2016 HOSST-TOSST

Halifax Summer School

Providing graduates with the scientific, technical, and professional skills required for responsible stewardship of the ocean

HOSST
TRANSATLANTIC RESEARCH SCHOOL

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HOSST-TOSST

JOINT GRADUATE RESEARCH SCHOOL

Welcome to the **H**elmholtz and **T**ransatlantic **O**cean **S**ystem **S**cience and **T**echnology Joint Graduate Research School (HOSST and TOSST, respectively)! This unique program links two world-renowned centers of marine science excellence in Kiel, Germany and Halifax, Canada to equip scientists with a wide range of skills and awareness for an increasingly internationalized society.

To date, 47 graduate students have participated or are currently enrolled in the HOSST-TOSST research school. These students come from 19 countries located on 5 continents and study the North Atlantic Ocean using a wide diversity of disciplines and technology; from the ocean floor to the atmosphere, from single genes to global circulation, in the past, present, and future ocean. Half of the students are based in Kiel and half in Halifax. Each student is co-supervised by two faculty, one located in Halifax and one in Kiel, which enables students to take full advantage of the advanced technological facilities available at each center and complementary expertise of their supervisors.

In addition to weekly video-conferenced seminars, students from both centers are brought together yearly for an intensive two week summer school. The location rotates among three HOSST-TOSST sites (Halifax, Kiel, and Cape Verde) and schools focus on the marine science strengths or issues at each location. This year the summer school returns to Halifax and will introduce students to the industrial and business side of marine science.

HOSST-TOSST is funded by the National Sciences and Engineering Council of Canada and the Helmholtz Association. Financial support is also provided by Canadian Excellence Research Chair in Ocean Science and Technology, Dalhousie University's Faculty of Graduate Studies and Faculty of Science.

HOSST-TOSST RESEARCH CENTERS

Dalhousie University

Ocean sciences are one of the strengths of Dalhousie University. Dalhousie is located in Halifax, NS, which contains one of the highest concentrations of marine related businesses world-wide and an easily accessible, long running time series station in Bedford Basin. Currently, there are 22 Dalhousie professors from five departments in the Faculty of Science and the Marine Affairs Program in HOSST-TOSST, as well as support from Bedford Institute of Oceanography scientists.

Helmholtz Center for Ocean Research Kiel (GEOMAR)

GEOMAR investigates the chemical, physical, biological and geological processes of the seafloor, oceans and ocean margins, and their interactions with the atmosphere. This center covers the entire oceanographic spectrum and is unique in Germany. At present, 23 GEOMAR professors from four research divisions are in HOSST-TOSST.

Christian-Albrechts-Universität zu Kiel (CAU)

CAU is a comprehensive university of interconnected and interactive academic cultures. It builds on four major foci of proven excellence in international, interdisciplinary research: Marine Sciences, Life Sciences, Nanoscience, and Societal, Environmental, and Cultural Change. There are 9 CAU professors from 7 institutes in HOSST-TOSST.

Masoud Aali

TOSST STUDENT CO-REPRESENTATIVE, SEPTEMBER 2015

The primary goal of my PhD studies is to use state-of-the-art geophysical and petrophysical methods in order to study sea-level change and constrain the complex forcing functions tying evolution and preservation of the margin stratigraphic record to base-level changes. In this study, I am using a newly collected seismic dataset from offshore the New Jersey passive margin to predict sedimentological properties in shallow marine sediments at a significantly higher resolution (~5 m laterally) than previously achieved (~100s of m). This will be done by integrating sequence stratigraphy and rock physics within the 600 km2 study area covered by the 3D seismic survey.

What is the applicability of 'your' science in ocean technology and observation companies?

Characterizing the sediments offshore the New Jersey margin, especially those which formed during eustatic changes, will help elucidate the sedimentary processes involved in the evolution of the shoreline. Furthermore, this study tries to refine the existing estimates of the eustatic changes for the geological period investigated.

What is your favorite thing about the ocean?

Shear wave doesn't propagate there!

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Jacqueline Bertlich

HOSST STUDENT CO-REPRESENTATIVE, NOVEMBER 2015

I studied geosciences with a focus on marine biogeochemistry and isotope geochemistry at the University of Münster in Germany. During my studies, I mainly focused on biogeochemical processes in marine environments, particularly in extreme habitats. I am also interested in volcanology and mineralogy.

For my master thesis I analyzed the elemental composition of cultured planktonic foraminifera from the Antarctic sea ice. Foraminiferal calcite is used as a geochemical proxy to determine past oceanic conditions and their biogeochemical interactions with the atmosphere, which is most interesting to me.

In my current PhD project I am still concentrating on foraminiferal (isotope) geochemistry, constraining the deglacial to Holocene decay of the Laurentide Ice Sheet and the related meltwater/freshwater discharge into the adjacent ocean areas. I will attempt to reconstruct ocean salinity and temperature anomalies at different depth levels to trace meltwater fluxes to distal ocean areas in the North Atlantic and to decipher extreme events. In addition, I will attempt to calibrate a new proxy for ocean salinity to gain a broader understanding of the ocean.

What is the applicability of 'your' science in ocean technology and observation companies?

To determine past ocean conditions, a suite of geochemical proxies is needed. For the isotope and elemental analysis of calcite we use different instruments as for instance an electron microprobe or laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS), providing high resolution data

What is your favorite thing about the ocean?

Although it seems that the ocean system is well understood, large mysteries are remaining in the deep sea and 95 percent of the ocean is still unexplored (National Ocean Service).

