientist at the Natural History Museum and co-author of the study, said: “We have known for some time that the abyssal plains are relatively high in biodiversity. What has been missing is knowledge of how that diversity is distributed and how it changes across broad spatial scales. These new data revolutionise our understanding of abyssal Pacific biogeography and will be vital to inform urgent policy decisions on potential deep-sea mining”



Dr Daniel Jones, principal scientist at the NOC and senior co-author of the study, said “The research findings are the result of a ten year-long study in collaboration with more than 13 world-leading deep-sea research institutions, universities, and



industry bodies, and involved 21 deep sea researchers. It shows the value of international collaboration in uncovering unknown patterns across huge areas of the ocean.”

The study showcases the patterns and processes that underpin the deep ocean’s biodiversity, and how these differ between shallower and deeper regions in a vast abyssal nodule field habitat that is currently targeted for mining. This provides a new basis for regional-scale management strategies to protect biodiversity in Earth’s largest biome. Read the full study in Nature at doi.org/10.1038/s41559-023-02122-9.

Rain triggers seasonal changes in shelf seas

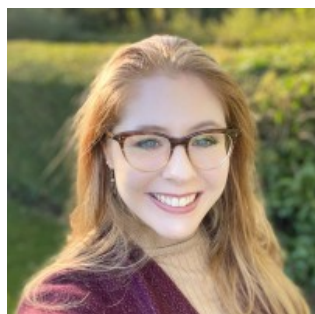
A new study led by NOC has revealed that rain is the main trigger of seasonal stratification in shelf seas. Stratification is the natural separation of the water column, with warm, less dense, water layered on top of colder, denser, water. This process impacts the spring phytoplankton bloom, an exponential algal growth event that underpins marine food webs. Prior to this study, it was thought that the onset of seasonal stratification was caused only by temperature, due to more heat going into the surface ocean towards springtime. Storms were thought to delay the onset of stratification due to increased mixing from strong winds, but data collected by autonomous ocean robots has now revealed that stratification can in fact be triggered by rain from passing storms.



A model used by scientists in the study uncovered that rain triggered stratification 88% of the time from 1982 to 2015 and that stratification onset could be further controlled by large-scale pressure changes across the North Atlantic. This suggests that in the future changing storm

patterns could affect both the timing and intensity of the spring phytoplankton bloom, thereby impacting the food web. This new understanding has important implications for fisheries as shelf seas, the shallow seas closest to our continents, account for 90% of the global fish catch.

Jenny Jardine from the Marine Systems Modelling (MSM) group at NOC, and Lead



Author of the paper explains: "Not only does this research have significant implications for marine ecosystems, but this research will further inform how changing storm activity will impact shelf sea

environments in the future." To read the full study in Nature Communications, visit doi.org/10.1038/s41467-023-38599-y.

Early Career Researcher (ECR) opportunity

While we know that plastic pollution is a global issue that needs a thorough reconsideration of plastic production, consumption and waste management practices, the Royal Society and the Department of Environment, Food and Rural Affairs (DEFRA) are keen on addressing plastic waste already in the marine environment, especially as this is an issue that has not fully been considered in the International Negotiating Committee (INC) Plastics Treaty. We are working with DEFRA who are keen to address some real-world questions to our cohort of ECRs which would be used to feed directly into the ongoing discussions within the INC on whether addressing existing plastic pollution in the environment should be a core obligation of the new international treaty on plastic pollution.

We would like to organise an event (potentially an intense workshop type hackathon) in September to answer specific questions on the topic of Legacy plastics: Policy considerations from hotspots identification to clean-up implementation. We are particularly interested in hearing from you if you are working on plastic pollution (impacts, sources, solutions including but not limited to clean-ups). This discussion will help understanding better the potential of plastic litter hotspots identification, along with the considerations and impacts of clean-up technologies' implementation. This is a fast-

moving opportunity, and we would appreciate your expression of interest by contacting resilientfutures@royalsociety.org If you think that your research and expertise could contribute to the discussion, please let us know as soon as possible. We are looking forward to hearing from you.

Expressions of Interest invited to Host the International Project Office for IMBeR

Integrated Marine Biosphere Research (IMBeR; www.imber.info) is soliciting offers to host one of its International Project Offices to continue the role fulfilled by IPO-Canada where the Executive Director is based. IMBeR welcomes expressions of interest to host the new IPO from the 1st March 2024.

Co-financing or partnerships between institutions are permissible. To send an expression of interest, please complete the table at the end of the Call for Expressions of Interest document, imber.info/uncategorized/call-for-imber-ipo-host/, together with a brief letter of intent to John Claydon, IMBeR Executive Director, John.Claydon@dal.ca. the deadline for expressions of interest is extended to the 15th September 2023.

