May 2023

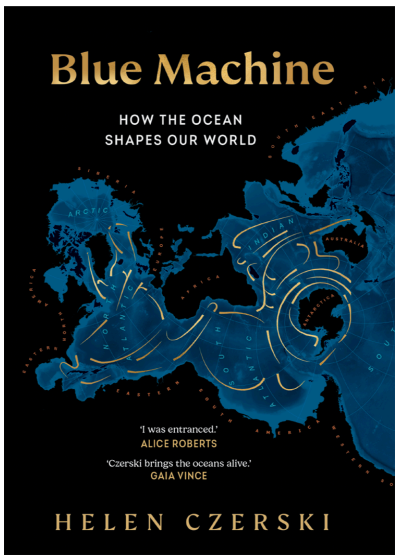
Challenger Wave

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

NEWS

Citizen of an Ocean Planet

The 1st June is the publication day for a new popular science book on the ocean called Blue Machine. Physicist and oceanographer Helen Czerski (a member of the Challenger Society) dives deep to illuminate the murky depths of the ocean engine, examining the messengers, passengers and voyagers that live in it, travel over it, and survive because of it. From the ancient Polynesians who navigated the Pacific by reading the waves to permanent residents of the deep such as the Greenland shark that can live for hundreds of years, she explains the vast currents, invisible ocean walls and underwater waterfalls that all have their place in the ocean's complex, interlinked system.



Blue Machine is unusual in being about the water itself, rather than what it carries; tales of the ocean normally focus on fish, pollution, whales or food, and it's time to expand that narrative. Coming just in time for World Ocean Day, the book presents a timely and fresh perspective on what it means to be a citizen of an ocean planet, and ends with a challenge: what sort of citizen do we choose to be ? The book has already received rave reviews, including being chosen as The Bookseller's Book of the Month in March.

Ship emissions: New study shows scope for 'faster, better, cheaper' monitoring

A new paper, doi.org/10.3390/atmos14030500, led by Plymouth Marine Laboratory with partners at **e**xactEarth Europe Ltd, spire.com/maritime/, and TNO, www.tno.nl/en/sustainable/sustainable-traffic-transport/, has highlighted possible solutions to help improve ship emission compliance and attribution.

A number of new regulations have been implemented by the International Maritime Organisation (IMO), www.imo.org/, over the last decade following global concerns over air quality. Emissions of sulphur dioxide (SO_2) and nitrogen oxides (NO_x) from ships have been limited in 'emission control areas', where areas of high shipping activity are in close proximity to coastal regions with high populations, such as northwest Europe and the eastern seaboard of the USA. Any legislation needs to have a robust and rigorous monitoring programme to ensure compliance and prove attribution to individual vessels. Current compliance is measured by inspection of logbooks and fuel samples taken in port, which is time-consuming and costly. Some innovative techniques, such as 'sniffer' drones, are being trialled but are unlikely to meet the scale of coverage needed and in-port inspections are still needed to meet legislative compliance standards.

As the global population and ship-based trade increases, without enforceable regulations, the impact of SO_2 and NO_x pollution is expected to be exacerbated further. SO_2 is linked with several adverse health effects and poses a particularly high risk to children, the elderly and

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those with respiratory issues, such as asthmatics. Likewise, NO_x can cause breathing issues, as well as headaches and also irritation to the skin and eyes.

In order to meet the challenge of global compliance and identification, the ship emission monitoring network needs to expand significantly so it has the capacity to cover all locations where there is shipping activity, around the clock. However there are clear obstacles to achieving full coverage: prohibitive expense and technical capability. The team's recommended concept builds on two widely accessible technologies of low-cost portable gas analysers, designed to measure automobile engine exhausts, and satellite based Automatic Identification Systems (S-AIS). By combining these technologies with devices that already transmit ship locational data via S-AIS, the approach has the potential to cover 100% of the global ocean whilst also being able to attribute emissions to individual ships in real-time.

Lead author and PML's Head of Science for Marine Biogeochemistry and Observations, Dr Tim Smyth, www.pml.ac.uk/People/Dr-Tim-Smyth, commented: "By utilising the additional data carrying capacity of on-board satellite automatic identification systems (S-AIS), we demonstrated all three facets of faster, better and cheaper for emissions monitoring. Faster with the real-time reporting of data, with message rates of 4–10 per hour even in radio frequency congested regions such as the Baltic and English Channel. Better in that the emissions are measured at source within the stack of a vessel, and that those emissions can be uniquely identifiable by a ship's Maritime Mobile Service Identity (MMSI); and cheaper in that the emissions sensors, together with the S-AIS telemetry system, maintenance and other costs, are in the order of 100–1000 EUR (whereas previous approaches to this either rely on expensive scientific laboratory grade equipment, monitoring stations over bridges, or drones)."

Tim continued, "We argue that our approach is suitable for the IMO and national regulatory authorities solving the atmospheric shipping emission compliance and attribution conundrum."

The work was funded by the European Union's Horizon 2020 research and innovation programme, research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-2020_en, under grant agreement Nr. 814893, Shipping Contributions to Inland Pollution Push for the Enforcement of Regulations (SCIPPER).

Call for Expressions of Intent: Schmidt Futures Ocean Biogeochemistry Virtual Institute

Schmidt Futures, www.schmidtfutures.com/, the philanthropic initiative founded by Eric and Wendy Schmidt, are pleased to announce the Ocean Biogeochemistry Virtual institute (OBVI), www.schmidtfutures.com/our-work/obvi/. OBVI aims to accelerate society's response to climate change by tackling some of the most challenging data and modeling problems in ocean biogeochemistry research.