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Andrea Buchholz

TOSST, JANUARY 2016

My research focuses on human uses of the oceans and associated management measures and processes. I am particularly interested in marine fisheries and their implications for coastal communities and marine ecosystems. Throughout my studies, my research interests have drawn me to various international research facilities. I spent time abroad at Queens University Belfast during my undergrad at the landlocked Tübingen University, which brought me closer to the ocean. For my Master's in marine ecology I finally moved to the sea, studying at Lund University and Dalhousie University.

For my Ph.D. project I am researching climate change impacts on marine ecosystems and fisheries in the North Atlantic Ocean, and how management and conservation measures can respond and adapt to predicted changes. A changing climate has already been associated with major biological changes in marine ecosystems, with significant consequences for ecosystem structure and functioning, as well as associated marine fisheries and fisheries dependent societies. How these changes may play out on regional or ocean-basin scale is largely unknown. Understanding climate change impacts on marine ecosystems and fisheries is essential to ensure future effective and sustainable management and conservation of marine ecosystems and their valuable resources

When I am not working on my project you can find me in or on the water enjoying waves and a fresh breeze. If the weather is not playing along I usually find the quickest way to the next coffee bar, getting lost in a book or planning my first big bike trek.

What is the applicability of 'your' science in ocean technology and observation companies?

Developing effective and adaptive management tools for marine fisheries and biodiversity conservation in the context of climate change.

What is your favorite thing about the ocean?

Its ever-changing colors and all the unknown.

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Allison Sueyi Chua

TOSST, SEPTEMBER 2016

My general area of research interest is around the development and use of autonomous or remotely operated vehicles and their associated instrumentation for oceanographic measurement and exploration. A possible area of research that interests me is the Canadian Autonomous Surface Vehicle, *DORADO*, which is a semi-submersible autonomous or remotely controlled vehicle that has special potential for research support of relevance to the international program SOLAS (Surface Ocean Lower Atmosphere Study). The *DORADO* has considerable potential for application within projects such as MOSES (Modular Observation Solutions for Earth Systems), a major initiative of Germany's Helmholtz Association. MOSES has an ocean component that develops infrastructure required to study ocean eddies or other mesoscale phenomena. The *DORADO*, or a closely-related vehicle, could contribute unique capacity to such an experiment. However, in order to realize this goal, further technical developments and modifications are required in order that *DORADO* can be used effectively for such scientific experiments. Therefore, a possible research project could focus on further development of this type of vehicle, which would eventually lead to its deployment as part of a major international ocean experiment.

Another area that interests me involves a possible collaboration with Helmholtz Centres on a project called ROBEX (Robotic Exploration of Extreme Environments). ROBEX combines oceanography with engineering, as its mission is to further explore environments that have extreme conditions, including the deep sea. The project would involve designing and constructing a stationary system that acts as a "home base" for energy supply and data exchange, with mobile elements that deploy and explore the environment.

What is your favorite thing about the ocean?

My favourite thing about the ocean is that it means home to me, especially the smell of salt air and the sound of crashing waves.

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Patrick Duplessis

TOSST, SEPTEMBER 2015

Fog is formed as water vapour in a supersaturated environment condenses on atmospheric particles. Through my research, I am trying to understand why some particles activate into fog and others do not. Focusing on marine and coastal fog for now, our group measures and collects fog droplets and interstitial aerosols at a field station on the coast of Nova Scotia at the peak of the fog season. These new data will help us understanding better the microphysical processes behind fog formation and duration, and will be implemented in a model to improve fog forecasting. I am generally interested in meteorology and the sea-atmosphere interactions.

What is the applicability of 'your' science in ocean technology and observation companies?

Marine and coastal fog is a hazard for air and marine transportation in general and causes economical losses that are comparable to those related to winter storms. Improved forecasts would help companies to plan better and therefore reduce the generated risks.

What is your favorite thing about the ocean?

Its strong impact on climate.

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Manuel Dureuil

TOSST, MAY 2014

Worldwide, shark populations are suffering from overexploitation and high incidental mortality rates. In particular the North Atlantic Ocean has experienced severe declines of many shark species over the last decades. However, a scientific basis for comprehensive protection measures is still lacking for many species. Therefore, this project is concerned with the delineation and characterization of critical habitat areas and the expansion of stock assessment methods for data-poor shark species, in order to aid spatial management and to provide scientific information on reference points and exploitation levels for data-poor shark species. The results will help to develop a more comprehensive science-based protection of threatened North Atlantic shark populations.

What is the applicability of 'your' science in ocean technology and observation companies?

As a scientist who deploys and uses acoustic transmitter tags feedback on obstacles discovered in the field can help improving this technology.

What is your favorite thing about the ocean?

That this environment produced something as evolutionary beautiful as sharks.

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Sebastian Flöter

HOSST, JANUARY 2014

The key aim of my work is to investigate the species-specific boron isotopic-pH incorporation in bamboo corals, a valuable tool that is increasingly applied for paleo-pH and paleo-pCO2 reconstructions. Along with the high resolution isotope data measured using LA-ICP-MS and solution-based techniques, major and trace elemental ratios in the calcitic skeleton of these cold-water corals are determined to understand their biomineralisation. These measurements will give more information about the biogenic calcite formation and the influence of organics on boron isotopic composition as well as element distribution in bamboo corals. With the gained results I am testing their applicability to record several environmental parameters controlling the carbon cycling. Identifying the factors influencing this cycle, which is an important climate driver, is a prerequisite for modeling past climate events and future development.

The investigation of past environmental conditions was also the reason for me to work in my bachelor's thesis on a sediment core from Patagonia to reconstruct the iodine concentration with core depth. This brought me later to GEOMAR, where I could focus my master's thesis research on marine volatile organic halocarbons, the main source of halogens on land.

What is the applicability of 'your' science in ocean technology and observation companies?

Understanding the mechanisms of climate change will help to predict its local impacts. By this, it may be possible to mitigate and to adapt to predicted future changes by the help of accordingly developed technology.

