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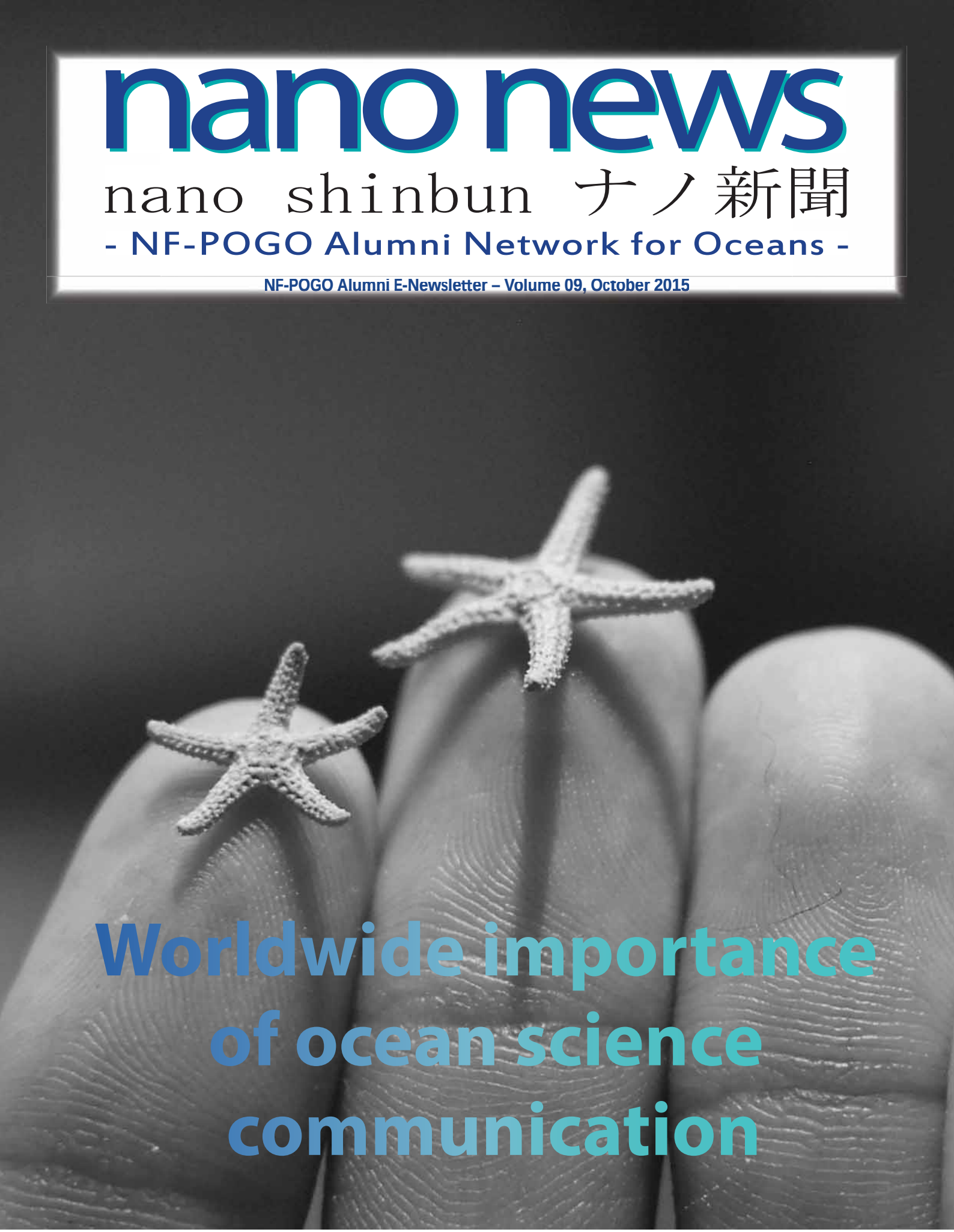
- NF-POGO Alumni Network for Oceans -

NF-POGO Alumni E-Newsletter – Volume 09, October 2015



Worldwide importance of ocean science communication

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pogo Partnership for Observation of the Global Oceans

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NF-POGO Alumni E-Newsletter – Volume 09, October 2015

This issue:

LET US SHOW YOUR ART

Have any nice photos or figures to share? E-mail us your seascapes, underwater photos or photos of field work and we'll include them in NANO News!

Baby starfish, by Kevin McCarthy. *The author has kindly authorized the use of his photo to illustrate this NN issue cover.*

From the Editorial Board

It is with great pleasure that we present the 9th issue of the NANO Newsletter dedicated to Ocean Science Outreach and Communication. The World Ocean regulates the climate on our planet, contains hundreds of thousands of unique and diverse species and represent the key source for livelihoods for over three billion people. Considering the wide global coverage of NANO, it is essential for the network members to promote public awareness and understanding of ocean science. In this regard, it was agreed to launch outreach activities within NANO during the annual meeting in Berlin.

The 9th NANO issue begins with an introduction to the NANO Outreach project provided by Monika Grabowska, the project coordinator, followed by an article from Lilian Krug who presented the project on the ASLO conference in Granada, Spain and share examples of outreach activities in other institutions. Since the start of the project, several NANO members have received funding to conduct outreach activities in their home countries (Argentina, China, Bangladesh, Ghana and India). In this issue you will read about their experience and the challenges they had to face. We also received a number of articles from NANO members sharing their past experience in science communication. You will get to know what it is like be involved in outreach activities in Brazil, England, Portugal, Venezuela, India, Germany, and Japan.

We also included articles from senior scientists and communicators who provided useful tips and thoughts on ocean science outreach. We hope that by reading them you will learn good principles of science communication and get inspired.

The NF-POGO Scholars for Year 2 CofE program at Alfred Wegener Institute and key updates on the regional NANO project in Southeast Asia are featured.

We are extremely grateful to all the authors who submitted articles for the NANO Newsletter 9!
I wish you a happy reading,
Yours sincerely,

Anna Rumyantseva
Editor-in-chief

outreach
noun [U] /ˈaʊt.riːtʃ/
An activity of providing service to populations who otherwise might not have access to that service.
http://www.pieceofeight.com/

Launching Outreach activities in NANO

The first main assumption of the Outreach Project, initiated during the Annual NANO Coordination Meeting held in Berlin in 2013, was to distribute and exchange knowledge by establishing a catalogue of educational resources. The main goal of the project was to create a 'place' where NANO members could share their ideas for teaching and/or educational materials they have been using in their work for use by other Alumni. Our intention was to provide a comprehensive source of oceanographic knowledge from which all POGO alumni could derive information on various ocean related topics and use these resources for teaching or educating society.

As a fast growing and constantly developing international Network created by people from different parts of the world, ocean enthusiasts, possessing knowledge on diverse oceanographic topics, we are capable of creating an incredible repository of scientific knowledge. It is a great privilege to be able to share the experiences with one another and transfer this knowledge further. The NANO Outreach Project gives a wonderful opportunity for that and thus it guides our goal.

In a nutshell

The project was officially launched in 2014 and initially resulted in the collation of educational materials in the online catalogue (http://www.nf-pogo-alumni.org/NO_Catalogue). Successful, small, Outreach Projects were conducted by Chunli Liu in China, Lailah Akita and Angela Lamptey in Ghana, Mohammad Uddin in Bangladesh, Nandini Menon in India and Mara Braverman in Argentina. These NANO members conducted outreach activities to disseminate knowledge to people of different age-groups about the oceans and issues related to its protection, sustainable exploitation and environmental issues.