OBVI is seeking short Expressions of Intent (EOI) for research projects that advance understanding and predictions of the ocean carbon cycle and resilience of marine ecosystems by innovating in the following areas:

- Integrated Ocean Observation and Modeling: addressing critical gaps in data and theory at new study sites and/or study sites with pre-existing foundational knowledge that can be built on in novel directions through integrated observing and modeling efforts. Projects may focus on processes involved in ocean carbon cycling and/or marine ecosystems to move a capacity for state estimation and prediction forward across multiple systems and scales.

- Ocean Data Synthesis: synthesizing diverse data streams in ocean biogeochemistry. Projects may focus on building computational workflows, establishing collaborative, flexible frameworks for data synthesis, facilitating development of software platforms or tools in order to gain new insights, advancing sophisticated process representation or model frameworks, identifying/prioritizing data gaps and needs, or facilitating efficient and

ISSN 0306-7335

effective use of ocean data in regional and global models.

OBVI will convene an international team of carefully selected scientific and technical talent to carry out complementary research projects, operating in an integrated manner to tackle technological, cultural, and logistical challenges that are pervasive in this field. At this time, we are requesting EOIs from teams of researchers or consortia interested in pursuing high impact, high risk ideas over a 5-year timeframe. Some teams will be invited to submit full proposals for evaluation later this year. Project budgets are intended to be approximately up to USD 10 million distributed over a 5-year period.

OBVI will maximize opportunities to support ocean observing and data collection as part of these high-quality interdisciplinary research projects by collaborating with the Schmidt Ocean Institute (SOI), schmidtocean.org/, a private non-profit operating foundation established by Eric and Wendy Schmidt.

EOIs are due by 11:59 pm EDT on 1st June 2023. Additional information and submission details can be found on the Schmidt Futures website, www.schmidtfutures.com/our-work/obvi/. We encourage you to share this EOI call with anyone in your network that it might be of interest to, and/or to recommend any individuals or consortia that we should forward it to directly. Thank you in advance. If you have any questions, please do not hesitate to let us know at obvi@schmidtfutures.com.

Projections show that the seas of Southeast Asia may warm by 1.1 to 2.9 °C through the 21st century

New modelling projections show that the seas of Southeast Asia may warm by 1.1 to 2.9°C through the 21st century, with reduced oxygen levels and many other environmental changes that could cause stress for marine life, doi.org/10.3389/fmars.2023.1082170. The changes are expected to reach all parts of the water column and could have serious implications for habitats such as coral reefs, which are important nursery grounds and places of refuge for marine creatures. In addition, altered species distribution driven by these changes would have consequences for biodiversity, the livelihoods of small-scale fishers and the food security of coastal communities. The study, undertaken as part of the Global Challenges Research Fund (GCRF) Blue Communities Research Programme and led by Plymouth Marine Laboratory, covered four sensitive coastal sites of key importance for biodiversity and sustainable development: UNESCO Biosphere Reserves at Cu Lao Cham-Hoi An (Vietnam), Palawan (Philippines) and Taka Bonerate-Kepulauan Selayar (Indonesia), and the coastal waters of Sabah (Malaysia), which include several marine parks.

The seas of Southeast Asia are home to some of the world's most diverse ecosystems and resources that support the life and livelihoods of millions of people. In some Southeast Asian countries, the ocean economy can account for 15-20% of total GDP but the region as a whole is particularly vulnerable to the effects of marine climate change, with large populations living in coastal areas and relying heavily on marine resources and marine ecosystem services.

Climate change will bring temperature changes, acidification, deoxygenation, sea-level rise and other environmental changes with uncertain consequences for human and natural systems, which is of particularly relevance to the tropics as changes here are likely to exceed natural variability first. Even so, there has been little regional-scale climate modelling of the marine ecosystem in this area of the world, which could help us to gain a better understanding of how these changes may impact the environment and wider society. Projections of the type presented in this study serve as a key tool for communities, policymakers and regulators to help develop adaptation strategies to address the challenges bought on by climate change, whilst still allowing for sustainable development in the region.

The team focused the modelling on a mid-range greenhouse gas scenario (RCP4.5), under which atmospheric carbon dioxide concentration rises until mid-century and then stabilizes, and a high-range scenario (RCP8.5), with concentrations rising throughout the 21st century. The projections were created using the Proudman Oceanographic Laboratory Coastal Ocean Modelling System (POLCOMS) coupled to the European Regional Seas Ecosystem Model (ERSEM). Together, these simulate the movement of water, energy and dissolved and suspended material through the sea and the cycling of nutrients and carbon through the

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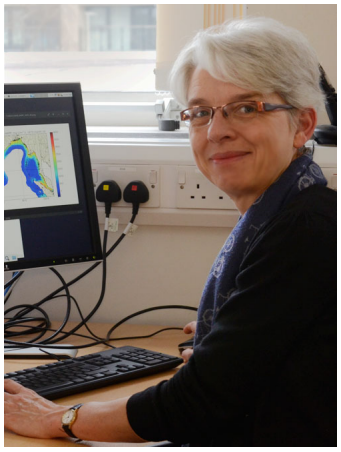
marine ecosystem.