What is your favorite thing about the ocean?

The great amount of still unsolved mysteries.

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Felix Geißler

HOSST, JANUARY 2016

In 2010 I started my undergraduate studies in chemistry at the University Potsdam (Germany). Here I was mainly involved in the development of in situ sensor systems (e.g. Optodes) for several environmental parameters in the physical chemistry department. Moving to Kiel in 2013 for my graduate studies, I focused on marine chemistry and the method development for determining nanoparticles in natural waters in the 'Biogeochemistry' group of GEOMAR.

As a HOSST PhD candidate in Kiel (GEOMAR) I got the opportunity to combine my research interests in marine science and sensor development. The project is about the development, validation and deployment of chemical in situ sensors, called Lab-on-Chip analysers, for marine parameters, e.g. Iron/Manganese and nutrient concentrations, pH or total alkalinity in close collaboration with the National Oceanography Centre Southampton, UK. These microfluidic systems rely on the chemical reaction between the analyte and reagents to induce a colour development. The characteristic absorption is measured in a flow cell using a photodetector and can be converted into concentration units.

What is the applicability of 'your' science in ocean technology and observation companies?

Due to the current undersampling of our oceans the development of new technologies like in situ sensors for ocean observation is highly demanded. The real-time analysis can replace laborious sampling procedures and the spatial and temporal high resolution allows the observation of sudden changes and short termed phenomena. Moreover, their deployment on remote platforms is ideal to collect data in seasonal inaccessible ocean regions.

What is your favorite thing about the ocean?

"How inappropriate to call this planet 'Earth' when it is quite clearly Ocean." (Arthur C. Clarke)

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Tatum Miko Herrero

HOSST, JANUARY 2016

I am an aspiring volcanologist from the Philippines and I have studied volcano-tectonics and morphology of island arcs for the assessment of mass movement hazards. Today, in my ambition to contribute to the world of volcanology, I search for more volcanoes in the North Atlantic seafloor. Most of the seafloor is a great unknown but should never be deemed as empty and so I am keen on discovering how active the seafloor in the North Atlantic really is.

I'm very new to this alien terrain and I find it fascinating how comparable and yet vastly different it can be from land. Although it's not possible to scan the whole North Atlantic seafloor within the three years of this PhD it is a welcome challenge to fit the puzzle pieces that are available to make sense of a big picture.

What is the applicability of 'your' science in ocean technology and observation companies?

My science deals with morphology, structures, and to some extent, the geology of an area. Before going anywhere it is best to have a map in hand, be it bathymetric or geologic. It will give a great sense of what kind of terrain you have to deal with especially if you are planning to excavate or install an infrastructure.

What is your favorite thing about the ocean?

The sand! I can stare at the handful of sand all day and wonder about where they came from, the adventures they had, and how they got to be where they are today.

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Florian Lange

HOSST, JANUARY 2016

After a Bachelor degree in chemistry in my hometown, Marburg, I moved to Kiel for my Master studies. During the lab courses I got in touch with Ocean Surface Chemistry and so, after graduating, I started my PhD project in this field.

I´m most interested in photochemistry, so my task for the PhD thesis is the investigation of the sea surface nanolayer by means of modern physicochemical tools. Besides chemistry, I´ve always been interested in many other fields, so I started another Bachelor degree (Philosophy and archaeology).

What is the applicability of 'your' science in ocean technology and observation companies?

Understanding the photochemistry occurring in the sea surface can improve the knowledge about gas exchange processes as well as formation mechanisms of certain compounds. This might offer new pathways towards photochemical procession of water as well as improvement of climate models.

What is your favorite thing about the ocean?

I like the calmness and power one can feel when resting besides the shore. It makes us feel being really small piece in a greater context and changes the perception of our problems and bad thoughts, no matter how big or important they might seem.

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Nadine Lehmann

TOSST, MAY 2014

As part of the Canadian Arctic GEOTRACES program, a research project on marine biogeochemical cycles of trace elements and their isotopes, my PhD focuses on the cycling of nitrogen and the geochemical modification of waters as they flow from the Pacific through the Canadian Archipelago into the Labrador Sea. I am interested in using the N and O isotopic composition of nitrate as a geochemical tracer to describe both nutrient cycling and water mass distributions in the Ocean.

My general interests are scuba, hiking, snowboarding, and outdoor activities in general.

What is the applicability of 'your' science in ocean technology and observation companies?

Although isotopic ratios in nitrate have been used to track biological processes in both the water column and the upper-most sediment column in a number of studies around the world, there is still the need for a more extensive application of this geochemical tool not only as a tracer for the cycling of nutrients, but also to investigate ocean circulation. Using state of the art continuous flow isotope ratio mass spectrometry therefore not only gives insight into biogeochemical cycling but further helps to elucidate the origin and history of water masses, hence improves our understanding of the physical environment.

What is your favorite thing about the ocean?

Its incredible diversity.

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Miryam Lima

TOSST, JANUARY 2017

Miryam is a Cape Verdean who will be joining Dalhousie University in January 2016, following a degree at the Cape Verde University. Miryam's first introduction to TOSST-HOSST was at the 2015 Summer School, where she gave a presentation at the Marine and Atmospheric Scientific Symposium as an undergraduate student. Her Bachelor's Thesis was a collaborative research project between Cape Verde and GEOMAR. Miryam will investigate the vulnerability and resilience of the Cape Verdean Island ecosystem to ocean acidification for her Master's Thesis.