The success of the NANO Outreach Project initiatives and lively interest of NANO members were rewarded by extending funding for these and other activities and the Outreach project continued into 2015. For this year we are hoping to expand the catalogue database and load it with additional ocean-related educational presentations from the NANO members and continue supporting individual initiatives especially outreach and knowledge dissemination. This goal will be accomplished only with full participation and engagement of all Alumni. From this place we would like to encourage greater involvement and contribution to the online educational catalogue. Recently we have closed the second call for grant proposals for the Outreach Activities and a contest for the design of educational gadgets. Both dedicated particularly to NANO members. We are pleased that they captured the attention of many NANO members. So far we have selected five projects to be held during this year. We are looking forward to the positive effects and feedback from their work to raise public awareness. Increasing the interest of Alumni in Outreach activities is appealing and we are hoping for further engagement of Alumni into our initiatives.

Dr Monika Grabowska
Coordinator of NANO Outreach Project
Institute of Oceanology, Polish Academy of Sciences, Poland

nano Global Ocean Education

Dissemination of knowledge, raising public awareness of threats to the Ocean and spreading good habits regarding marine environmental protection should be part of the job of every Oceanographer. Thus NANO has developed an outreach component as an addition to its research-oriented projects.

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Report on the NANO-POGO Outreach Program in Ghana

Dr A. M. Lamptey

Department of Marine and Fisheries Sciences, University of Ghana, Accra, Ghana

The outreach program was finally scheduled for 12th August 2015. The participants included a youth group of Action Chapel International, some interested individuals and some level 300 students of the Department of Marine and Fisheries Sciences, University of Ghana. The audience were 62 in number for the seminar and twenty of them participated in the beach clean-up. This was as a result of the fact that there were other activities scheduled for the same day. There was a one-hour slot for the seminar. They were aged between 19 and 28 years. The seminar was held in the Francis kofi Drah Conference Room on University of Ghana campus. The participants were shuttled from the church premises to the University of Ghana and to the James town beach (the most polluted beach in Ghana) for the clean-up exercise. Refreshment was served and souvenirs (pens, notepads and bookmarks) were shared after the seminar.

The seminar topic was, "Importance and Conservation of the Marine Environment"; in which they were briefed on the various divisions of the marine environment and its importance, problems associated with the marine and coastal environment in Ghana, and the preventive measures to tackle the environmental issues. A Naval Officer was invited to give a 5-minute talk on the role of the Ghana Navy in protecting the Ghanaian coast. The audience was very responsive and had lots of questions to ask after the seminar.

The beach clean-up lasted for two hours and the dominant litter identified was mainly plastics. Plastic litter is a big menace in Ghana. The litter was identified and sorted out and later disposed of. The beach clean-up was meant to create the awareness of the devastating effect of littering our environment.

Top: Dr Angela Lamptey and participants of the outreach event in Ghana.

Bottom: The James town beach clean-up

Marine open day in Weihai city

Dr Chunli Liu

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Marine College, Shandong University, Weihai, China

The oceans are the blue home for mankind and treasury for sustainable development. In the 21st century, we are entering an era of marine exploitation and utilization. Weihai city is on the long Yellow Sea coastline. With economic development, Weihai city is facing many problems such as marine water pollution, marine litter, overexploitation and unsustainable use of marine resources. Therefore, it is necessary to promote ocean literacy among people especially among children. This will ensure efficient protection of the marine environment in the future. In order to achieve this goal, our team held one outreach project for the students of Weihai primary schools. The activity topic is "Oceans protection, here we are on the road!"

Six activities were conducted during the event:

- Visiting art exhibition called "Impressions of Sea"
- An on-site visiting of the laboratory of marine animal specimens
- Microscopical observations of several common marine phytoplankton species in coastal waters of Weihai area. Here, the students discovered the invisible side of the wonderful world
- A science lecture on marine protection. The lecture aimed to advocate for a positive outlook on the protection of the marine environment and for active participation in the protection activities.
- Creating vivid marine organisms with beautiful plasticines
- Taking photos for all participants.

The event was very successful. It increased the students' interest in the marine environment and provided basic knowledge of marine biology. After answering questions from curious students, every student was given a small gift (plasticine marine animal). Propaganda film, 'Marine hazards and prevention' was shown and inspired the students to protect the marine environment. In the end, the students drew lovely marine animals on a six-meter long canvas and left their signatures to express their willingness to protect the environment. Both parents and students enjoyed this event and learned about the tight connections between marine environment and mankind. They also learned that marine protection is not only done by specialists, but that regular people can also contribute to this important process.

NANO Outreach in India – Experiences on Teaching at Different Levels

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The NANO outreach programme in India gave me the opportunity to introduce the work done by pioneering scientists in the field of Marine Biology, especially on marine pollution and its ecological impacts, and through this create awareness about the need for conservation of the sea. The series of lectures conducted for postgraduate students evoked only moderately enthusiastic response among the students and I was left with a feeling that the outreach programme failed to have the impact anticipated in the mind of youngsters. So another series of lectures was offered at undergraduate and high school level. These led to much better feedback from the student community, their involvement in environmental issues and their commitment to society.

The lectures were held in a government upper primary school, a reputed women's college and a University in Kochi, at the southern tip of India. Oil pollution and invasive alien species were selected as the main themes of the lectures, as the students in the institutions in Kochi are very familiar with this kind of pollution due to the location of an oil terminal which is situated close to the mainland in the estuary which frequently produces a foul smell of petroleum hydrocarbons in the air during tanker loading and unloading, and leakages leading to fire in the estuary.

The talks given to the three different categories of students varied in their scientific content. For the school students the focus was more on the basics of marine pollution, sources and fate of oil in the ocean, easily understandable impacts of oil pollution, and introduction to invasive alien species with examples cited from Kerala waters. Pictorial representations, animations and lecturing in the local language Malayalam helped in getting the attention of the audience. At the undergraduate level, the talks were more scientific. The focus was given to oil pollution and its impacts with special reference to the dissolved fractions that leach out into the water in the case of oil spills. This topic was accepted immediately by the students as they were familiar with the oil slicks and films floating in the estuarine waters around the oil terminal. Vectors that introduce invasive alien species, the relative importance given to each of these vectors and ballast water management were also dealt with. The medium of instruction was English at both the undergraduate and postgraduate levels. At the postgraduate level, the same topics were dealt with from a purely scientific standpoint. The biological impacts of oil pollution were dealt with in detail with reference to DNA adduct formation and recent developments in bioremediation techniques. Ballast water management and invasive alien species were dealt with in an interactive fashion rather than teaching using only a PowerPoint presentation. Facts were presented with clear-cut references and simple illustrations. At all the three levels, the students were very much attentive to the sessions.

By observing the reactions of students to the lectures, it was felt that the school children were more enthusiastic to learn about the pollution aspects and eagerly listened to the impacts of an anthropogenic activity that happens in their neighbourhood. It was interesting to note that even school children were well aware of topics such as global warming, and climate change, whereas they had only a faint idea about marine pollution and were absolutely unaware of invasive alien species. The response of the postgraduate students was lukewarm. This could be because the undergraduate and postgraduate students were aware of the topics, only that they lacked information on the details and management measures. Along with the lectures on marine pollution, an appeal was made to conserve the seas, which was also received with great interest by the school children when compared with the university students.