The modelled results showed that sea surface temperatures could rise by 1 to 1.5°C by mid-century and 2 to 3°C by end of the century under RCP8.5, when compared to sampling datasets from 2000-2019. Smaller increases were projected under RCP4.5, with mid-century increasing by 0.5 to 1°C and end of the century by 1 to 1.5°C. These results imply that temperatures that were average for the region in 2000-2019 would occur only in the very far north by the end of the century under RCP8.5. Change under RCP4.5 was smaller but still showing end of the century conditions similar to those at mid-century under RCP8.5.

Increased temperature and reduced salinity, as seen in these projections, may also result in a higher frequency of harmful algal blooms (HABs). The consequences of such HAB events include reduced water quality and toxin build-up in fish and shellfish, with potential impacts for human health and food security. Changes in the biological system (plankton biomass, primary production) are projected to be smaller than in physical and chemical conditions but are still significant in some places, especially for the more extreme RCP8.5 scenario.

Dr Susan Kay, www.pml.ac.uk/People/Dr-Susan-Kay**,** lead author on the study, Work Package Leader on Blue Communities and Numerical Modeller at Plymouth Marine Laboratory, commented: "The model outputs showed considerable variation between the different sample areas, emphasising the value of and need for dedicated regional ecosystem modelling that can effectively incorporate different spatial scales, water dynamics and biogeochemical processes. Examples of such differences include tidal mixing, river inputs, the interaction of multiple plankton types and supply or shortage of a range of nutrients."



Dr Amy Then, co-author, Work Package Leader on Blue Communities and Senior Lecturer at the University of Malaya, said: "Warming waters mean that by the end of this century some parts of our Southeast Asian seas may experience average temperatures not seen in the region at present. Fish and other animals that live at or near the sea floor are particularly likely to experience conditions of temperature, oxygen and pH outside the current range of variability, to which they may not be adapted. It is critical to understand the potential changes and what they may mean for our marine environment and the millions of people that depend on healthy, diverse and productive seas."

The paper also suggests direction for future research in this area, such as using a range of global models and regional models with different biogeochemical components to provide more definitive confidence levels. A further aspect of regional modelling that would benefit from additional attention is future changes in storminess. This is of high concern for people in the region especially considering that climate change may result in increased intensity and frequency of typhoons and flooding in SE Asia; but further research is needed.

Call for Grímsson Fellows now open

Grímsson Fellowships are open to scientists, researchers, experts, scholars and writers of any nationality. The fellows are invited to stay in the House of Grímur in the historic town of Ísafjörður, the capital of the beautiful Westfjords region in Iceland. In addition to the free stay, the Fellowship includes travel to and from Iceland, as well as a stipend contribution towards living cost.

The Grímsson Fellowship program will appoint annually 2-4 fellows in order to encourage research and writing in an idyllic space close to the Arctic. The aim is to promote cooperation and knowledge as well as relations between international and Icelandic communities. The Fellowship will be open to candidates in the fields of Climate Change, Environment, Social Sciences, Natural Sciences, Health Sciences, Oceans, Sustainability, Clean Energy, the Arctic, History, as well as Literature.

The program offers a 2-6 weeks stay in *Grímshús*, the House of Grímur, where President Ólafur Ragnar Grímsson was born and his family lived. President Grímsson now owns the apartment which will house the fellows and has made it available for the program. In addition to

ISSN 0306-7335

living in this splendid old house which offers excellent working space, the fellows can have access to the Town Library in the magnificent old hospital, a one-minute walk from the House of Grímur, or in the facilities of the University Centre of the Westfjords, located further downtown. Air fare for the fellow from Icelandair's European and American destinations will be covered as well as 500 US dollars per week stipend as a contribution towards living expenses.

No obligations are attached to the Fellowship other than participating in a seminar or a dialogue or giving a lecture either at the University Center of the Westfjords or with one of the main universities in Iceland. The Fellowship was launched in November 2022 at a conference in Ísafjörður opened by Katrín Jakobsdóttir, the Prime Minister of Iceland. Among other speakers were Ólafur Ragnar Grímsson, former President of Iceland, Jón Atli Benediktsson, Rector of the University of Iceland; Ragnhildur Helgadóttir, Rector of Reykjavík University; Eyjólfur Guðmundsson, Rector of the University of Akureyri; Peter Weiss, Director at the University Center of the Westfjords along with a number of scholars and scientists from the Westfjords region.

The international program is initiated by and within the auspices of the new Ólafur Ragnar Grímsson Centre, founded in late 2021 at the instigation of the Government of Iceland to honour the international legacy of President Grímsson who is the founding father of Arctic Circle. He remains the longest-serving President of Iceland; from 1996-2016. The fellowships are based on participation by the University of Iceland, University of Akureyri, Reykjavík University, the University Centre of the Westfjords and the biotechnology company Kerecis, which originates in Ísafjörður. The office of the Fellowship is in the Arctic Circle Secretariat.

Applications for the Fellowship are now open for the period August 2023 to July 2025. In the years that follow, the Fellowship will be advertised annually. A selection committee consists of representatives of the main universities in Iceland as well as from the Ólafur Ragnar Grímsson Centre and Arctic Circle. General management of the program is in the hands of the Arctic Circle Secretariat. The deadline for the first round of applications is July 1st. Apply here, forms.monday.com/forms/7c07481f20f955d16516c52db8f6df7f?r=use1, or for further information contact secretariat@arcticcircle.org.