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Annalena Lochte

HOSST, NOVEMBER 2015

In my PhD project, I use a set of paleoceanographic proxies on unique cores containing thick layers of late Holocene sediment that were recovered from several basins along the Labrador continental shelf to investigate the late Holocene variability of the Labrador Current (LC). The LC is part of the anticlockwise circulating subpolar gyre (SPG), where deep-water formation is supposed to stabilize the Atlantic Meridional Overturning Circulation (AMOC). Previous work in the North Atlantic region discovered deglacial and early Holocene freshwater events (such as Heinrich events, the Younger Dryas and the 8.2 ka event), which had severe effects on global climate due to disturbances in the deep-water formation. However, little is known about the late Holocene climate variability in the Labrador Sea, as significant and undisturbed Holocene sediment covers along the shelf and upper continental slope are sparse.

I am generally interested in the role of the ocean in the global climate system and how it is affected by current climate change. Apart from my research interests, I like to travel and hike.

What is your favorite thing about the ocean?

It's magical and powerful.

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Evangelia Louropoulou

HOSST, JANUARY 2016

I graduated from the Department of Chemistry of the University of Athens, where I also obtained my Master's Degree in "Environmental Chemistry and Technology" in 2012. Afterwards, I worked as a Research Assistant at the University of Athens in two projects related to Marine Chemistry funded by the European Union. I consider key issues the understanding of the ecosystem's functions, the management of natural resources as well as environmental sustainability, and my research focuses on trace element biogeochemistry in the marine environment.

Concerning my PhD project within the framework of HOSST, I am expanding my research on the biogeochemistry of certain trace elements, while linking their impact to global scale issues, such as nitrogen fixation and climate change. My study focuses on the molecular adaptation of diazotrophs under iron limitation situations and I aim to identify strategies of iron optimization. The study involves the determination of the abundances of key iron-binding proteins and genes encoding them at different iron concentrations. Additionally, field survey is carried out in the Atlantic Ocean, since this area contributes significantly to global nitrogen fixation rates and offers the chance to work on well characterized diazotroph communities.

This project will contribute to our understanding of the factors controlling nitrogen fixation in the marine environment and thus the biogeochemistry of nitrogen in the ocean and how this important nutrient influences marine productivity.

What is the applicability of 'your' science in ocean technology and observation companies?

My project aims to identify potential iron optimization strategies that can be linked to carbon and nitrogen cycles. Data can be incorporated into models in order to predict carbon and nitrogen fixation patterns in the future constantly changing ocean.

What is your favorite thing about the ocean?

The magic and the mysteries around it that have always inspired pioneers to explore it and to understand it.

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Kristė Makarevičiūtė

HOSST, JANUARY 2016

Ever since my bachelor studies in Ecology in Lithuania, I have focused on studying aquatic systems and human influence on them. Currently I am most interested in the effects of global change on the base of oceanic food-webs: the phytoplankton communities. My interest in plankton ecology was sparked during numerous field trips and thesis work during my master studies in Applied Ecology at the Universities of Kiel, Germany and Poitiers, France. At the moment I study experimentally how changes in nutrient loads are affecting phytoplankton communities and how these effects are transmitted within planktonic food webs as a part of my PhD. Besides this, I am also interested in environmental management, especially management of water resources.

What is the applicability of 'your' science in ocean technology and observation companies?

My research may provide new insights on how changing nutrient ratios can affect physiology and community structure of phyto- and zooplankton, which is of importance for aquaculture, bioenergy and nutraceutical industries.

What is your favorite thing about the ocean?

It's huge!

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J. Scott Mccain

TOSST, JANUARY 2017

While completing my MSc. in Biology at Dalhousie University, I developed an interest in quantitative methods in both statistics and computer science. I enjoy applying and developing novel analysis tools to make insights into biological systems. As a biologist, I am specifically interested in how organisms interact and how these interaction influence the environment. For my PhD, I will foster these interests by specifically examining how marine microbes and their interactions influence ocean biogeochemistry. My proposed PhD project will examine microbial communities in the North Atlantic and Antarctica.

Outside of the laboratory, I enjoy windsurfing and SCUBA diving.

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Kirsten Meulenbroek

HOSST, JANUARY 2016

My name is Kirsten Meulenbroek and I moved to Kiel from Amsterdam half a year ago for my PhD. I did my bachelor in Earth Sciences with a minor in geology while majoring in physical geography. My thesis involved creating a 3-dimensional map of a salt marsh in Connecticut that showed past storms being recorded as sand or clay layers in peat. As my interest was always peaked by climate and the role of the ocean in its system, I did my masters in Palaeoceanography and geo-ecosystems. Here I worked on two research projects, both on tropical Atlantic sediment cores. It acquainted me with geo-chemical methods and I got to know (a lot of) planktic foraminifera. I am interested in reconstructing climate and ocean circulation patterns by using different proxies. My PhD involves trying to develop a proxy for ocean salinity by using Barium isotopes. Next to my research, I am especially captivated by nature in all its different shapes and forms.

What is the applicability of 'your' science in ocean technology and observation companies?

Different geochemical proxies can be used to not only reconstruct past ocean circulation, but also to get a grip on causes and effects of changing ocean characteristics in modern times. The need to understand the ocean system becomes more apparent now that we need to deal with human induced climate change.

What is your favorite thing about the ocean?

It's so many things combined. Mysterious and beautiful, strong and gentle, and it has weird little creatures and huge whales and all stuff in between. I love that we don't understand such a big part of our planet; it means it can surprise us all the time.