Another aspect that caught my attention was that the post graduate students showed more interest in knowing about POGO and NANO activities than the scientific subject itself, whereas school children were more interested in the subject and hardly listened to the activities of POGO and NANO. At the undergraduate level also, which was a women's college - the students did not seem to be interested in the POGO and NANO activities. This intrigued me as Kerala is a state of

high literacy for women, and women dominate in graduate and postgraduate levels (see photo on the right). I wondered if my experience shows that the girls are interested only in scoring high marks in exams and thereby securing seats available for higher studies?

The outreach programme was an opportunity to assess the social commitment of the young generation in Kerala. Even as the grim reality of chronic pollution from an oil terminal with minimum reception facility and the invisible threats to the ecosystem unwound in front of them, it was the school children who reacted strongly whereas the university students, who are the envoys of the future generation, viewed the whole scenario with apathy. This disinterest could have been because of their knowledge of these topics beforehand. The impression that I had from the outreach lectures was that any attempt to create awareness on conservation of the sea has to be started among younger children. They imbibe information, become alarmed by the dangers of silent chronic pollution of the marine environment and would surely act, whereas the more scientifically literate the student is, the lesser is his commitment to the environment. This should not be viewed as a comment applicable to the student community as a whole, but this is a reflection of the lethargic reaction of some people of Kerala to socially relevant problems.

A view of the students who attended the outreach lecture at St. Teresa's College, Kochi.

Ocean literacy campaign in Bangladesh

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Although "Ocean Literacy" is a growing movement in Europe and worldwide its necessity is yet to be felt nationally in most of the developing countries such as Bangladesh. Most parts of the country's south and southeastern regions are less than 3 meters above sea level and has one of the most geomorphologically dynamic active deltas prone to ocean-related hazards like cyclones, storm surges, floods etc. The country has already been suffering from the vulnerable situation due to ongoing climate change. In addition, the offshore Island, Sandwip has been turned into a refugee site for climate change. But the people of this island (where about 350,000 people have been living in an area of only 250 km^2) are totally ignorant of the oceanographic and the climate knowledge necessary for hazard management and resilient community development.

Inspired by the NANO outreach project initiative to encourage its alumni to conduct outreach activities in their home countries, a proposal was submitted aiming to organize a seminar followed by a visit to Sandwip Island, Bangladesh. School teachers and students were primarily targeted as an important audience. Teachers are able to pass their knowledge onto students as well as society in general. Those students could grow up to become scientists, policy makers or any other type of stakeholder of the ocean.

The Seminar was carried out in the framework of the 1st attempt of the "Education and Prospect for Sandwip island, Bangladesh" supported by NANO Outreach project 2014. The workshop took place from 27th to 30th of December 2014. It was held at the Hall Room of Sandwip Ananda Pathshala in Sandwip Island, Chittagong, Bangladesh. Briefly, the seminar consisted of lectures, questions and answers on the topics of Lectures (Ocean Literacy and RISCKIT) and followed by a site visit on the following day.

The main goals set for the seminar and field visit are stated below:

- Offer a brief introduction to the Oceanography and importance of Ocean Literacy
- Offer a brief introduction to the EU project RISCKIT and its activities in Sandwip
- Presentation of the Lecture 1 on Ocean Literacy focusing understanding the Ocean's influence on you and your influence on the Oceans following standard principles of Ocean Literacy including its worldwide view and status
- Presentation of the Lecture 2 on RISCKIT project focusing on the objectives of the project reasoning behind Sandwip to be selected as the only international study site outside of Europe and the results produced so far for the island

- A site visit program for the interested learners to the accreted and eroded coast of the island
- Personal as well as group discussions with the interested participants of the island on future prospects and oceanographic education for the next two days

Two speakers led the seminar. At the beginning, Mr Abdur Rahim, Assistant Professor of History, Government Haji A. B. College at Sandwip, offered opening lectures on general topics regarding the objective of the seminar and importance of oceanographic research and education for sustainable coastal and Island management. Furthermore, Dr Mohammad Uddin, from the Institute of Marine Sciences and Fisheries, University of Chittagong delivered two more lectures on Ocean literacy and the Risckit project. Both speakers provided a valuable input as lectures and also by getting the public involved into the discussion on how to improve oceanographic education and research for the benefit of the island in the face of climate change-related vulnerabilities. On the 2nd day the participants visited a site to the North of Sandwip, a newly accreted and eroded land area, and talked with affected people to understand their perceptions.

Finally, it is worth mentioning that the conducted outreach project served as an appreciated start for Oceanographic education which promised to yield remarkable outcomes for the whole island. Moreover, both organizers and participants perceived and acknowledged the commitment of POGO and NF in order to get a good outcome for the motto- “together we can make a change in the world!”

Scenes of NANO Outreach activity in Bangladesh

NANO SEAsia Regional Project field work in Indonesia. Read more at page 17

The Education and Outreach session at the ASLO Meeting 2015

Lilian Krug

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In February this year, 2500 students and researchers from 64 countries met in Granada, Spain for the ASLO (Association for the Sciences of Limnology and Oceanography) Aquatic Sciences Meeting: Global and Regional Perspectives – North Meets South. During one week, participants discussed a variety of subjects related to recent freshwater and ocean sciences achievements. Several members of the NANO network attended the meeting presenting results of their research work. NANO itself participated in a very special session, the session 133: Aquatic Science Education and Outreach – Expanding International Science Literacy. In the NANO presentation we introduced the alumni network history, its members´ commitment to it and the results of our activities, especially those from the Outreach component.

The section included 21 oral presentations and 4 posters delivered by representatives of universities, networks and groups of graduate students. It was great to see different examples of activities being implemented on the improvement of aquatic science literacy around the world. In this article I would like to mention a few successful examples presented at the session. Some of these initiatives I believe are not too demanding to execute and I hope this may bring inspiration to our alumni to conduct their own outreach activities. This article was written based on my notes from the session and additional information obtained on abstracts and websites. Although I put my best effort into writing everything down during the Meeting, I would like to apologize if any relevant information has been overlooked. I have included links for the activities summarized here and direct readers to them for more information and contact details.

Lilian Krug presenting NANO and its Outreach component at the ASLO Meeting

Digital Explorer

Dr C. Lewis from the University of Exeter (UK) presented the Digital Explorer Programme (http://digitalexplorer.com/) that aims to bringing science to the classroom in the UK. The programme supports school teachers by using marine sciences examples and case studies to cover core science topics. The organizers encourage the use of tools that brings science to life, like photos, videos and computational resources in classroom demonstrations. One of the examples mentioned by Dr Lewis was the use of Google Earth's street view on coral reefs (https://www.google.com/maps/views/streetview/oceans?gl=us). Kids were introduced to the device and left to explore it. Examples that they encountered were used later to explain ecosystem components.

Digital Explorer has training courses for school teachers who then become programme ambassadors and deliver cascade training to their own colleagues. At the time of the Meeting, they had applied it to almost 40 schools in the UK and it was proving to be very successful.

ScienceToGo

The partnership ScienceToGo (www.science-togo.org) presented a creative example to raise climate change awareness among the general public in Boston (USA). They 'advertise' it through posters and placards on subway platforms and trains, where more than 400000 people commute every day. A light humorous message is delivered by the character Ozzie, an ostrich who along with his friends takes a journey to "raise his head out of the sand" to become a climate leader. In addition to the advertisements on the trains, there are a website, a selfie app, cutout ostrich signs placed around the town, social media (Facebook and Twitter) and other ways to engage, educate, and entertain people in the city.