SAMS scientist adds voice to 'twin crises' warning

A Scottish Association for Marine Science (SAMS) scientist has co-authored a report in the influential journal Science, which calls on governments around the world to reconsider strategies to tackle the climate crisis and on-going biodiversity loss. An unprecedented and continuing loss of biodiversity has been sparked by human induced climate change, together with the intensive use and destruction of natural ecosystems, says Prof Michael Burrows, www.sams.ac.uk/people/researchers/burrows-professor-michael/, who published the report 'Overcoming the coupled climate and biodiversity crises and their societal impacts', www.science.org/doi/10.1126/science.abl4881, alongside 17 other environmental scientists from around the world.

The study estimates that human activities have altered roughly 75 percent of the land surface and 66 percent of the marine waters on our planet. As a result, today approximately 80 percent of the biomass from mammals and 50 percent of plant biomass have been lost, while more species are in danger of extinction than at any time in human history. Meanwhile, global warming and the destruction of natural habitats not only lead to biodiversity loss, but also reduce the capacity of organisms, soils and sediments to store carbon, which in turn exacerbates the climate crisis.

Prof Burrows, who last week was named on the Reuters Hot List of the world's most influential climate scientists, contributed research on marine species redistribution caused by climate change. He particularly looked at temperature limits to assess how types of marine creatures might fare in the future. He said: "Climate related

ISSN 0306-7335

changes in biodiversity will impact the ecosystems that humans rely upon for our continued existence: forestry, fishing, coastal protection, atmospheric gas concentrations are a few examples. But we have also destroyed habitats, making it more difficult for the planet to cope with these changes. What we are dealing with is twin crises, because greenhouse gases are causing warming and climate change. Additionally, our use of the land and the ocean have caused a dramatic decline in biodiversity. We investigated what would be required to cope with these twin crises over the coming century."

Prof Burrows' work has shown a dramatic shift of biodiversity from regions around the equator towards the poles, as marine life adapts or dies as the average ocean temperature rises. "From an ocean perspective, humans haven't hugely altered the marine environment, when compared with our influence on the terrestrial landscape," said Prof Burrows. "This intervention by humans on land makes redistribution more difficult for terrestrial species. Meanwhile, the more fluid and open ocean environment, where there is less habitat destruction, allows for greater connectivity and quicker range shifts as species adapt to a warming ocean. For example, it is far easier to imagine cod moving from the North Sea to the Arctic regions than it is to consider elephants moving to Europe."

To address these multiple crises, the researchers propose a combination of emissions reduction, restoration and protection measures and intelligent land-use management. This includes the protection of coastlines by maintaining coral reefs and wetlands; the restoration of at least 30 percent of land, freshwater and marine zones to prevent further biodiversity losses; and the connection of protected areas via migration corridors, hence creating a web of safe habitats around the world for animals. However, for any measures to be successful, the report authors insist that joint strategies and regular exchange between institutions and world leaders is required.

Researchers take time for science at Europe's biggest conference in the fields of Earth, planetary and space science

Just days after EGU23, www.egu23.eu/, concluded in Vienna and virtually, EGU is pleased to report that we welcomed 18,831 attendees from around the world. A total of 16,357 presentations were made during the conference week of which 57% were contributions from Early Career Scientists (ECS). This year, we encouraged attendees to take time for science, allowing for a balanced experience of the latest in geoscience, science art and communication, networking, awards and medals, jobs and careers and so on.

This message is to highlight some of the most unique and diverse parts of EGU23. From the varying composition of a single bolt of lightning, egu.eu/85RK2G/, and observations of EGU23 poster designs from geophysicist and graphic designer Fabio Crameri, egu.eu/84V02W/, to how to make your geoscience communication publishable, egu.eu/0HV1T4/, EGU23 had something to offer for everyone.

Presenting at the posters, Nomikos Skyllas tells us if changes in Arctic climate variability severely impact migratory birds, egu.eu/53SY8R/, and an international team of scientists share their findings of the Emirates Mars Mission (EMM), the first interplanetary mission by an Arab nation, egu.eu/1UWJE3/. For this and more, check out our recorded sessions now available for on-demand viewing, egu.eu/1YJSRY/. As a reminder, on-demand viewing and commenting is open until 31st May 2023.

Early Career Researcher Opportunity

An exciting opportunity for ECRs will take place in Edinburgh on Wednesday 7th June 2023. This opportunity is part of the Royal Society's Creating Connections events, royalsociety.org/topics-policy/industry-innovation/creating-connections/, a series of regional and national meetings that address the scientific and technical opportunities and challenges faced by the UK. The Ocean and Marine Science policy event, royalsociety.org/science-events-and-lectures/2023/06/creating-connections-scotland/, will bring together experts from academia, industry, and government to address scientific and technical opportunities and challenges in Scotland. The event will thus be open to applicants who are based in Scotland or whose

ISSN 0306-7335

research is relevant to the Scottish context. The one-day event will be chaired by Professor David M. Paterson, Executive Director of the Marine Alliance for Science and Technology for Scotland and will foster dialogue between industries, policy makers and early career researchers and provide a platform for ECRs to discuss how their research and science generally can better inform policy and business decision-making. If you have any questions about the event, please get in touch with resilientfutures@royalsociety.org

This event is for researchers who have already obtained their PhD and have up to 10 working years post PhD. We welcome applications from researchers whose work is related to ocean or marine science and policy, and relevant to the Scottish context, and particularly encourage applications from a wide range of disciplines including (but not limited to) arts and humanities, social sciences, marine biology, geography, environmental psychology, marine biology, and oceanography. To apply for a place, please submit your application form at the following link: https://forms.royalsociety.org/s/ZXMULD/ by Tuesday 16th May.