UK Sustained Scientific Ocean Observation Priorities Consultation

In 2022 the National Oceanography Centre (NOC) led a consultation, on behalf of the Natural Environment Research Council (NERC), on prioritising the ocean observations that are important to the UK and internationally. To ensure objectivity, impartiality, and to capture a broad spectrum of views from across the UK marine science community, NOC ran an open consultation, coupled with a reliance on documented evidence and best practice from across the UK and the international community.

The consultation consisted of three mechanisms to gather data, evidence and opinion:

- Individual Consultation – open to all
- Best Practice from international strategies
- Ideas and Opinions from existing organisations and forums.

Following collation of the evidence, NOC assembled a workshop to discuss the results and identify the key priority observations and the

report from this community-based consultation is now published, <https://ocean-observations.uk/>.

Exciting opportunity – MEDIN Chair

The Marine Environmental Data and Information Network (MEDIN) is seeking an outstanding new Chair, who can bring strategic leadership, enthusiasm and independent thinking to our Sponsors' Board and Executive Team at a significant time in our development. Further information about the role can be found at medin.org.uk/independent-chair-medin.

MEDIN is a long-term, open partnership that provides the national framework for managing the United Kingdom's valuable marine data. The network facilitates the delivery of cross-cutting ambitions for UK marine data, taking into account diverse drivers across our broad range of stakeholders, across policy, industry and academic sectors. Anyone interested in becoming our next Chair should complete the Expression of Interest form and submit it along with a CV to the MEDIN Coordinator (Dr Clare Postlethwaite, cfpo@noc.ac.uk) by Sunday 17th September. We hope to appoint our new Chair by the end of October.

VIEWS

Seabed 2030 and Ocean Census announce partnership uniting efforts to map the seabed and discover ocean life

A new partnership has been announced between The Nippon Foundation-GEBCO 'Seabed 2030' Project and The Nippon Foundation-Nekton 'Ocean Census', the largest programme in history dedicated to species discovery in the ocean. With the shared goal of unravelling the mysteries of the deep and enabling sustainable management practices, the partnership will greatly strengthen the future of ocean science and marine conservation.

Both programmes have been initiated and supported by The Nippon Foundation, Japan's leading philanthropic organisation which works to solve global issues through social innovation. "The partnership between Ocean Census and Seabed 2030 marks a pivotal moment in ocean scientific exploration and marine conservation. By integrating seafloor mapping data with a deeper understanding of where and what lives in

our ocean, we can gain a holistic understanding of ocean ecosystems, their role in oxygen production, climate regulation and food security. In combination, we will be able to identify areas of high conservation priority so we can develop effective strategies to safeguard ocean life, the life that makes all life on Earth possible," explained Yohei Sasakawa, Chairman of The Nippon Foundation.

The Nippon Foundation and Nekton launched Ocean Census in April this year, with the aim of revolutionising our understanding of marine life. Scientists maintain that we have discovered slightly more than 10 per cent of the species that live in the ocean, despite it being home to an estimated 2.2 million species. The rate of discovery has remained relatively unchanged since the 1800s, with approximately only 2,000 new ocean species described per year.

However recent technological advances in high resolution imaging, DNA sequencing, and machine learning mean that scientists can now considerably accelerate the process, and Ocean Census has set itself the ambitious target of discovering 100,000 new species over the next decade. This will be achieved through expeditions to the ocean's biodiversity hotspots, with species discovered on expeditions sent for imaging and DNA sequencing at Ocean Census Biodiversity Centres. Ocean Census is being undertaken by a coalition of partners uniting the resources and expertise of science, media and civil society with government, philanthropy and business.

Seabed 2030 is a collaborative project between The Nippon Foundation and GEBCO to inspire the complete mapping of the world's ocean by 2030 and to compile all bathymetric data into the freely available GEBCO Ocean Map, it is also a formally endorsed Decade Action of the UN Ocean Decade.

GEBCO is a joint programme of the International Hydrographic Organization (IHO) and the Intergovernmental Oceanographic Commission (IOC), and is the only organisation with a mandate to map the entire ocean floor. For more information and comment, please see www.oceanbusiness.com/general-ocean-news/seabed-2030-and-ocean-census-announce-partnership-uniting-efforts-to-map-the-seabed-and-discover-ocean-life/.

August 2023

Recently qualified Biology graduate seeking temporary Research Assistant position.