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Ocean Acidification: A Systems Approach to a Global Problem

The Institute for Systems Biology (USA) presented an activity called Ocean Acidification: A Systems Approach to a Global Problem (http://baliga.systemsbiology.net/drupal/education/?q=content/ocean-acidification-systems-approach-global-problem). This 5 week-secondary school activity teaches critical systems thinking through ocean acidification research with hands-on, interdisciplinary, standards-based lessons. In the course, students take different roles as scientists and investigate the consequences of changing carbon cycle on the oceans. They critically assess data, create a network diagram, align themselves with stakeholders and design collaborative experiments to test hypotheses and network properties. They discuss findings, systems consequences, and make recommendations for further research, policy-making, and lifestyle changes. Dr C. Ludwig said that after accomplishing the activity; students show a higher level of engagement, increase in science literacy and scientific inquiry.

Scientific Research and Education Network

A group of graduates in North Carolina (USA) created the Scientific Research and Education Network (SciREN - http://www.thesciren.org/) The aim of the network is to connect the science, technology, education and math (STEM) educators to researchers, facilitating collaboration and sharing of knowledge. SciREN accomplishes these goals by hosting biannual events, which bring researchers and educators together for face-to-face interaction as well as exchange of ideas and materials. Pretty much like a speed date event according to A. Paxton, a PhD student at the University of North Carolina who gave the talk.

It brings cutting-edge research into classrooms and supports researchers in improving outreach and communication skills. SciREN – which started with a marine science focus and now encompasses all STEM fields – connects + 500 educators and researchers across their state. Their intention is to expand activities to other states and countries. Paxton also mentioned they were working on a handbook with guidelines for preparing this kind of interaction event.

The ostrich Ozzie and friends, characters from Sciencetogo Outreach activity in Boston (USA). Source: www.sciencetogo.org

The sticker distributed by the University of Buenos Aires to raise awareness on the role of Cyanobacteria in the marine ecosystem. Source: Gigantes Microscópicos Facebook page.

Gigantes Microscópicos

The limnology laboratory of the University of Buenos Aires (Argentina) participates in several activities aiming to communicate their research to the general public. Dr Tezanos Pinto was focused on a few of the activities during her talk. One of them is the annual event "Night of the Museums". It happens at the University building, where ~ 1000 visitors spend the evening (from 8 pm to 2 am) visiting laboratories' stands. The Limnology group display activities for adults with microscopes, magnifying lenses and games, and for young with a Create Your Algae art and painting session. A brief talk on the Gigantes Microscópicos (Microscopic Giants), focusing on nitrogen fixing Cyanobacteria and the awareness of their ecological importance is completed with the distribution of stickers (Figure 3) and a take-home message (Facebook page: https://www.facebook.com/pages/Gigantes-Microsc%C3%B3picos/640661296041916).

The laboratory also participates in two different activities dedicated to high school students: 1) the Biology Week, where they show the students what limnologists do; and 2) a programme where science-oriented students become involved in a research project in the laboratory and later present their findings to the general public at the conference.

Science Cafes

Another initiative from graduate students is the Science Cafes, where selected speakers initiate conversations with short descriptions of their work. Science Cafes is run through the GrOE (Graduate students for Ocean Education) Facebook group (https://www.facebook.com/COSEEGrOE) in association with other organizations.

Diving into the ocean

The Campus do Mar (Sea Campus - www.campusdomar.es) is a project led by the University of Vigo together with three other universities, the Spanish Council of Scientific Research and the Spanish Institute of Oceanography. It gathers 25 marine research institutions to develop research, teaching and technology transfer in Galicia-Northern Portugal Euroregion. The Campus do Mar also has an outreach project called Diving into the Ocean. Activities in Diving into the Ocean are based on the science generated by researchers and adapted by educators.

Every summer since 2011, they perform the activity at the beach or in the city bringing marine science to the public throughout simple experiments. Coloured water tanks demonstrate thermohaline circulation, water samples on a microscope show the diversity of microscopic organisms, a water tank with fake fishes is used to instruct on minimum size limits for fish catch and impacts of overfishing and so on. Some experiments approach coastal upwelling processes, ocean acidification, world fishing areas and the origin of commercial fish species, integrated coastal zone management and dunes structure and dynamics. The programme is complemented with fieldwork activities and outdoor movie exhibition.

Each experiment is located in a station, and, as the public walks through the tent, they stop at different stations. Kids receive a passport at the entrance which gets stamped at the visited stations. At the end of the visit, if a passport is completed, a child can exchange it for a small gift and the title of "Expert Marine Researcher". The audience is then asked to answer questions to evaluate the workshop. After 4 editions of the project, more than 90% of visitors expressed their interest to repeat the learning experience. Dr Juanez, who presented Diving into the Ocean, said the success of the activity depends on the ability to adapt the speech to the age of the participants, who have been from 2 to 99 years old.

Chile es mar

The Pontifical Catholic University of Chile presented campaign Chile es mar (Chile is ocean), an educational platform for marine conservation in the country. Their activities involve local action at the small aquarium where they engage students with age-specific activities and games and also visiting schools, delivering non-formal education approaches. Chile es mar (www.chileesmar.cl) also has a national scale of action, targeting responsible seafood consumption with the involvement of the population and restauranteurs. Restaurants associated with Chile es mar compromise in selling seafood that respects size and season. They also distribute educational material like informative cards, coasters and tray liners, bracelets for kids, postcards pictures and poems from Pablo Neruda, the famous Chilean poet.

Front and back of informative cards distributed in the campaign Chile es Mar.
Source: www.chileesmar.cl

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Ten top tips for effective science communication

Dr Sophie Seeyave

POGO Executive Director
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Compiled by Dr Sophie Seeyave from information gathered from the POGO News and Information Group and Ocean Communicators United

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Scientists are generally not trained as science communicators, and their day job consists of communicating very complex research results to other scientists using highly technical jargon and a host of acronyms. The tips below have been assembled by polling a few Science Communication experts about the most important aspects of science communication. Most of the advice can be applied to a number of communication methods, such as writing in popular science magazines, blogging, using social media, writing press releases, responding to interviews, science fairs, school activities and many more.

1. A good title

- The title should make the reader curious. Many titles of publications in scientific journals don't.

2. The language

- Explain your research and findings in terms that anyone - including your grandmother!- can understand. In other words, don't use technical or specialized terms to sound important when you have a more general alternative that a much larger audience will understand. As a rule of thumb, words longer than four syllables are iffy, and acronyms are alienating. Omit sentences with more than one comma.
- Content that could be quite dry if stated in a purely factual manner can be brought to life by weaving it into a narrative, using story-telling and humour and engaging the imagination of the reader by posing questions and bringing in the senses. Use analogies and metaphors to help provide context for your work. Be as creative, multidisciplinary, interactive and engaging as possible.

3. The content

- Layer the information and stick to a handful of take home messages. Some people will just read the first paragraph or two, some people will just look at the pictures, graphs and subheadings, some people will read every word. Set it up so that every one of these readers will walk away having gained something.
- Tell your audience how your (often rather technical and academic) research is embedded in an issue which they will recognize and (hopefully) agree with you that it is important. A connection to a generally well-recognized societal issue increases the chance that your news is picked up. Blue-skies science is often more difficult to 'sell' even if it is something you, as a scientist, are very passionate about.
- Real life applications and examples will bring to life why what you are saying is important. Try to think as your audience would to bridge gaps with them instead of creating an abyss.
- Always explain why your science matters, by answering the "so what?" question.
- Incorporate pictures (and video) into your communications for they are "truly worth a thousand words". Think about how to evoke the other senses.
- Be well prepared. Don't speculate and don't be afraid to say "I don't know".
- Good science communication is built on good science.