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Maryam Mirzaloo

HOSST, JANUARY 2014

My name is Maryam Mirzaloo, I graduated from the University of Tehran, Iran (MS Course) where I majored in sedimentology, palynology & palaeontology. After that I have got a fellowship for my second MSc (the SE Asia Petroleum Geoscience in the Chevron PTTEP postgraduate program) at Chulalongkorn University in Bangkok, Thailand. My thesis focused on isotopic and petroleum evolution across selected shallow & deep water Permian carbonates. I moved to Kiel, Germany as a HOSST PhD student. My PhD project particularly focuses on reconstructing surface to subsurface and bottom water dynamics around south Icelandic shelf over the last ~55.000 years at centennial resolution. Severe slow-downs or even collapses of the Atlantic Meridional Overturning Circulation (AMOC) during the last deglaciation were closely linked to rapid changes in North Hemisphere ice sheet dynamics and climate.

I combine micropaleontological, geochemical and sedimentological techniques to understand weather changes in AMOC have entailed changes in thermocline depth in the North Atlantic Drift and changes in Iceland-Scotland Overflow Water (ISOW).

What is your favorite thing about the ocean?

94 percent of life on Earth is aquatic, About 70 percent of the planet is ocean, the deep sea is the largest museum on Earth, the longest mountain range in the world is under water, Underwater hot springs shoot water that's 650° F, BUT still we have only explored less than 5 percent of the Earth's oceans.

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Ricardo Arruda Monteiro da Silva

TOSST, JANUARY 2016

My PhD project will use new field data from Volunteer Observing Ships (VOS), sea gliders, wave gliders and moorings to estimate air-sea fluxes of CO_2 in the NW Atlantic Ocean. These new data, combined with existing data, will be used to establish accurate, year-round estimates of air-sea CO_2 fluxes. My project will also explore value of these new data constraints for biogeochemical models designed to track inter-annual variability of the air-sea CO_2 flux in the North Atlantic, and investigate the main processes and drivers affecting pCO_2 spatio-temporal variability.

What is the applicability of 'your' science in ocean technology and observation companies?

The main applicability for ocean technology is the development of new sensors and platforms for pCO_2 (and state variables) data acquisition, which will lead to a finer spatio-temporal coverage and improve our understanding of the role of the ocean in controlling our climate.

What is your favorite thing about the ocean?

My favorite thing about the ocean is how it controls our climate, and that we still have a lot to understand about the role of the ocean on the major biogeochemical cycles.

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Helen Packer

TOSST, SEPTEMBER 2016

Helen, originally from France, has a BSc in Marine Biology from Swansea University (UK) and an MSc in Marine Resource Management from Wageningen University (The Netherlands). During her studies Helen has explored a number of aquatic research topics including estuarine ecology, river ecology, sea bream aquaculture, life cycle analysis for African catfish aquaculture, seafood ecolabels and tuna fisheries. After completing her studies, Helen went on to work on the Corporate Social Responsibility team of a major American frozen tuna importer. Her work mainly consists in engaging supply chains and working on the implementation of Fishery Improvement Projects in Indonesia, Vietnam, Cooks Islands and Micronesia that aim to achieve Marine Stewardship Council certification. During this time, she developed a strong interest in the drivers for sustainability in tuna fisheries, leading her to pursue a PhD focusing on how market dynamics, traceability can be leveraged to drive sustainability in tuna fisheries.

What is the applicability of 'your' science in ocean technology and observation companies?

This research is especially relevant to companies that are involved in developing technology to capture and share data in seafood value chains. Indeed, this research will be addressing the question of how value chain information, when made accessible to pivotal stakeholders, can be used to create awareness on who has the means to drive change and how this change can be brought about in the seafood industry. The technological aspects here is key given that one of the main barriers is not having an efficient, interoperable and comprehensive data capturing and sharing system. Especially a system that could be used by a variety of stakeholders, including enforcement agencies, scientists, industry and civil society.

What is your favorite thing about the ocean?

The Ocean can never be tamed. It will always be wild and, as humans we have to learn how to respect and understand it if we want it to continue to support and inspire us.

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Lorenza Raimondi

TOSST STUDENT REPRESENTATIVE, MAY 2014

I was born in southern Italy in the city of Napoli where I studied in a French school for ten years and continued with a high school degree in humanistic studies. After realizing that biology and chemistry were my passion I decided to change my academic path and obtained a Bachelor's Degree in Marine Biology at the University of Napoli "Federico II". Once graduated, I moved to northern Italy, in Genova, where I obtained my Master's Degree in Marine Sciences and finally moved to Canada to pursue my PhD studies. I have several interests in the Chemical Oceanography field but my main obsession at the moment are gas exchanges between atmosphere and ocean and in particularly how different processes can affect gas equilibrium.

What is the applicability of 'your' science in ocean technology and observation companies?

Currently we are witnessing an unprecedented change in ocean observation technologies. Together with the classic approach (RV, CTD, Niskin bottles etc.) most data are now obtained remotely and more and more autonomous platforms are used. In this context my research would be applicable in development and calibration of chemical sensors that are more and more implemented in oceanographic platforms (moorings, Argo floats, gliders). At the same time my research could be facilitate by implementing these "new generation" data from sensors with the "old-fashioned" ones.

What is your favorite thing about the ocean?

My favorite thing about the ocean is that 95% of it is still unexplored. It's amazing thinking that most of it remains unseen. There is so much to do!

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Subhadeep Rakshit

TOSST, JANUARY 2017

My research interest is to integrate marine and terrestrial biogeochemical cycles to better understand the global biogeochemistry and to distinguish the human induced environmental changes from the natural trend. In my project I will be studying the development of ocean hypoxia and anoxia in the ocean water column. I will use both theoretical and experimental tools to understand the feedback processes involved in nitrogen cycling in Bedford Basin, Halifax. The project will also investigates the anthropogenic nitrogen pollution and its effect on the coastal ecosystem. Outside academic activity, I am interested in biking.

What is the applicability of 'your' science in ocean technology and observation companies?

This project will help to understand by what extent the added nutrient due to human activity affects the ocean water condition. The outcome of the research would help in sustainable policy build-up for the healthier future ocean.