As a recent graduate from the School of Biology at the University of St Andrews, I am currently employed as a Research Assistant at the University until 25th August 2023 but plan to start a PhD in 2024. I have a strong interest in the ecology of coastal, estuarine, freshwater, and wetland systems, particularly with respects to anthropogenic stressors and their effects on invertebrate fauna. During my studies and work I have gained a solid foundation in experimental design, data analysis and report writing. I am currently working on my first publication which has focused heavily on histological analysis, with forays into computer vision and automated image segmentation using Roboflow and ImageJ. I have experience in invertebrate behaviour and I have field experience working with the National Trust. I am keen to gain experience and would be happy to consider a range of opportunities. If you are looking for a Research Assistant please contact me, Rhys Hague on: ah339@st-andrews.ac.uk

SALTS

No news from sea this month I'm afraid

I know that this is a favourite section for many readers, where we get the inside information about life at sea, its thrills and spills. So please the next time you are at sea or carrying out any fieldwork, please remember that a simple paragraph or two will get you published here. – Ed

CALENDAR

5th-6th September 2023: Challenger Ocean Modelling Special Interest Group (SIG) Southampton, UK

The Ocean Modelling SIG meeting is being held on the at the National Oceanography Centre in Southampton. Registration is now open, www.challenger-society.org.uk/Ocean_Modelling

6th-8th September 2023: Advances in Marine Biogeochemistry (AMBIO) SIG Plymouth, UK

The AMBIO SIG meeting is being held at the Plymouth Marine Laboratory. Registration will

www.challenger-society.org

open very soon www.challenger-society.org.uk/Advances_in_Marine_Biogeochemistry. We will hold the conference from lunchtime-to-lunchtime, to assist with travel logistics. We will have sessions with talks in addition to networking, a poster session, poster flash talks, and an ECR event. Lastly, we will be holding our annual Town Hall/AGM over the Friday lunchtime.

The Challenger Society for Marine Science
ADVANCES in
MARINE
BIOGEOCHEMISTRY

Marine Biogeochemistry for the Future

The tenth biennial meeting of the Challenger Society for Marine Science's Special Interest Group, AMBIO

September 6th - 8th 2023
Plymouth Marine Laboratory, UK

Future announcements via the web and Twitter:
www.challenger-society.org.uk/Advances_in_Marine_Biogeochemistry
[@ChallengerAMBIO](https://twitter.com/ChallengerAMBIO)
Follow the QR code to join the AMBIO mailing list

Convened by:
Kate Hendry (BAS)
Sarah Reynolds (Portsmouth)
Andy Rees (PML)

Sponsored by:



We now have a full list of sessions:

- Biogeochemistry and Marine Autonomy;
- The Cutting Edge of Biogeochemical Observations and Modelling;
- The Future of GEOTRACES; and
- Marine Biogeochemistry at the Sediment-Water Interface.

For now, keep the date in your diary. If you have any questions or suggestions, please don't hesitate to contact us kathen@bas.ac.uk and sarah.reynolds@port.ac.uk.

13th-14th September 2023: Challenger Deep-Sea Ecosystems SIG Lowestoft, UK

The Deep-Sea Ecosystems Special Interest Group (SIG), www.challenger-society.org.uk/

ISSN 0306-7335

[DeepSea_Ecosystems](#), is hosting a meeting at Cefas, Pakefield Rd, Lowestoft. Some sessions will also be available online via MS Teams but registration is still required. The meeting convenors are Prof. Kerry Howell (Plymouth University, kerry.howell@plymouth.ac.uk), chair of the DSE-SIG, and Dr James Bell (Cefas, james.bell@cefas.gov.uk). Attendance is free and refreshments will be provided. Attendees are otherwise fully responsible for their travel and subsistence costs. Please register for the meeting at www.challenger-society.org.uk/DeepSea_Ecosystems.

13th-20th September 2023: Biodiversity, Ecology, and the Biological Carbon Pump in the Ocean Twilight Zone, a sustainable future in the face of human exploitation and climate change.

Woods Hole, USA

Woods Hole Oceanographic Institution will be hosting this international mesopelagic conference in collaboration with JETZON. There will be two main plenary sessions.

Session 1 will focus on how we determine biomass in the mesopelagic, looking at the architecture of mesopelagic food webs, and understanding diel vertical migration.

1. What is the biomass and distribution of the mesopelagic: how do we know ? Who are the major contributors to biomass ? How is biomass distributed ?
2. Diel vertical migration and biodiversity: who's migrating, how often, how does this change seasonally, annually ?
3. Food web architecture: what fuels the mesopelagic biomass, how are the epipelagic and mesopelagic connected, what are the predator prey relationships ?