VIEWS

Sonardyne launches new Origin ADCPs for intelligent operations.

Sonardyne, a leading provider of underwater acoustic technology, today announced the launch of its new Origin Acoustic Doppler Current Profilers (ADCPs). The new ADCPs are designed to be simple to operate with class leading data results, integrated communications and positioning, making it ideal for a wide range of applications, including marine research, offshore renewable energy and defence.

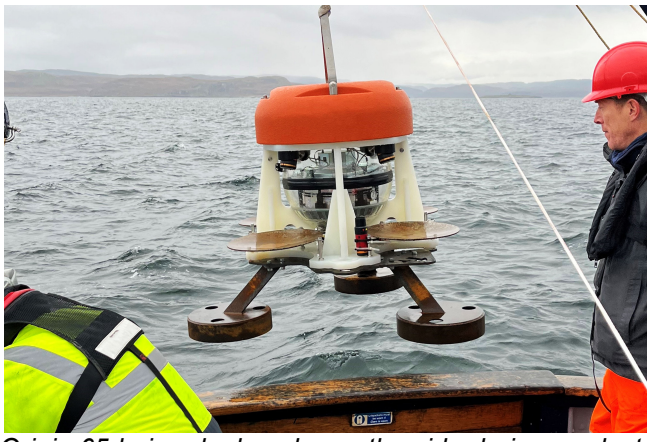
The new Origin ADCPs feature several innovations that make them the most advanced ADCPs available on the market. These include an integrated modem for communications and positioning, new Edge processing capability and ecosystem where you can write your own apps for your projects. As well as the industry standard PD0, our new and exclusive A-gram and B-gram proprietary data formats offer up to ten times greater spatial resolution producing astonishing data sets.

There are two introductions for the new Origin ADCP family:

- Origin 600 - Origin 600 has a five-beam configuration with a central vertical beam. Paired with a maximum sampling frequency of 4Hz on all beams, it's suitable for waves and turbulence applications, as well as mean currents. Combining field proven transducers with an integrated modem, internal rechargeable battery and Edge processing, Origin 600 expands ADCP capability for acquiring mid-range current profiles.

Origin 600 being deployed over the side during product trials

- Origin 65 - Origin 65 boasts a unique acoustic design that increases robustness, reduces cost, and all the while maintaining outstanding current profiling performance. The integrated modem allows for remote actions, whilst the PIES functionality delivers high-precision time-of-flight and average in-situ sound velocity data.



Origin 65 being deployed over the side during product trials

"We are excited to launch our new Origin ADCP

ISSN 0306-7335

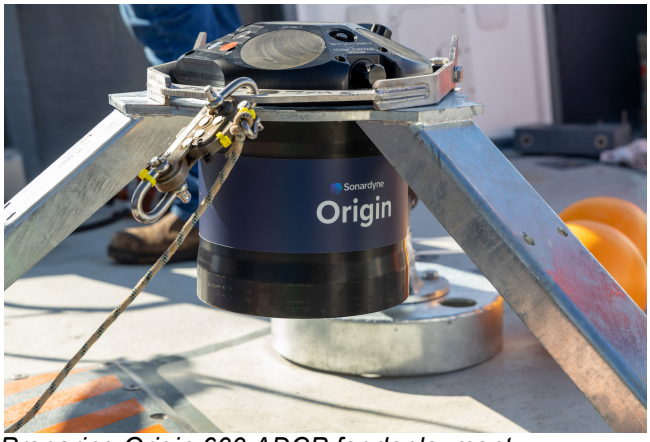
family at Ocean Business 2023," said Geraint West, Head of Science at Sonardyne. "This new product represents a significant advance in ocean current profiling technology. It will provide our customers with the highest quality data, specifically tailored to their needs, in the most challenging of environments." The new Origin ADCP is available now. For more information, please visit www.sonardyne.com/products/origin-65-adcp/ or www.sonardyne.com/products/origin-600-adcp/.

Sonardyne partners with Smart Sound Plymouth for UK's premier proving area for next-generation marine technologies

Sonardyne has been selected to provide a subsurface communications and navigation network for the Smart Sound Connect Subsurface (SSCS) Project. Sonardyne will partner with the University of Plymouth and Plymouth Marine Laboratory to install, operate and manage an underwater acoustic communications and navigation network that will link to the existing surface assets. Located in the city of Plymouth and the waters in and around Plymouth Sound, SSCS builds on the existing Smart Sound Plymouth infrastructure that underpins the National Centre for Coastal Autonomy. The £1.2 million initiative, supported by funding from the Heart of the South West Local Enterprise Partnership, will further enhance the unique proving ground for businesses to test, trial, prototype and commercialise new products and services.

During 2023, Sonardyne will provide nine navigation and communications nodes based on its 6th Generation (6G®) technology, which can be deployed on the seabed either as fixed or mobile networks. In addition, two integrated sensor nodes will be supplied to enable real-time reporting of key subsurface operational safety parameters, including water temperature and currents. Sonardyne's new Origin 600 ADCP with integrated acoustic communications and onboard Edge processing will be at the heart of these. In addition, two gateways to the subsea networks will be provided: Firstly, a Ranger 2 GyroUSBL, which can be mounted on either a crewed or uncrewed surface vessel, will act as a mobile gateway, and secondly, a Mini-Ranger 2 system, which will be mounted on the L4 buoy as a fixed gateway. Sonardyne will also be providing a comprehensive training and support package.