Engaging the public by encouraging them to love the ocean

Dr Vikki Cheung

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"If there is magic on this planet, it is contained in water."

Loren Eiseley

"People protect what they love" said Jacques Yves Cousteau, a pioneer of marine conservation and co-developer of the Aqua-Lung. This was the philosophy that gave birth to a mass participation event called 'The Blue Mile' (www.thebluemile.com), which started in 2010 in the city of Plymouth, UK, the location of the POGO Secretariat.

The Blue Mile is an event where participants can swim, kayak, or paddle on a standup paddleboard, the distance of a mile (or more if they enter the Aquatriathlon), in a "race for the environment". The participants can enter as individuals or teams. By getting people immersed in the marine environment, they come to appreciate it, love it and protect it. For the first four years of the event, Ecover was the title sponsor. This brand produces and manufactures cleaning products that use natural ingredients and minimise the impact on the environment, particularly the marine environment where many detergents and cleaning products end up. The aim is to raise the public's awareness about some of the chemicals that are present in other products that can cause damage to marine biota and contribute to water quality issues such as eutrophication, so that they take this into consideration when they make their next purchase of cleaning products. This year, the title sponsor is 'Rockfish'. This is a restaurant chain with outlets in the South West of England. It is a member of the sustainable restaurant association and serves fish that are certified as sustainable seafood. "Fish and Chips" is a classic British dish, but the source of the fish might not always be sustainable. By raising consumers' awareness of which fish stocks are under pressure and serving locally sourced species, this helps to educate consumers' palates, as well as their conscience.

In addition to the on-the-water activities, the event's charity and educational partners such as the World Wide Fund for Nature (WWF), Marine Conservation Society (MCS) and most recently the Shark Trust provide exhibits in the race village that enable spectators, participants and passers-by to learn more about the marine conservation activities that take place locally and world-wide and how they inform policy-makers with the research that they conduct. Other educational exhibits have been provided by partners such as Plymouth University, the Marine Biological Association, South West Water, the National Marine Aquarium, the Sir Alister Hardy Foundation for Ocean Science and others. These provide opportunities for visitors to the race village to take part in science workshops, see microscopic plankton, learn about how to conserve water use in the home and hear about amazing animals and plants that inhabit the marine environment.

However, the educational programmes are not just limited to the race events, there are some downloadable ideas for classroom activities (http://www.thebluemile.com/schools/) for pre-school, primary and secondary school level pupils, and school visits to the Rockfish restaurants can be arranged.

I have been involved with the event every year and love the opportunity to talk about the ocean; share my thoughts on the importance for people to make the right choices in their everyday lives to minimise their environmental impact; and particularly, persuade people to reduce waste, reuse and recycle as much as possible; and to encourage children to appreciate and take care of the environment. It is this generation, their children and grandchildren who will live in a world with ever increasing pressures on the planet and its resources and education is the key to reducing the detrimental impacts of human activity.

Schools kids at the Blue Mile event in Plymouth
(Photo by Sport Environment)

The Blue Mile swim
(Photo by Sport Environment)

Making marine microbes matter

Darlene Trew Crist

Director of Communications
Bigelow Laboratory for Ocean Sciences, Maine USA

The communications challenge was a grand one. How could we make people interested enough in marine microbes to be curious about the research being conducted here at Bigelow Laboratory for Ocean Sciences? Bigelow Laboratory is the only independent basic research institution in the world that focuses on microbial oceanography. How could we pique people's interest? Draw them in? Make them understand that the invisible world of marine microbes is vitally important to planetary balance? And, how could we make them understand that we need to know a whole lot more about how the ocean's tiniest inhabitants are responding to ongoing climate change?

Our motives were not entirely altruistic. We also wanted to advance the reputation of the Laboratory, draw attention to the world-class research going on here, and garner additional public and private support for our research. To meet our goals, we made the invisible visible and, by so doing, set out to make "marine microbes matter."

Using images taken at three different scales with three different microscopes (compound-light, confocal, and scanning electron), we not only made the invisible visible, but we made the visible huge! We coloured and enlarged images of diatoms, dinoflagellates, coccolithophores, and other tiny marine organisms into a photographic exhibit of 18 images that ranged in size from 40" x 40" to 60" x 50." We called the exhibit, which we took on the road for display in public places, *Tiny Giants: Marine microbes revealed on a grand scale*. We captioned the images with information about the microbe itself, its role in the environment, its benefit to society or notation if it was at risk, and any relevant research being conducted at the Lab. An accompanying brochure was created, but in the interest of "being green," we created an app (http://tinygiants.toursphere.com) that described the various images that was accessible on a smartphone. For those without smart phones, we offered up a local call-in number that provided an audio tour.

To date, the exhibit has been seen by thousands at venues throughout the New England region of the United States, with a full schedule plan through 2016. In September of this year, the exhibit will move to Colby College in Waterville, Maine, where professors are developing curriculum around the Tiny Giants exhibit in a variety of disciplines ranging from the arts and humanities, to the sciences, to economics. In terms of media coverage, we succeeded in opening up coverage in new media markets, including a slide show on National Public Radio. In short, as our exhibit literature reads, *Bigelow Laboratory for Ocean Sciences is proud to share the beauty, wonder, and fascinating stories of these amazingly intricate and adaptable organisms upon which our lives depend*.

Example of images and captions

TINY GIANT #3
BIOENGINEERING A SOLAR PANEL

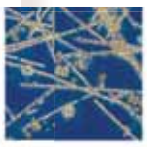
Light-harvesting green chloroplasts are distributed throughout the cylindrical diatom *Coscinodiscus*. The energy they harvest from the sun makes this diatom one of the giants of the microbial world – some are even visible to the naked eye, with individual cell dimensions of nearly half a millimeter! This top-down view shows the nano-scale architecture of *Coscinodiscus*' silica skeleton, which is so efficient at collecting light that engineers are copying it in solar panel designs.

Credit: Dr. Peter Countway, Bigelow Laboratory for Ocean Sciences with funding provided by the National Science Foundation

TINY GIANT #1
FOUNDATION OF MARINE FOOD WEB

Chain-forming diatoms from the genus *Thalassiosira* often initiate the early spring phytoplankton bloom. These diatoms provide an important source of nutrition to the base of marine food webs, just as larval fish are looking for their first meal. *Thalassiosira* was the first single-celled marine alga to have its genome fully sequenced. Bigelow Laboratory Senior Scientist (Emeritus) Robert Guillard isolated the strain of *Thalassiosira* that was used in this pioneering work.

Credit: Laura Lubelczyk, Bigelow Laboratory for Ocean Sciences with funding provided by NASA



TINY GIANT #11
FALL HARVEST

Floating at or near the surface of the sunlit ocean, phytoplankton display thousands of morphological variations. A single tablespoon of seawater contains hundreds of thousands of these single-celled organisms. Though most are invisible to the naked eye, phytoplankton impact the atmosphere, climate, and ocean food chain in ways that are disproportionate to their size. All life in the sea depends on the abilities of phytoplankton to capture energy from the sun and to convert it into biomass. Each fall, some phytoplankton proliferate into a bountiful harvest in response to prevailing environmental conditions. Scientists are looking at the implications of ongoing changes in the timing and duration of these autumn blooms.