Session 2 will focus on the biological carbon pump, seeking to establish a benchmark figure for its magnitude now and to understand how it may change in the future.

4. How large are the fluxes due to gravitational sinking and how well do we understand its drivers to predict their future magnitude ?
5. How significant is the transport of organic carbon to depth due to the physical circulation and how will anticipated changes in properties such as stratification affect this?

6. How significant are the carbon fluxes associated with the vertical migration of organisms and how will these respond to changes in temperature and oxygen ?
7. What biogeochemical constraints are there on the magnitude of the biological carbon pump and what do they tell us about its future strength ?

This conference is possible through the generous support from WHOI's Ocean Twilight Zone project, the NERC CUSTARD project, and the Grantham Foundation. Registration closed on June 1st, but please email kbates@whoi.edu to be added to an email list for virtual participation. For conference details, visit twilightzone.whoi.edu/otz-symposium/.

2nd-5th October 2023: 5th Euro-Mediterranean conference for Environmental Integration

Rende (Cosenza), Italy

The editorial office of the Euro-Mediterranean Journal for Environmental Integration, www.springer.com/journal/41207, in collaboration with the University of Calabria (UNICAL), www.unical.it/?lang=en, organizes this year's the EMCEI. On this occasion, we are pleased to invite you to take part in the conference (in person or virtually) and share/discuss your latest research findings from various fields of environmental sciences. Visit our website, www.emcei.net, to learn more about the event.

The MedGU Annual Meeting is one of the largest international geoscience meetings in the Mediterranean region. It aims to provide a forum where geoscientists, especially early career researchers, present and discuss their findings with experts in all fields of geosciences. It will feature talks and panels covering a diverse range of geoscience and geoscience-society topics.

The EMCEI series is one of the largest international gatherings of environmental science in the Mediterranean (400-500 participants). The EMCEI aims to provide a forum where scientists, especially early career researchers, can present their findings and discuss their ideas with experts in all fields of environmental sciences. Contact us, if you need more information: contact@emcei.net.

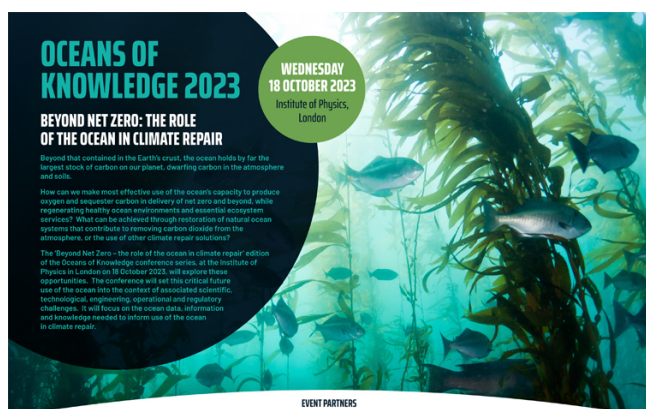
18th October 2023: Oceans of Knowledge 2023. Beyond Net Zero: The role of the ocean in climate repair

London, UK

Beyond that contained in the Earth's crust, the ocean holds by far the largest stock of carbon on our planet, dwarfing carbon in the atmosphere and soils.

How can we make most effective use of the ocean's capacity to produce oxygen and sequester carbon in delivery of net zero and beyond, while regenerating healthy ocean environments and essential ecosystem services? What can be achieved through restoration of natural ocean systems that contribute to removing carbon dioxide from the atmosphere, or the use of other climate repair solutions?

The 'Beyond Net Zero – the role of the ocean in climate repair' edition of the Oceans of Knowledge conference series, at the Institute of Physics in London on Wednesday the 18th October 2023, will explore these opportunities.



The conference will set this critical future use of the ocean into the context of associated scientific, technological, engineering, operational and regulatory challenges. It will focus on the ocean data, information and knowledge needed to inform the use of the ocean in climate repair. For more information, registration and the current programme, visit www.imarest.org/events/category/categories/imarest-event/oceans-of-knowledge-2023.

19th-22nd October 2023: Arctic Circle Assembly 2023

Reykjavik, Iceland

Breaking previous records, over 280 session

www.challenger-society.org

proposals have been received and hundreds of speakers have already confirmed from more than 27 countries. Attended by more than 2000 participants from over 60 countries last time, the Assembly is the largest international gathering on Arctic, Climate, Energy, Oceans, Geopolitics and more. Registration is now open, www.arcticcircle.org/assemblies/2023-assembly-registration, and help finding hotel accommodation is available, www.arcticcircle.org/hotels. For more information and booking activities, visit www.arcticcircle.org/.