Geraint West, Head of Science at Sonardyne, said: "We're really excited that our technology will be heading the next chapter in Smart Sound Plymouth's evolution. We are proud members of the Plymouth maritime ecosystem, and this project is set to be a great showcase not only for our technology, but also the region as a whole."



Preparing Origin 600 ADCP for deployment

Dr Alex Nimmo-Smith, Associate Professor of Marine Physics at the University of Plymouth, said: "This initiative expands on the already unique capabilities and facilities of Smart Sound Plymouth, and creates unrivalled opportunities for research that will advance our understanding of the ocean. It will also enable us to work even more closely with businesses across the marine and maritime sector, and to use our collective knowledge to inspire the workforce of the future."

Smart Sound's aim is to accelerate the adoption and deployment of advanced marine and maritime technologies across multiple sectors, including offshore energy, aquaculture, defence, and advanced engineering. With nearly 1,000 km^2 of authorised and deconflicted water space and a unique combination of infrastructure facilities and local expertise, Smart Sound Plymouth is already one of the UK's premier maritime proving and trials facilities. SSCS will elevate its capabilities to a new level to create the first truly multi-domain connected offshore environment in the UK. Dr James Fishwick, Head of Smart Sound Plymouth, said: "Smart Sound Plymouth is central to Plymouth's ambition to be a world-leading academic and business cluster for the development of the next generation of maritime technologies in order to better understand our oceans and create new sustainable businesses. We look forward to working with Sonardyne to realise this ambition."

ISSN 0306-7335

Karl Tucker, Chair of the Heart of the South West LEP, said: "We are delighted to support the University of Plymouth and Plymouth Marine Laboratory in advancing the capabilities of Smart Sound through Sonardyne's technologies. The upgraded Smart Sound will provide even more opportunities for world-class testing and research, adding to Plymouth's unique offering as a global centre of excellence for ocean technologies including autonomous marine vessels."

RRS *Discovery* celebrates 100th anniversary and becomes the first to use Babcock's Rosyth facility

The National Oceanography Centre (NOC) is celebrating the 100th anniversary of the world class scientific research ship RRS *Discovery*'s predecessor being designated as a Royal Research Ship (RRS); while the modern RRS *Discovery* becomes the first Research Vessel to be refitted at Babcock's Rosyth facility, a mere 35 miles away from the Dundee birthplace of the original vessel, as part of the UK Government's £45 million award to maintain its flagship scientific research vessels.

To mark this 100th anniversary, the current RRS *Discovery* will also join its ancestral inspiration, the original RRS *Discovery* in Dundee from Friday the 2nd to Sunday the 4th June, where the past and present will stand in each other's presence, serving as a reminder of the UK's world leading ocean research capabilities and long-term commitment to future scientific ocean research.

RRS Discovery *arriving in Rosyth for refit. Image Credit: Brian Donovan*

During her ten years on the sea, the current RRS *Discovery* has travelled 227,554.21 nautical miles, taking part in 56 expeditions, and partnered with multiple organisations worldwide, exploring a diverse range of science topics to help better understand our oceans. To help continue to support the world-leading science undertaken by the RRS *Discovery*, Babcock's International Rosyth shipyard was recently awarded £45 million by the Natural Environment Research Council (NERC), part of UK Research and Innovation (UKRI), to maintain its fleet of scientific research vessels. These vessels include the RRS *Discovery*, RRS *James Cook*, and RRS *Sir David Attenborough*. The funding was granted to ensure that the UK's research capabilities can continue to lead the way in polar and ocean research. The three vessels are involved in some of the most demanding research across the globe, visiting polar regions and exploring the depths of tropical oceans.

As part of this investment in science, the RRS *Discovery* will be the first to undergo a refit at Babcock's Rosyth facility in Fife, Scotland. During this refit, RRS *Discovery* will be in drydock to allow the maintenance team access to clean the hull and propulsion equipment, which will help to lower fuel usage and increase overall speed making her more efficient for future expeditions. Safety checks will also be conducted by a Lloyds of London surveyor to ensure the vessel is safe to operate for another year. RRS *Discovery* will then undertake her post refit trial expedition to the North Atlantic over the course of 19 days.

Jon Short, Senior Project Manager at the National Oceanography Centre, said: "The RRS *Discovery* is not only one of the most famous research ships in the world, but she is also among the most technologically advanced of her kind. She has provided scientists around the globe with the ability to understand the ocean in a way that the scientists of the original RRS *Discovery* could only dream of. The refit in Scotland will ensure that she is ready to take on future expeditions, often in treacherous seas in order to help us further understand the mysteries of the oceans."

RRS *Discovery's* refit comes at a key time for the maritime community as it transitions towards becoming more sustainable in its operations. The NOC is committed to working with NERC to reduce the carbon impact of the research fleet and to be Net Zero by 2040. The refit will help meet that target by ensuring that RRS *Discovery*

ISSN 0306-7335

will be able to run more sustainably when on expeditions. Sean Donaldson, Managing Director, Marine Engineering and Systems at Babcock, added: "Babcock is delighted to welcome the RRS *Discovery* to Rosyth. Our team is proud to play a part in readying her for her global operations during this notable anniversary. We look forward to supporting the UK's fleet of scientific research vessels during their maintenance periods."