What is your favorite thing about the ocean?

The vastness and the continuous formation of waves.

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Lisa Samrock

HOSST STUDENT REPRESENTATIVE, DECEMBER 2015

Always being fascinated by rocks and minerals, I started my undergraduate studies at Potsdam University (Germany) in 2010. My main focus for my first research project was sedimentology, where I performed a microfacies analysis of drill cores to characterize potential hydrocarbon reservoirs.

In the course of my Master's studies at Uppsala University (Sweden) I developed a fascination for volcanoes and volcanic plumbing systems. For my thesis I developed a 3D structural model of the Tejeda cone-sheet swarm on Gran Canaria (Canary Islands, Spain), in order to reconstruct the geometry of the magmatic source below the Tejeda caldera and to analyze processes and dynamics of magma supply in volcanic edifices.

My PhD project at HOSST allows me to continue investigating ocean islands and, in particular, the geodynamic evolution of the Cape Verde archipelago. To understand the evolution of the Cape Verde archipelago it is vital to compare the temporal and spatial evolution of both island and seamount edifices. An important goal of this project is therefore to establish absolute ages, especially for the seamounts in the area and the onset of volcanism. I will also investigate structural controls on the evolution of the archipelago (e.g. faults, fracture patterns, local and regional stress fields) in order to account for the spatial distribution of volcanic activity through time, as well as further geodynamical parameters controlling the evolution of the archipelago such as magma composition and thermobarometry to constrain the magma plumbing system.

What is the applicability of 'your' science in ocean technology and observation companies?

My project aims to gain an understanding of fundamental processes and mechanisms that form seamounts and ocean islands. The insights might be important for developing technology that can be used at the seafloor for different purposes, such as sampling (e.g. ROVs), mapping (e.g. high resolution bathymetry), and exploration of mineral deposits that are linked to seafloor volcanism.

What is your favorite thing about the ocean?

The ocean is so wide and wild. It's like entering a completely different world. Although it covers almost three quarters of the surface of our planet, the ocean is still not well explored and large parts of it remain to be "white spots" on our maps.

lsamrock@geomar.de, Seafloor Structures, Dynamics of the Sea Floor, GEOMAR-East

Najeem Shajahan

TOSST, JANUARY 2017

My research topic aims to study the properties of hydrothermal vents based on passive acoustic measurements. The measured noise data will be used to study the spectral and spatial characteristics of hydrothermal vent. Thus acoustic data analysis can be used to understand the sound generating mechanism and physical properties of vents. Once the acoustic properties of hydrothermal vents are understood, background sound measurement can be later used for the localization of new vent sites. Passive acoustics, signal processing, sound propagation modelling and geoacoustic inversion are my topics of interest in ocean acoustics.

What is the applicability of 'your' science in ocean technology and observation companies?

Ocean acoustics finds application in scientific, military and industrial purposes. Due to the environmental effect of anthropogenic sound to marine organisms, the recent years has seen significant importance in passive acoustic measurement systems. Nowadays most of the research in ocean acoustics focuses on the application of passive measurement systems in detection, localization, tracking, imaging and measurement. My research topic aims to study the properties of hydrothermal vents based on passive measurements. Hydrothermal vents are found to be distributed along the seafloor in tectonic boundaries with rich deposits of rare earth minerals, which are used in electronic components. The main objective of the project is to study the physical properties of vents and later to localize new sites based on noise measurement. Thus the possible outcome of the project would be helpful for ocean technology and observation companies for the exploitation of minerals from hydrothermal fields in a cost effective manner.

What is your favorite thing about the ocean?

Beautiful beaches are the first thing comes to my mind about the Ocean.

najeemtkm@gmail.com, 4D Ocean-Atmosphere Dynamics, Oceanography, Dalhousie University

Falko Vehling

HOSST, NOVEMBER 2015

While studying geophysics at Kiel University, I became very interested in geodynamic processes and how geological systems work. I discovered that numerical models are great tools for gaining deeper insights into geologic systems and for obtaining quantitative answers to scientific questions. During my diploma thesis work I became interested in hydrothermalism at mid-ocean ridges. I realized that quantitative studies of hydrothermal convection are held back by the numerical difficulties in resolving boiling and condensation processes. Consequently I developed a two-phase-flow model and evaluated various techniques for simulating two-phase phenomena.

My PhD project aims at using numerical modeling techniques to investigate the pattern of hydrothermal circulation along the Reykjanes Ridge. The slow spreading Reykjanes Ridge located south of Iceland in close proximity to the Iceland mantle plume and is characterized by an anomalously high magma flux that leads to a crustal thickness 2 km thicker than expected and a relatively shallow bathymetry. Despite the large magmatic input, the RR shows few signs of hydrothermal activity along the volcanically active ridge axis. In addition, the anomalously shallow water depth results in pressure-temperature conditions where boiling of seawater thereby phase separation phenomena are likely to affect the mobilization and transport of metals form the crust to the seafloor. Investigating how magma flux, sea floor bathymetry, hydrothermal convection pattern, and metal fluxes are related to each other along the RR is the principle objective of my study

What is the applicability of 'your' science in ocean technology and observation companies?

My research contributes to investigate the formation and distribution of seafloor mineral resources. Since massive seafloor deposits are enriched in zinc, copper, cobalt, lead, silver and gold, they have economic relevance for deep sea mining companies.

What is your favorite thing about the ocean?

Making holiday at the seaside.

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Wanxuan Yao

HOSST, DECEMBER 2015

I started my training in China (Wuhan University of Technology) as a Geography Information computer scientist. Thereby, I focused on the research of dynamic network planning optimization and implemented game theory in my simulation system, which significantly enhanced the system performance. Subsequently, I did my master degree in mathematical modeling at the Carl von Ossietzky University Oldenburg. During my master, I formulated a special food web model, which serves as a framework to study the spatial variety of ecosystems.