7th November 2023: Beyond the Ocean's Depths: Revisiting the Challenger Expedition

Revisiting the Challenger Expedition (1872-1876) Interdisciplinary Conference,

www.rmg.co.uk/whats-on/national-maritime-museum/beyond-oceans-depths-revisiting-challenger-expedition-1872-1876. This event is in

part sponsored by the Challenger Society for Marine Science and the UCL Department of Science and Technology Studies, www.ucl.ac.uk/sts/science-and-technology-studies.

With the environmental threat of global warming, rising seas and biodiversity loss, knowledge of the ocean is more important than ever. The Challenger Expedition, www.rmg.co.uk/stories/topics/hms-challenger-expedition-oceanography-trailblazer, named after the British Royal Navy vessel *HMS Challenger* which circumnavigated the globe from 1872 to 1876 with the aim to explore the deep sea, has been celebrated as a foundational moment in the history of modern oceanography. Data and specimens obtained from the expedition are actively studied by scientists today, and provide a historical benchmark for climate change and species distribution. Meanwhile, historians are increasingly calling for the voyage's imperial context to be recognised, and are bringing attention to people and places that have previously been given little attention in the expedition's historiography. How do we tell more inclusive and holistic histories of *Challenger*, while engaging with its scientific importance today? Looking forwards, what can we learn from the past while considering the future of ocean science?

'Beyond the Ocean's Depths' will provide a welcoming interdisciplinary forum for historians, scientists, museum curators, and coastal and

island communities to share ideas and their work. The day will bring together a variety of perspectives, and resources. Papers are encouraged on a range of topics related to *Challenger*, 19th-century ocean science and voyages of exploration in a broad sense, especially:

- The use of *Challenger* materials in modern scientific research
- *Challenger*-related objects in museum collections
- Public engagement and education
- Colonial legacies
- Untold histories
- Local knowledge and expertise
- Links between oceanography past, present and future

This one-day conference will be held in person at the National Maritime Museum, Greenwich and online. It will consist of four panels, each consisting of three 15-minute papers and a Q&A, and a guided visit to the Caird Library, www.rmg.co.uk/collections/caird-library, to view *Challenger* archives, photographs and ship plans. We will also have a keynote talk and time to view relevant gallery spaces. If you have any queries, please contact the organisers at research@rmg.co.uk.

7th-9th November 2023: The Nansen Legacy symposium, Towards a new Arctic Ocean – Past, Present, Future

Tromsø, Norway

During this science conference, www.nansen-legacy-symposium.com, the current understanding of the Arctic Ocean across disciplines and regions will be presented and discussed. In the mornings we will have plenary sessions with invited key-note presentations, dedicated presentations on the use of science for societal needs, and panel discussions to stimulate interdisciplinary discussion and involve user perspectives.

During the afternoons, we welcome the pan-Arctic research community across the natural science disciplines, and stakeholder representatives interested in knowledge status and future perspectives, to contribute to a vibrant symposium to build bridges across disciplines, regions, and from natural sciences to societal needs.

Details about registration are here: <https://>

www.nansenlegacy-symposium.com/registration/
Feel free to also check out the program overview <https://www.nansenlegacy-symposium.com/program/program-overview/> (more details will be added soon) and our compilation of practical details <https://www.nansenlegacy-symposium.com/practicalities/>.

15th-17th November 2023: The 11th Annual World Congress of Ocean

Sapporo, Hokkaido, Japan

Following the success of the previous events, we are honored to launch The 11th Annual World Congress of Ocean-2023 (WCO-2023). WCO-2023 is intended to provide a platform for professionals around the world to exchange state-of-the-art research and development and identify research needs and opportunities in the field of the Oceans. It covers a wide range of topics related to Ocean Economy, Maritime Law, Ocean Engineering, Ocean Energy, Green Port, Shipping and Modern Shipbuilding, Marine Management and Environment Protection, Ocean Science, etc. Over the conference period, you will have opportunities to share information and come face to face with business leaders, academic researchers and government agents around the world. It serves as a great opportunity to find global partners and build up research and business relations.