The RRS *James Cook,* also operated by NOC, and the RRS *Sir David Attenborough*, which is operated by the British Antarctic Survey (BAS) are both scheduled for forthcoming refits in Scotland.

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

16th–18th May 2023: 2023 Sustainable Management of UK Marine Resources (SMMR) Conference

Bristol, United Kingdom

Building on the success of our inaugural conference in 2022, this year's event will feature presentations, discussions, and workshops exploring the varied work underway in the SMMR programme, both from our funded project teams and across the SMMR Network. We invite you to register for the conference here, hopin.com/events/smmr-conference-2023.

4th-9th June 2023: ASLO Aquatic Sciences Meeting 2023, Resilience and Recovery in Aquatic Systems

Palma de Mallorca, Spain

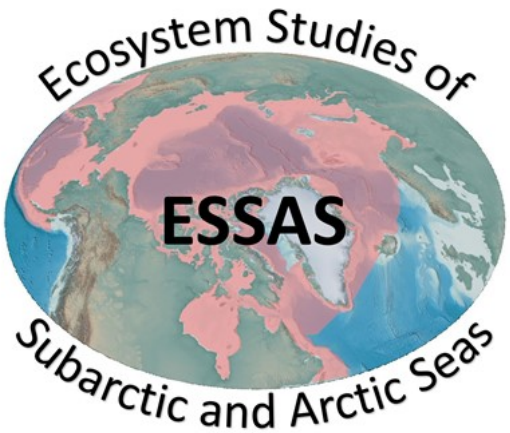
Concepts of resilience and recovery do not only apply to aquatic ecosystems but also to societies when faced with disruptions and crises. Past events have shown that adaptability and decisiveness are important keys to resilience and recovery. Disruptions are opportune moments for setting up strategies for management and recovery. Faced with the COVID-19 pandemic, ASLO meetings have adapted by transforming the ASM 2021 Palma meeting to virtual with a positive attitude that in 2023 we will recover and meet in-person. Positivity is also an important factor. We do not dwell on problems, but we try to look for solutions and get united for whatever crisis we face.

We will incorporate the theme of resilience and recovery in aquatic systems into the plenary sessions. We look forward to having a dynamic meeting. This will be an in-person meeting, beginning on Sunday with an opening plenary and reception, then conclude on Friday, with the scientific program scheduled Monday through Friday. There will be a small virtual component for those unable to travel to Spain. The programme is available at www.aslo.org/palma-2023/.

19th–22nd June 2023: Ecosystem Studies of the Subarctic and Arctic Seas (ESSAS) 2023 Annual Science Meeting

Bergen, Norway

This meeting, entitled Ecological, social and economic dynamics of high-latitude coastal systems, will be a Hybrid in-person / online meeting. Arrangements have been made for an in-person meeting for those who are able to attend, but remote attendance and presentations from anyone interested in participating are also catered for. We hope to make the hybrid conference format work as effectively as possible.



There will be a workshop on 19th June, AnalogueART – Using natural analogues to investigate the effects of climate change on

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northern ecosystems; moving from gradient to mosaic approaches.

Conference sessions include:

1. Cooperative studies of coastal ecosystems engaging local communities in the sub-Arctic and Arctic
2. Natural disasters, multiple stressors and cumulative impacts along sub-arctic and arctic coasts
3. Blue Carbon, mariculture and climate change mitigation and adaptation in the Subarctic and Arctic
4. Cod and climate change at the coastal interface

For more information, please visit the web page at essas.arc.hokudai.ac.jp/what_s_new/2023-essas-annual-science-meeting-in-bergen-norway/.

26th–30th June 2023: MARE Conference People & the Sea XII, Blue Fear, navigating ecological, social and existential anxieties during the Anthropocene

Amsterdam, Netherlands

In addition to regular paper-based panels, we have encouraged panel proposals with innovative formats that stimulate interaction and dynamism. These include formats such as roundtables, workshops, brainstorm sessions, debates, artistic interventions, exhibition (virtual excursion), documentary film (photo essay/story) screenings with discussion, meet the author sessions, book presentations etcetera.

To present a paper in the MARE conference, the participant must be physically present in Amsterdam. Online participants can observe all conference sessions, but will not be able to present themselves. Please, regularly visit this page, https://marecentre.nl/, for updates and important information about the 12th MARE People and the Sea conference.

28th June 2023: Structures in the Marine Environment (SIME) 2023 conference

Glasgow, Scotland

MASTS (Marine Alliance for Science and Technology Scotland) is assisting with this year's SIME 2023 conference which will be held in person in Glasgow at the Studio. The call for abstracts is now open and we invite abstracts for 15min presentations or a paper poster. To find out more and download the abstract template document, visit our webpage, masts.ac.uk/events/structures-in-the-marine-environment-conference/. The deadline for submiting abstracts is 12:00 on Friday 12th May 2023.

Academics, stakeholders, industry and government representatives and interested parties are invited to come together for talks, posters, networking and discussion about the environmental effects of artificial structures already within the marine ecosystem, and the rapid expansion of new infrastructure over the coming decades.