Credit: Dr. Peter Countway, Bigelow Laboratory for Ocean Sciences with funding provided by the National Science Foundation

The Tiny Giants exhibition in Portland

New school lab at the Alfred Wegener Institute on Helgoland

OPENSEA - Marine EcOlogical Program for EducatioN and SciencE@AWI

Dr Antje Wichels

Alfred Wegener Institute of Polar and Marine Research

In March 2015 the new AWI school lab OPENSEA at the Biologische Anstalt Helgoland was established. Our target scholars are High-School Graduates (ages 16-18) with a strong interest in natural and marine sciences. Up to 25 scholars at a time are invited to spend 5 days in our school lab to perform indoor and outdoor experiments and field excursions on the beautiful Island of Helgoland, in the middle of the German Bight (North Sea).

It is widely accepted that young people will learn best if they are actively engaged and if their activities are closely linked to understanding important biological concepts. We offer a scientific environment to explore the marine science, thereby promoting young peoples' scientific thinking. We encourage the scholars to ask scientific questions, conduct experiments and collect field data to find conclusive answers and to foster scientific thinking.

We impart knowledge in the oceanography and biology of coastal regions. With the unique marine site of Helgoland we can offer a unique and exciting marine environmental experience. Helgoland is special as it exhibits an immense diversity of animals and plants both in marine pelagic and benthic habitats.

Key aspects of our concept are the learning of how to protect the marine environment and to manage marine resources. Climate change is studied by evaluating our knowledge of the consequences of the invasion of alien species, both considered in the light of risks or chances for the environment. Rising water temperature as a factor is explored with focus on consequences to biodiversity and food webs.

Scenes from the school lab OPENSEA in AWI.

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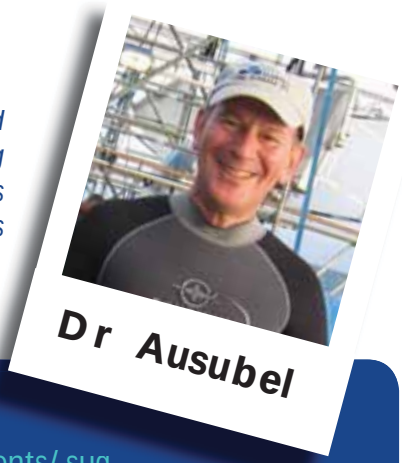
NANO Interview

Dr Jesse Ausubel

Dr Ausubel is a Rockefeller University environmental researcher, former vice president and current science advisor of the Alfred P. Sloan Foundation of New York, one of the founding fathers of POGO and of the Census of Marine Life. In this interview Dr Jesse Ausubel shares his thoughts on the future of the NANO, advice on ocean science communication and tells us about the most important and rewarding experience in his career.



NN You are one of the founders of POGO and now, a NANO Friend. Have you been following the progress of the NANO Network? If so, what is your opinion about the progress we have made so far? Do you have any comments/ suggestions for its future development?

JA The NANO Network is growing in regions where more experts on ocean observation are urgently needed. I hope in another 20-25 years we will look back to find that NANO alumni prove to be the heroes of building the next level of the global ocean observation system.

NN NANO has started developing outreach activities in addition to -and in combination with- its research projects. Drawing on your experience, particularly with the Census of Marine Life, which had a very successful public outreach component, what would your advice be to NANO? How can the results of NANO projects be communicated effectively to the general public?

JA Ocean exploration and discovery fascinate the public, especially when we have good images and maps to help explain what we learn. My advice is always make exciting visualizations an integral part of your work.

NN The ocean is still vastly unexplored, and yet humankind is often more attracted by space exploration than ocean exploration. In your opinion, how can scientists help the public to feel inspired by the ocean?

JA Most experts present only sad environmental news. It is as if we report only the admissions to a hospital and the deaths, but not the births and cures. We need to present a true spectrum of discovery, including marvels. Space exploration has the advantage of an absence of bad or depressing news.

NN Without a doubt, your career is admired by many young researchers. Looking back, can you name major milestones/turning points in your career? Also, do you remember any crisis or critical moments and how you overcame these difficulties?

JA An early involvement with a truly international program (the Global Atmospheric Research Program) and in multidisciplinary, international teams at the International Institute for Applied Systems Analysis (IIASA) affected me greatly. They proved to me that complex cooperation could flourish and reward everyone involved. These efforts also impressed me at the outset of my career about the importance and difficulty of accurate observations.

After about 10 years, I faced a big choice, whether to become a full-time program manager. I wanted also to continue to do my own research and analysis. I was fortunate to be able to move from Washington DC (the capital of program management) to The Rockefeller University in New York City where I could have a career balanced between research and management of research.

NN Can you name three examples of the most rewarding experiences in your career?

JA On the one hand, it is rewarding to build programs, fields, and institutions, such as the Census of Marine Life, World Climate Program and Global Change Program, Encyclopedia of Life, DNA barcoding, industrial ecology, Deep Carbon Observatory, International Quiet Ocean Experiment, and of course POGO. On the other hand, it is rewarding to contribute to discoveries such as decarbonisation, dematerialisation, land sparing, and now global greening.

NN You initiated four major international programs to survey the planet and catalogue its biological diversity, which have been hugely successful. This requires a strong commitment and collaboration of many parties contributing to the projects. In your opinion, what is the key for the successful establishment of such collaborations and sustaining them for a long period of time?

JA Alignment is the most important word. One must search for and create alignment. Programs succeed best when the interests of key individuals (young and old), organisations for which they work, funders, and other stakeholders are aligned. When interests are not aligned, even huge power and money may not overcome the problems.

NN You envision our environment to be protected, but not harmed by technology. Could you explain how this might be?

JA My 1996 essay The Liberation of the Environment (http://phe.rockefeller.edu/Daedalus/Liberation/) explains many of the key ideas. Advances in efficiency and productivity across many sectors can spare nature, and in fact the sparing is happening on a large scale as reported in a 2015 essay, Nature Rebounds (http://phe.rockefeller.edu/docs/Nature_Rebounds.pdf).

NN Finally, do you have any words of wisdom for researchers in the early stages of their careers?

JA With regard to research, always keep in mind that the essence of science is structured questioning of authority. Much of what we are "certain" today will be replaced in 25-30 years, that is, during your career. With regard to management, read a little essay that I co-authored in 1993 with marine ecologist John Steele, Flat organizations for earth science (http://journals.ametsoc.org/doi/pdf/10.1175/1520-0477%281993%29074%3C0809%3AFOFES%3E2.0.CO%3B2).

Read more about educating the public at the Blue Mile event in Plymouth at page 12. (Photo by Sport Environment)

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NANO REGIONAL PROJECTS

A progress on the NANO Southeast Asia 2015 Regional Research

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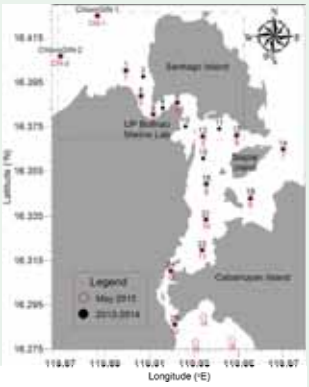
NANO members from five Southeast Asia countries further investigate eutrophication enhanced by nutrient load and modulated by residence time. The study includes fieldwork, lab measurements and application of the LOICZ approach and/or models such as Delft3D to estimate the eutrophication status using UNTRIX, a eutrophication index based on water quality, and water residence time. Remote sensing data are also applied to quantify chlorophyll-a (Chl-a) from satellite information where relevant. This article reports some activities and results from our first field observations.