The three-day conference has an effective series of activities such as plenary lectures, parallel symposiums, oral communications and lively poster sessions etc. Currently Programmed activities at a glance include:

- Opening Ceremony and Keynote Forum
- Track 1: Ocean Economy and Finance
- Track 2: Maritime Law
- Track 3: Coastal and Ocean Engineering
- Track 4: Ocean Energy Development and Utilization
- Track 5: Emerging Ocean Science and Technology
- Track 6: Marine Management and Environment Protection
- Track 7: Smart Port, Green Shipping & Shipbuilding
- Track 8: Marine Biotechnology
- Track 9: Aquaculture and Fisheries

Sapporo, the capital of Hokkaido, Japan's northernmost island, draws international visitors for its annual Snow Festival and its world-famous

ramen. Those seeking out the full diversity of Japanese cuisine will want to visit: a city with a ramen-inspired theme park is one that embraces and pampers foodies. For more information about the conference, please visit www.bitcongress.com/wco-2023/default.asp.

27th-30th November 2023: 3rd Mediterranean Geosciences Union annual meeting

Istanbul, Turkey

The annual meeting of the Mediterranean Geosciences Union, association.medgu.org/, will be held this year at the Congress Center of Istanbul Technical University. Visit our website, www.medgu.org, to learn more about the event.

The MedGU Annual Meeting is one of the largest international geoscience meetings in the Mediterranean region. It aims to provide a forum where geoscientists, especially early career researchers, can present and discuss their findings with experts in all fields of geosciences. It will feature talks and panels covering a diverse range of geoscience and geoscience-society topics. Contact us, if you need more information, contact@medgu.org.

5th-7th December 2023: MASTS Annual Science Meeting (ASM), Science, Sustainability and Society – valuing and protecting our marine systems

Glasgow, Scotland

Join us as we celebrate our thirteenth annual conference in-person at the Technology & Innovation Centre, University of Strathclyde, Glasgow. The Marine Alliance for Science and Technology Scotland (MASTS) Annual Science Meeting is a cross-disciplinary event that brings together members of the marine science community, with the aim of promoting and communicating research excellence and forging new scientific collaborations. Early bird registration will open in September.

The first two days will bring together expert plenary speakers and contributed talks, panel sessions and posters outlining the latest research and management practices that address key topics related to marine science and management in the face of global climate change. Alongside our general science sessions, the event will include special topic sessions, and plenty of opportunity to enjoy networking with your peers and making new contacts. The first day will also host the annual “Decommissioning

& Wreck Removal” workshop. The third day will be devoted to workshops and we already have some confirmed (more details soon).

Abstracts for talks and posters are now invited for our general science sessions or one of our special sessions. Talks will be followed by a live group Q&A session within which all the speakers will be panel members. All presenters are encouraged to not solely focus on past and current research but reflect on gaps in knowledge and future research directions. Talks should be accessible to other disciplines, by avoiding jargon and keeping technical details simple.

Abstracts are invited for sessions on:

- General Science sessions (any field of study related to marine science)
- Multiple Aquatic Stressors
- Artificial Intelligence
- Deep Sea
- Climate Change
- eDNA
- Blue Carbon

The deadline for abstract submission is 16.00 on Friday 8th September 2023. For further details about the sessions and the abstract submission template, please visit our dedicated webpage, masts.ac.uk/annual-science-meeting/. Don't forget to stay up to date on the ASM by following us on Twitter, www.twitter.com/mastscot, or LinkedIn, www.linkedin.com/company/masts-scotland, #MASTSasm2023. If you would like to get involved or have a query about the ASM, please drop us an email, masts@st-andrews.ac.uk. We would love to hear from you if you would like an exhibit space at the ASM. Finally, it may be worth booking accommodation now. It's a busy month in Glasgow and places get booked up quickly.

12th-14th March 2024: Oceanology International 2024

London, UK

Build your personal and corporate brand. Be a speaker at Oi 2024. We're delighted to let you know that the Call-for-Papers for Oceanology International is open for you to submit your abstracts. Use this link, www.oceanologyinternational.com/london/en-gb/landing-pages/call-for-papers.html, to discover more. If you, or someone else in your company has a paper, research, or case study to

share, then Oi is the ideal stage for you. The Call-for-Papers closes on the 12th, Sept and all applicants will be notified on the 10th October whether their talk has been accepted.



Topics on the agenda for 2024 include:

- Asset Integrity & Monitoring
- Coastal Zone & Shallow Water
- Data Interpretation & Ai
- Hydrography, Geophysics & Geotechnics
- Marine Pollution Mitigation & Environmental Stressors

Plus, many more. Oceanology International is one of the largest ocean tech, science, and engineering conferences globally. “Speaking at Oi provides you with a perfect platform to connect with new and exclusive contacts, it’s like a VIP pass to your part of the ocean science and technology community.”, Dr. Ralph Rayner, Conference Chairman.