In response to our societal need to generate energy, artificial structures have been placed into our coastal and marine environments. The structures range from oil and gas installations, associated pipelines and seabed infrastructure, as well as offshore wind farms and other renewables that, as part of an energy transition, are rapidly scaling up to meet the needs of the Government's Energy Strategy as well as tackling the world's climate crisis. Inevitably, these structures host communities by providing habitat and shelter, and potentially serve as stepping-stones for the spread of some species. In addition to deliberately placed structures, shipwrecks can also serve a similar function. In turn, the biodiversity that develops on these structures can affect biological, hydrodynamic and biogeochemical processes from the water column to the seafloor, either directly (e.g. food-webs, scouring) or indirectly (e.g. biorefugia, displacement of fisheries) and, hence, ecosystem functioning, ecosystem services and benefits to society are also affected at various spatial and temporal scales.

Science plays a critical part in understanding these effects as well as the role they play in our society and any opportunities they create, for example for environmental restoration, marine net gain and environmental credit trading markets. Ambitions for more integrated decision making across marine planning, fisheries, nature conservation and energy sectors, rely on the scientific evidence base to develop suitable polices and decisions where multi-sectoral considerations are increasingly important. Within an international context, SIME2023 will focus on developing a better understanding of the role artificial marine structures have in a changing seascape, supporting ecological best practice in

ISSN 0306-7335

relation to the energy transition, marine environmental management and a changing climate.

Let's talk about the effects, benefits and implications of structures, and discuss how we can accelerate our understanding to support decisions for the benefit of the environment and society.

9th-14th July 2023: Goldschmidt Conference
Lyon, France
Let's Talk about #DEI @goldschmidt2023. Tell us about obstacles that contribute to the under-representation of marginalized groups in geochemistry, conf.goldschmidt.info/goldschmidt/2023/cfp.cgi.

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, 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.

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. Abstract submissions (max. 350 words) will be accepted until 31st May 2023. The EMCEI encourages submissions of research works that aim to bring solutions to the most pressing environmental issues and to ensure more societal welfare in the Mediterranean and surrounding regions. Case studies from other regions of the world could also be submitted.

Before submission, please read the guidelines, emcei.net/index.php?p=author-guidelines. Read more details about our 5th EMCEI Publication Plan here, emcei.net/index.php?p=special-issue. Contact us, if you need more information: contact@emcei.net.

19th-22nd October 2023: Arctic Circle Assembly 2023
Reykjavik, Iceland
2023 assembly sessions proposal deadline less than a month away www.arcticcircle.org/assemblies/2023-arctic-circle-assembly-call-for-proposals. Attended by more than 2000 participants from over 60 countries, the Assembly is the largest international gathering on the Arctic - Climate - Energy - Oceans - Geopolitics and more. Participation will be granted based on Session topic, area of focus, goals, and room availability in the Assembly Area; Harpa Concert Hall and Conference Centre and the Reykjavík EDITION Hotel, www.arcticcircle.org/.

7th-9th November 2023: The Nansen Legacy symposium, Towards a new Arctic Ocean – Past, Present, Future
Tromsø, Norway
During this science conference, www.nansenlegacy-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.

The abstract submission is already open and will close 15 May 2023, 23:59 - details on Abstract

ISSN 0306-7335

Submission and 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/.

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. On this occasion, we are pleased to invite you to take part in the conference either in person or virtually, and share/discuss your latest research findings.

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.

Abstract submissions (max. 350 words) will be accepted until 10th June 2023. The MedGU-23 encourages submissions of research works not only from the Mediterranean region, but from all regions of the world. Before submission, please read the guidelines, medgu.org/index.php?p=author-guidelines.

The MedGU-23 Proceedings will be published in the Springer/IEREK ASTI Series, www.springer.com/series/15883, (indexed in Scopus & SCImago). Selected papers will be published in some Springer and Elsevier journals Special Issues, medgu.org/index.php?p=special-issue. Contact us, if you need more information, contact@medgu.org.

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), oceandecade.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, oceandecade.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.

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. More details about the programme, registration process and calls for

ISSN 0306-7335

proposals for side events will be available soon. If you would like to receive updates, please sign up here, www.surveymonkey.com/r/OceanDecade24_updates.

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

JOBS and OPPORTUNITIES

There are jobs on the IMBER web site

http://www.imber.info

IMBeR Integrated Marine Biosphere Research

Jobs and opportunities

New

- Call for SCOR Working Groups. Submit by **12 May**
- POGO-SCOR Fellowship 2023: Training and capacity building towards a global observation scheme for the oceans. Apply by **15 May**
- PhD: Morality, justice, and adaptation to environmental change. James Cook University, Townsville Australia. Apply by **17 May**
- Call for applications: Autumn School on Sustainability Science, 16 - 20 October 2023, Aussois, Savoie, France. Apply by **31 May**
- Executive Manager: Oceanographic Research Institute, Durban, South Africa. Apply by **31 May**
- 2024 Call for Expressions of Interest: Chancellor's Research Fellowships, University of Technology, Sydney, Australia. Apply by **5 June**
- Postdoc: Identifying leverage points to foster pathways towards sustainable coasts, IRD, Noumea New Caledonia, Fiji and Germany. Apply by **8 June**
- PhD: Recognizing the importance of biology in the ocean's carbonate pump, Heriot Watt University, Edinburgh, Scotland, UK. Apply by **30 June**

In case you missed it...

- Call for EoI: For collaborative, multidisciplinary research using R/V Falkor (too), Schmidt Ocean Institute. Submit EoI **now**
- SOLAS Masters Program: Ocean, Atmosphere and Climate , University of Galway, Ireland. Apply **now**
- Pivot Fellowship program: One year training fellowship. Apply by **15 May**

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