Philippines The oceanographic survey last 2 May 2015 in the water channel of Bolinao (right) was highly relevant. We were able to monitor the hydrographic conditions during the fish kill event. Seldom has it been that a field survey has been conducted during the onset of a mass fish kill event. The team comprised of 6 student volunteers, 3 NANO friends, and 3 NANO members who successfully monitored all of the 18 stations in Bolinao. Some photos during our observation are presented in Figure 1. All were glad of the perfect timing in collecting the water samples but at the same time, we all felt terrible of the economic implication brought about by such unfavourable event. The outcome of this monitoring will help characterize the intensity of eutrophication and hydrographic conditions leading to a fish kill event.

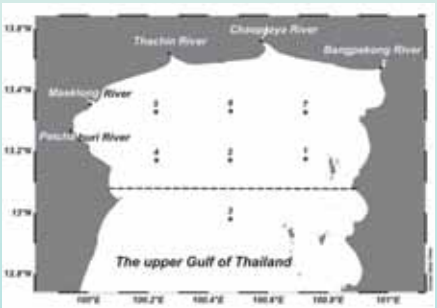


Channel of Bolinao, Philippines

Nha Trang Bay, Vietnam

Vietnam The first field trip was carried out from 6 to 9 of June 2015 in Nha Trang Bay at 12 general stations and one mooring station (left). The research team, 11 people in total, included two from Ho Chi Minh City Institute of Physics, six from Institute of Oceanography, and 3 students from University of Science and Technology in Hanoi. The weather on those days was good for the campaign on the boat and collecting samples (page 19). Joining with the NANO survey, the VNIO project "Determination of organic degradation in Nha Trang Bay" also collaborated to collect water sample for the analysis of organic matter decay, COD and primary production. The results indicated that water quality in Nha Trang was good for marine ecotourism and marine protected areas. In general, UNTRIX value ranged from 0.59 to 2.94 in surface layer and from 1.21 to 4.73 in bottom layer. At the mooring station, UNTRIX value shows that water quality in the bottom layer was moderate, whereas that in the surface layer it was good. The UNTRIX changed over time in a tidal cycle suggesting that water quality during high tide was more suitable for coastal tourism than that during low tide.

Thailand Field observations in the upper Gulf of Thailand (UGoT) (right) were conducted during the dry season from 19 – 20 March 2015 using RV Chulavijai. We expected calm sea in this inter-monsoon period, but the sea condition was quite rough due to the southerly winds. It is not very strong but enough to generate wave heights of about 1 m. Anyway, the observation was completed very well as planned. The observation to collect data at 5 major river mouths in the north of UGoT after that was

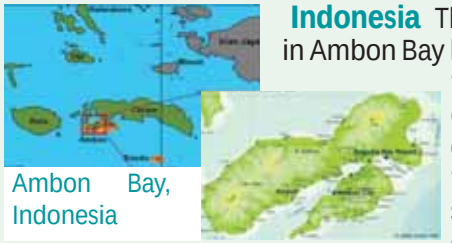


The upper Gulf of Thailand

also successful. The activities during field observation are shown in page 19. Although this field observation was conducted during dry season, low salinity was significantly observed. Averaged UNTRIX value overall area in this season around 4.2 – 4.6 suggest that water quality was not eutrophic. The residence time of water mass inside UGoT estimated using a single box model (LOICZ) is 19.35 days.

Kelantan river delta, Malaysia

Malaysia The first field observations in wet season in Malaysia were conducted in the Kelantan river delta, Bachok (right). The water quality parameters were collected at two sampling sites, A & B (page 19). The field sampling in site A were conducted in November, 2014 at 29 stations. There are a lot of fish cages near Station A1-A3 (approximate density of 100 cages of sea bass etc.) and some agriculture on land. The sampling in site B was conducted from the end of February to early March 2015 at eight stations. A total of 15 members including undergraduate and master students have participated in this coastal monitoring. We found high DO and Chl-a in *Noctiluca* blooming areas in February and March during the northeast monsoon. Remote sensing data similar to in situ sampling for Chl-a and sea surface temperature will be proposed for long term (time series) monitoring.


Ambon Bay, Indonesia

Indonesia The first field observation was conducted in the wet season from 9 - 12 March 2015 in Ambon Bay located in the Maluku region of Indonesia (left). The elongate outer bay is connected to a small, shallow inner bay by a channel less than 1 km wide and 15 m deep. The outer bay reaches over 250 m in depth in the northeastern portion near Ambon city and over 700 m near the mouth. The development in Ambon Bay is located in the surrounding coastal area. This condition has led to the increasing of suspended sediment and nutrient loads into the bay. Our results reveal high TSS and nutrient concentration especially in the upper part of the inner Ambon Bay, resulting in high UNTRIX values in this area. UNTRIX is also relatively high in the deeper layer of the outer Ambon Bay which supposedly occurred from high nutrients delivered by the ocean current.

Next Steps

We will conduct the second series of field observations during September and October to investigate eutrophic conditions in different seasons. The data will be analyzed to clarify eutrophic levels and controlling environmental factors between seasons and among the areas. There will be a meeting of all country members in November to summarize what we have learnt and how to implements this finding knowledge to policy makers and the general public.

A progress on the NANO Southeast Asia 2015 Regional Research Project

Prof. Po Teen LIM
Bachok Marine Research Station, Institute of Ocean and Earth Sciences, University of Malaya, Malaysia

In July 2015, a mid-term meeting of eleven participants of the NANO Southeast Asia (SEA) regional research project "Eutrophication in the coastal waters of Southeast Asia" was hosted by Bachok Marine Research Station. In addition, the participants were joined by Dr Vikki Cheung on behalf of the POGO Secretariat and eight observers consisting of research staff and students from the Institute of Ocean and Earth Sciences at the Bachok Marine Research Station.

As the Head of the Bachok Marine Research Station, I welcomed the meeting participants and opened the meeting. After self-introduction of the participants, Vikki Cheung then provided an overview of the 2015 NANO Southeast Asia Regional Research Project and outlined the objectives of the meeting, which included identifying the parameters which remained to be analysed from each participating country; agreeing on the appropriate models that should be applied to the data for determining water residence time and water quality based on eutrophication indices; identifying any challenges or issues that had been experienced; reviewing the work plan and milestones; reviewing the project budget; drafting the interim report; and agreeing a communication strategy for completion of the project.

The Project Co-Leaders representing each participating country (Thailand, Vietnam, Philippines, Indonesia and Malaysia) then presented their methods and preliminary results from the first set of fieldtrips. In depth discussions on the methods applied were made and the Co-Leaders agreed upon the most relevant methods for calculating water residence times and water quality parameters using the eutrophication index calculated using UNTRIX. Good progress was made on the interim project report and colleagues from Thailand will be assisting with calculating the water residence time for the Malaysian group using the Delft-3D programme.

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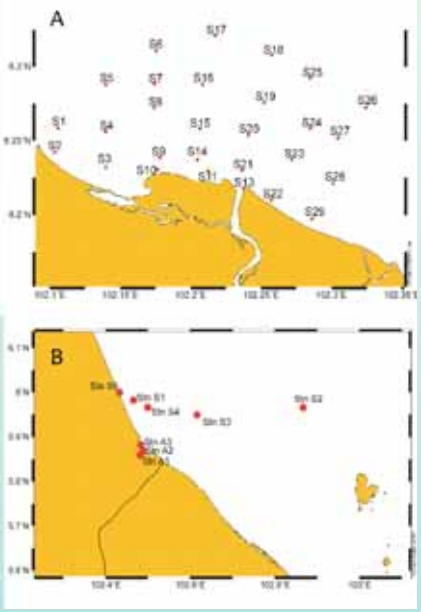
Field work of SEA Regional Project

Bolinao, Philippines

Nha Trang Bay, Vietnam

Upper Gulf of Thailand

Kelantan river delta, Malaysia and station locations



A journey to remember with NF-POGO CofE: Privilege of being a POGOnian

Atul Kumar Yadav

Indian Institute of Technology Bhubaneswar
Wikipage: http://www.nf-pogo-alumni.org/~Atul+Yadav

Namaste! Ich bin Atul!!!