26th March 2024: ASSW 2024 Science Day *Edinburgh, Scotland*

The Arctic Science Summit Week (ASSW) 2024 Science Day will be held at the Dynamic Earth, www.dynamicearth.co.uk/. The day’s theme of “Arctic Coasts” encompasses all International Arctic Science Committee (IASC) Working Group areas, iasc.info/our-work/working-groups.



There will be a mixture of invited talks on the day’s theme from each working group, panel discussions on net zero arctic research aspirations and on effects of arctic environmental change on coastal communities, and a public

facing Keynote presentation. Abstract submission for poster presentations will be open to all ASSW attendees.

“Our Dynamic Earth” is a public facing science centre focussed on the natural history of planet Earth. Alongside the IASC working group talks and panel discussions, there will be public displays related to scientific community research activities in the Arctic. We invite ASSW participants to get in touch with the local organising committee about bringing their displays to this space, assw.info/program/science-day-2024.

10th-12th April 2024: UN Ocean Decade Conference

Barcelona, Spain

Three years after the start of the UN Decade of Ocean Science for Sustainable Development (2021-2030), oceansdecade.org/, a global conference will bring together the Ocean Decade community and partners to celebrate achievements and set joint priorities for the future of the Decade. Hosted by Spain and co-organized with UNESCO’s Intergovernmental Oceanographic Commission (IOC/UNESCO), it will be a 3 day, in-person event co-led with a range of partners: Government of Catalonia and the Barcelona City Council through the Barcelona Capital Náutica Foundation, and the Spanish National Ocean Decade Committee, which is led by the Ministry of Science and Innovation through the Spanish Research Council (CSIC).



The conference will be a key moment for governments, leaders, maritime sectors, philanthropy, universities, private sector, NGOs and more, to take stock of the achievements of the first three years of the Ocean Decade and define a collective vision for the coming years. Participants will benefit from concrete examples and best practices in ocean science to deliver

“the science we need for the ocean we want”. A key outcome of the 2024 UN Ocean Decade Conference will be the publication of a set of white papers related to the 10 Decade Challenges, oceansdecade.org/challenges/, that will identify future priorities for the Ocean Decade to generate the knowledge needed for science-based solutions related to global challenges, such as climate change, food security, biodiversity conservation, sustainable ocean economy, pollution and natural hazards.

off-site Satellite Events will be organized in a variety of locations around Barcelona starting from 8th April. To learn more about Satellite Events and to submit your application, please visit oceansdecade-conference.com/satellite-events.php. Deadline for submission is 30th October 2023.

To provide partners with the opportunity to present their activities, foster knowledge-sharing and strengthen collaboration, a small number of booths will also be available at the Conference venue. Stay tuned for information on calls for posters and for presentations during the parallel sessions. If you would like to receive updates, please sign up here, www.surveymonkey.com/r/OceanDecade24_updates. For more information, please contact the Ocean Decade Team at oceansdecade@unesco.org.

14th-19th April 2024: EGU General Assembly 2024

Vienna, Austria

The EGU hereby invite you to take an active part in organizing the scientific programme of the conference, from now until the 14th September 2023, by suggesting sessions with conveners and a description in your preferred programme group, meetingorganizer.copernicus.org/EGU24/provisionalprogramme. Prior to suggesting a session, we strongly encourage you to review the guidelines. Please check with all conveners that they agree to take part in the proposed session and refer to the convener guidelines and rules for detailed information of what to expect.

Please find convener guidelines and rules at egu24.eu/guidelines/conveners.html, education & outreach session guidelines at www.egu24.eu/guidelines/eos.html, inter- and transdisciplinary session guidelines at www.egu24.eu/guidelines/its.html, union symposia and great debate guidelines at www.egu24.eu/guidelines/us_and_gdb.html, and short course guidelines at www.egu24.eu/guidelines/sc.html.

We create a new programme every year, and the programme groups therefore do not show sessions from last year. This means that all session proposals need to be submitted even if similar sessions were run in previous years. When making suggestions, explore the programme groups and place your proposal only into the PG that is most closely aligned with the proposed session's subject area. Please avoid



A number of related high-level national and international events will take place before and after the main conference and there will also be scope for partners to propose and lead side events, exhibitions and networking events relevant to the conference themes on the days before the conference and in the sidelines of the conference itself.

Registration for the 2024 Ocean Decade Conference will take place in two steps:

- Pre-registration which will be open from 8 June to 30 September 2023.
- Full registration which will take place from 30 September to 30 October 2023.

To pre-register for the 2024 Ocean Decade Conference, visit oceansdecade-conference.com/registration.php. Deadline for pre-registration is 30th September 2023.