Currently, I am PhD candidate in the Biogeochemical Modeling Group at the GEOMAR, in which I research on iron scavenging in the ocean, which limits the oceanic primary production. My research objective is to improve the description of the scavenging process and thereby provide better parameterizations for global biogeochemistry models.

What is the applicability of 'your' science in ocean technology and observation companies?

Network Planning:	Production Management and Optimization
GIS:	Observational Network and Error Validations. Heterogeneous Data Integration. Database Developing. User Interface Design.
Modeling:	Simulation and Product Developing, Maintenance Prediction.
Ecology:	Data interpretation.

What is your favorite thing about the ocean?

Ocean blue!

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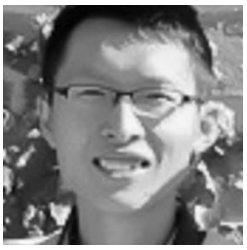

Rui Zhang

TOSST, JANUARY 2014

Ecosystems in the northwest North Atlantic Ocean are characterized by complex hydrographic and biological conditions, have suffered from fish stock collapses in the past few decades, and are facing threats from warming, ocean acidification and de-oxygenation. Efforts to manage and conserve marine ecosystems will require a better understanding of the underlying causal mechanisms that determine how climatic variability and anthropogenic activity affects ecological processes. My research aims to evaluate ecosystem responses to natural and man-made external forcing in the northwest North Atlantic from three different perspectives: 1) by quantifying the primary processes controlling nutrient dynamics and primary production on the continental shelves using a physical-biological coupled model, 2) by demonstrating the relative roles of climate change and fishing in driving fish stock variations using a marine upper trophic-level model, and 3) by examining Atlantic salmon population dynamics using an age- and stage-structured time-dependent matrix model.

What is the applicability of 'your' science in ocean technology and observation companies?

Bottom-up forcing associated with climate plays an important role in the dynamics of pelagic ecosystems, comparable in importance to that of top-down forcing associated with commercial fishing. A mechanistic understanding of the marine ecosystem responses to both natural and anthropogenic perturbations is necessary to quantify relevant physical, chemical and ecological ocean state variables and thus provide a solid scientific basis for ecosystem-based management and fisheries assessment.

What is your favorite thing about the ocean?

My favorite thing about the ocean is beach hiking and sea kayaking.

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HOSST-TOSST Halifax Summer School

25 SEPTEMBER – 7 OCTOBER 2016

Sunday, 25 Sept. 2016

2:00-5:00 pm	*Welcome Reception*	Wallace House, 6121 Regina Terrace

Monday, 26 Sept. 2016

9:00-9:30 am	*Welcome Remarks*, Richard Florizone, Dalhousie President *Introduction to HOSST-TOSST*, Dr. Markus Kienast, TOSST	Great Hall
9:30 am-12:00	*Smudging Ceremony*, Elders in Residence *Blanket Exercise*, Elders in Residence	Great Hall
12:00-1:00 pm	Lunch	LSC, Biology 5th Floor Lounge
1:00-3:00 pm	3 *Minute Introductions*, HOSST-TOSST cohort	LSC, Biology 5th Floor Lounge
3:00-4:00 pm	*Introduction to Dragon's Den Project* Jim Hanlon, IORE	LSC, Biology 5th Floor Lounge
4:00-evening	*Group Work on Dragon's Den project* Dinner provided	LSC, Biology 5th Floor Lounge

Tuesday, 27 Sept. 2016

9:00-12:00 pm	*Introduction to Business* Dr. David Roach, Rowe School of Business	LSC, Oceanography Riley Room
12:00-1:00 pm	Lunch	LSC, Oceanography Riley Room

1:00-2:30 pm	*Introduction to Finances, Part 1* Dr. David Roach, Rowe School of Business	LSC, Oceanography Riley Room
2:30-3:30 pm	*Tour of Dalhousie Campus*	
3:30-4:30 pm	*Tour of Aquatron,* Jim Eddington	LSC, Oceanography
4:00-evening	*Group Work on Dragon's Den project*	

Wednesday, 28 Sept. 2016

8:00 am	*Pick up rental vans*	1161 Hollis St.
8:30 am	*Meet for overnight in Amherst, NS*	Steele Ocean Sciences Building
9:00-10:30 am	*Travel to Joggins, NS*	
12:30-4:00 pm	*Tour of Joggins Fossil Cliffs*, UNESCO World Heritage Site	
Evening	*Group Work on Dragon's Den project*	Wandlynn Inn, Amherst, NS

Thursday, 29 Sept. 2016

8:30-10:00 am	*Transit to FORCE*	
10:00-12:00	*Tour of Fundy FORCE*	Parrsboro, NS
12:00-1:00 pm	*Transit to Ocean Sonics*	
1:00-3:00 pm	*Tour of Ocean Sonics*	Great Village, NS
6:00 pm	*Return to Halifax*	Steele Ocean Sciences Building

Friday, 30 Sept. 2016

8:00-9:30 am	*Thesis Advisory Committee Meetings*	arranged with TOSST supervisor
9:30-11:00 am	*Guest lecture on public outreach* Dr. Boris Worm	LSC, Biology 5th Floor Lounge

11:00-12:30 pm	*Presentation by Hana Nelson* Founder of Afishionado	LSC, Biology 5th Floor Lounge
12:30-1:30 pm	Lunch	LSC, Biology 5th Floor Lounge
2:00-4:00 pm	*Food from the Ocean*, panel discussion	SOSB 2-22
4:00-5:00 pm	*Reception with panel*, refreshments provided	SOSB Atrium