On-site Satellite Events will take place at the Conference venue on 10th-12th April 2024 during the lunch breaks of the Conference, while

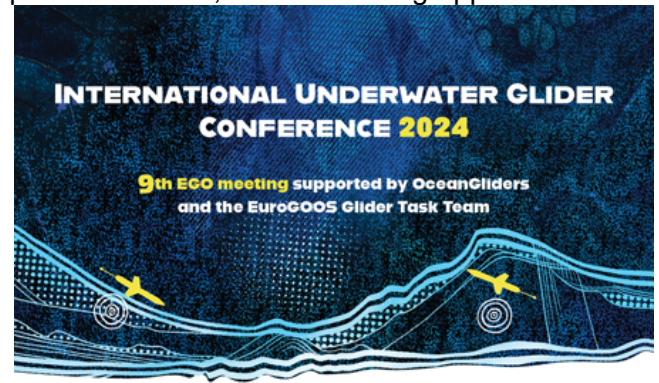
submitting session proposals that are similar to sessions already suggested. In this case, it is possible to suggest modifications to an earlier session proposal. If the subject area of your proposal is strongly aligned with two or more PGs, it is possible to request a co-organization between PGs. You will be able to indicate PGs that you believe should be approached for co-organization in the session submission form. However, you can only put your session proposal into one lead PG.

The programme committee will take into account all suggested sessions and use them to compile the final session programme as the basis for the call-for-abstracts. Then, conveners of approved sessions will be asked to actively promote their sessions and the public will be invited to submit their abstracts. This will be announced by a separate email. If you have questions about the appropriateness of a specific session topic, you may contact the programme group chair and/or the officers of the specific programme group, www.egu24.eu/about/programme_committee_composition.html.

10th-14th June 2024: The 9th EGO meeting International Underwater Glider Conference Gothenburg, Sweden

The International Underwater Glider Conference aims to bring together leading researchers, innovators, and experts from around the globe to exchange knowledge, share discoveries, and foster collaborations in the exciting realm of underwater gliders. The conference promises to be an engaging platform for sharing insights, addressing challenges, and shaping the future of

this field. We plan for presentations, workshops, poster sessions, and networking opportunities.



SAVE THE DATE

We are excited to announce that we will be part of hosting the next International Underwater Glider Conference.

 **Gothenburg, Sweden**
June 10 - 14 / 2024

- ▶ Registration form to be sent out separately
- ▶ Call for abstract open on **September 2023**



Got excited by:

- Cutting edge science
- Plenary, workshops, and training sessions
- Scientists and industry gathered in one place

If you have any questions, don't hesitate to contact:
louise.biddle@voiceoftheocean.org -or- vturpin@ocean-ops.org



The planning team will return to you with event registration, hotel suggestions, and more information about financial support during the coming months. In the meantime, I encourage you to mark the dates in your calendar.

The CSMS email address is challenger.society@gmail.com. Contributions for next month's edition of Challenger Wave should be sent to: john@myocean.co.uk by the 31st August.

JOBS and OPPORTUNITIES

There are jobs on the IMBER web site

<http://www.imber.info>



Integrated Marine Biosphere Research

Jobs and opportunities

New

- Call for nominations: Transdisciplinarity for Early Career Researchers in Asia School (TERRA School), 13-17 November 2023, Research Institute for Humanity and Nature, Kyoto, Japan. Apply by **29 August**
- Open grant call: Marine Debris Foundation. Submit by **31 August**
- MPhil: Public engagement with science, CREST, Stellenbosch University, Stellenbosch, South Africa. Apply by **31 August**
- 5 Postdoc Fellowships: Climate change, Smithsonian, USA. Apply by **31 August**
- 2-5 Postdoc Fellowships: Environmental justice Smithsonian, USA. Apply by **31 August**
- 5 Postdoc and 2 Ocean Nexus-STRI Fellowships: Resilience and sustainability science, Smithsonian. Apply by **31 August**
- MSc: Applied Ocean Sciences, University of Cape Town, Cape Town, South Africa. Apply by **30 September**
- Trevor Platt Fellowship 2024: Biological oceanography research, PML, Plymouth, UK Apply by **15 December**

In case you missed it...

- Continuous open call for proposals: AQUAEXCEL3.0 transnational access program for young European researchers
- Call for applications: Future for Nature Foundation Awards 2024. Apply by **25 August**
- Project Manager: Marine Science, ICM-CSIC, Barcelona, Spain. Apply by **1 September**
- Save the date: Call for applications for Azrieli International Postdoc Fellowships in Israel opens on **1 September**
- Call for proposals: MSCA Marine Science Postdoc Fellowships 2023. Apply by **13 September**

imber@imr.no