Saturday, 01 Oct. 2016

9:00-10:30 am	*Visit Halifax Farmer's Market/Afishionado stand*	Halifax Waterfront
10:00-11:00 am	*Shark Dissection*, Manuel Dureuil	Halifax Public Library
12:00-6:00 pm	*Group Work on Dragon's Den project*	
6:00-8:00 pm	*Sailing on the Tall Ship Silva*, dinner provided	Halifax Waterfront

Sunday, 02 Oct. 2016

9:00-6:00	*Day trip to the Valley,* Student Organized Visit to Grand Pré, winery and marsh tour with Dr. David Lowe

Monday, 03 Oct. 2016

8:00 am	*Transit to Bridgewater, NS*	
9:30-11:30 am	*Tour of Pro Oceanus*	Bridgewater, NS
12:00-2:30 pm	*Tour of Clearwater* (potential)	Lunenburg, NS
3:00-4:00 pm	*Transit to Lower Prospect, NS*	
3:45-7:00 pm	*Sea Kayaking Tour*, dinner provided	Lower Prospect, NS

Tuesday, 04 Oct. 2016

9:00-10:30 am	*Guest lecture on Whale Glider Project* Dr. Kim Davies	LSC, Biology 5th Floor Lounge
10:30-12:30 pm	*Workshop*, Ocean Tracking Network Fred Whoriskey	LSC, Biology 5th Floor Lounge
1:00-3:00	Tour of VEMCO	Dartmouth/Bedford, NS
3:00-4:30 pm	Guest lecture on sea floor biology Dr. Anna Metaxas	LSC, Biology 5th Floor Lounge
4:30-6:00 pm	*Introduction to Finances, Part 2* Dr. David Roach, Rowe School of Business	Rowe School of Business, Rm 1010

Wednesday, 05 Oct. 2016

8:00-10:00 am	*Thesis Advisory Committee Meetings*	arranged with TOSST supervisor
10:00-12:00	*Guest lecture on ocean acoustics* Dr. David Barclay	LSC, Biology 5th Floor Lounge
12:00-1:00	Lunch	LSC, Biology 5th Floor Lounge
1:00-3:00 pm	*Guest lecture on Ocean Engineering* Greg Siddall, B.Eng., Bedford Institute of Oceanography	LSC, Biology 5th Floor Lounge
3:00-5:00 pm	*Marine Shipping Risks and Noise* Panel discussion	LSC, Earth Sciences Milligan Room
5:00-6:00 pm	*Reception with panel*, refreshments provided	SOSB Atrium

Thursday, 06 Oct. 2016

8:00-10:00 am	*Thesis Advisory Committee Meetings*	arranged with TOSST supervisor
10:00-11:00 am	*Group Work on Dragon's Den project*	

11:00-12:30 pm	*TOSST-HOSST Mini-symposium* with Mr. Werner Wnendt, German Ambassador to Canada	LSC, Biology 5th Floor Lounge
12:30-1:00 pm	Lunch	
1:30-2:30 pm	*Tour of Seabird Scientific*	Halifax, NS
3:00-7:00 pm	*Group Work on Dragon's Den project*	
7:00-8:30 pm	*Plastics in our Oceans*, Jenna Jambeck 9th Annual Ransom A. Meyers Lecture in Science & Society	McCain Building, Ondaatje Hall

Friday, 07 Oct. 2016

9:00-12:00	*Group Work on Dragon's Den project*	
12:00-1:00	Lunch	
1:30-4:00	*Dragon's Den Presentations* Mr. Werner Wnendt, German Ambassador in attendance	LSC, Earth Sciences Milligan Room
5:00-7:00	*Summer School Reception*	SOSB Atrium

ACKNOWLEDGEMENTS FOR 2016 HOSST-TOSST SUMMER SCHOOL

The Halifax Summer would not have been possible without the efforts of many people. HOSST-TOSST is very thankful to all guest speakers who donated their time, including Dalhousie President Richard Florizone, Dr. Boris Worm, Hana Nelson, Dr. David Lowe, Dr. Kim Davies, Dr. Anna Metaxas, Dr. David Barclay, and Greg Siddall. We also thank Geri Musqua-LeBlanc, Elders in Residence, and Fred Whoriskey (Ocean Tracking Network) for their workshops. HOSST-TOSST is particularly indebted to David Roach for the many hours and initiative he took introducing participants to the business world and helping to prepare them for their Dragon's Den project.

HOSST-TOSST gratefully thanks panel members: Susanna Fuller (Ecology Action Centre), Dr. Jon Grant, Stefan Leslie (MEOPAR), Robert Orr (Cuna del Mar), Dr. David Barclay, Dr. Ron Pelot, Hilary Moors-Muphy (BIO), Bruce Martin (JASCO), and Paul Yeatman (Geospectrum). Thank you Dragons; Jim Hanlon (IORE), Tony Hall (Welaptega), Mark Jollymore (Amirix-VEMCO), Desiree Stockermans (Ocean Sonics), Hana Nelson (Afishionado), and Christine Penney (Clearwater), without you the Dragon's Den event would not have been possible.

A big thanks goes to FORCE, Ocean Sonics, Jim Eddington (Aquatron), Seabird Scientific, Amirex-VEMCO, Clearwater, Afishionado, and ProOceanus for showing us their facilities. We would also like to recognize the TOSST summer school planning committee representatives, Mirjam Held, Masoud Aali, and Lorenza Raimondi for their input and ideas.

We were honored to include Mr. Werner Wnendt, German Ambassador to Canada in the Halifax Summer School. Thank you to the Ambassador, the German Embassy, Christoph Hebermehl, and Pat Rodee for making it possible.

Thank You!

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