Using many languages for a conversation became my habit when I was attending the NF-POGO CofE at Alfred Wegener Institute, Germany. I must say it has been the habit of my fellow POGOnians too, who came from different corners of the world covering the Latin American, African and Asian continents and from Oceania too. Together we shared our culture and delicious food and different perceptions on a very small island of the North Sea called Helgoland most of the time and for short time on the Wadden Sea Island named Sylt. We gave names to each other like Brother, Buddy, Parça and very soon without realizing became a family, in particular a global family. I also got the name "survivor" after setting off the fire alarm while cooking at midnight, but it was a fake alarm so I survived. After all it was these lifetime experiences for me which sprouted the concept of global citizenship in me and made the concept of borders go away.

I must say leaving my PhD to join the NF-POGO CofE was worth the risk I took in my career because it broadened my oceanographic knowledge in chemical, biological, ecological as well as remote observations of the ocean, which was before only focused on the physical discipline. My fellow POGOnians were also facilitated in this regard as we were a multidisciplinary group which included physical oceanographers, chemical oceanographer, meteorologist, marine biologist, satellite oceanographer and ecological expert. It was a very unique experience to work together under a multidisciplinary training program as we were able to help each other and share our knowledge at very basic levels. An excursion on R.V. Heinke in the North Sea and Excursion on R.V. Mya in the Wadden Sea gave the proper training for in-situ observation of the ocean. We also visited the ice core lab in Bremerhaven and Leibniz Center for Tropical Marine Ecology (ZMT) in Bremen which introduced us to ongoing research in the field of polar research and tropical marine ecology. We also got a tour of Bremen guided by Prof. Hempel, former director of Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Germany, which was memorable in its own way.

After the successful completion of the courses we started our independent research projects and some of us moved to different places (Bremen, Bremerhaven and Potsdam) to execute the research project and I was visiting my supervisors in Bremerhaven from time to time. On August 20th 2015 (our graduation day) the journey we started on October 18th 2014 (which happened to be the date of my master's graduation, which I missed to attend NF-POGO CofE) came to its end and we presented our independent research projects, which were:

Lamona Bernawis: Evaluation of a global ocean general circulation model; The Lat-Lon-Cap (LLC90) configuration of the MITgcm.

Khishma Modoosoodun: Spatial and temporal sea surface temperature variability in The Indian Ocean – a local, regional & basin-scale perspective using Remote Sensing as a tool.

Sri Nandini: Seasonal succession of bioeroders in the Papagayo Upwelling System (Costa Rica).

Hoa Nguyen: Modelling-based-experiment approach to quantify phytoplankton biomass in the context of chronic oil pollution. Case study: German Bight.

Arnaud Nicolas: Reconstruction of sea-surface temperatures in the Northeastern Bering Sea using the biomarker indices UK'37 and TEXL86.

Mariele de Paiva: The application of uncoated and MnO_2-coated acrylic cartridges for measurements of particulate and dissolved ^{224}Ra in coastal waters.

Ana Carolina Peralta Brichtova: Responses of mesograzing amphipods-crustaceans to different environmental factors.

Folly Serge Tomety: Numerical simulation of the Lena River estuary dynamics.

Atul Kumar Yadav: Calibration of sea-ice ocean model NAOSIM with remotely sensed sea-ice observations.

Graduation of the 6th batch of the NF-POGO Centre of Excellence in Observational Oceanography.
Photo courtesy of Alfred-Wegener-Institute/Uwe Nettelmann

I enjoyed being the moderator with the assistance of my colleague Ana Carolina Peralta Brichtova and was very happy to have my supervisor Dr Michael Karcher, who managed to be there despite his busy schedule, because most of the mentors couldn't make it. After our presentation we enjoyed our graduation party with Mr Kentaro Ogiue, Dr Sophie Seeyave, Dr Gerald Plumley, Prof. Maarten Boersma, Prof. Karen Helen Wiltshire, Dr Alex Kraberg, Dr Mirco Scharfe, Dr Vera Fofonova, Ms Christine Grauel, Ms Gioia Karnagel and our lecturers/supervisors. We received our certificates from the Nippon Foundation represented by Mr Kentaro Ogiue after Prof Karen Helen Wiltshire's speech in which she appreciated our accomplishment and gave a take-home message that "success is not a destination it is a journey". She also told us to use this opportunity to shape our career and make a potential contribution for leading the research in our home countries. Nippon Foundation representative Mr Kentaro Ogiue congratulated us for successful completion of the program and shared the Nippon Foundation's vision for encouraging multidisciplinary research for observing the ocean. Finally Executive Director of Partnership for Observation of the Global Oceans (POGO) Dr Sophie Seeyave congratulated us for our success and also inspired us for doing collaborative regional research to observe and mitigate ocean problems in our country and she appreciated our fellow POGOnian Ana Carolina Peralta Brichtova for getting funding to organize NANO outreach program in her country this October.

While receiving the certificates every POGOnian shared their experience and we all shared our appreciation to Dr Gerald Plumley, former NF-POGO CofE program coordinator by presenting him a memento for his huge contribution for making this program a huge success. We POGOnians also conveyed our gratitude to the Nippon Foundation, POGO and Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research for their valuable help and support. We also enjoyed having ex-POGOnian Wilfried Essowe Panassa on our graduation day to share this event with us. Presence of Subrata Sarkar, ex-POGOnian as well as our family member from Hegimier Haus Sudhir Kumar Joon made our graduation day more joyous.

After finishing this amazing journey with many sweet memories I am very positive that we all ready to face upcoming challenges and contribute our best for leading oceanic research for the welfare of our global community. I am looking forward to meet my fellow POGOnians in near future and work with them in collaborative research framework.

I heartily appreciate my POGOnian family for the great time we enjoyed "zusammen", for supporting me in hard time, even when I made silly mistakes and teasing me afterwards. I miss you all and will see you "afta".

Dhanywaad!!!

This future microbiologist discovered his skills in an outreach activity in Brazil. Learn more turning the page.

Priscila Lange
Department of Earth Science, University of Oxford, UK
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The world of marine microorganisms

In early 2000's, marine-related laboratories from the Federal University of Rio de Janeiro (UFRJ), Brazil, initiated a big outreach festival called UFRJ-Mar (mar means 'sea'). The idea behind the festival was to provide information and entertainment to people of small villages in Rio de Janeiro, with the biggest goal of taking the knowledge acquired at the University to these local people, and strengthen the bonds between the University and the society. The festival consists of an event that happens once a year in a small village or town, lasting from two to four days, where different activities take place from dawn to dusk. The event is promoted by volunteer students and professionals from different Departments of the University such as Biology, Naval and Oceanic Engineering, Physical Education, Chemistry, Arts, and Communication. Activities included workshops of marine science (with different activities and topics), sailing and boat building, water sports, dancing, and other practices. The first UFRJ-Mar (2002) happened in Ilha Grande, an island populated by fishing villages, located on the southwest of the State of Rio de Janeiro. In the following 10 years, the festivals occurred in cities in the southeast coast of Rio, such as Arraial do Cabo (2003, 2004), Cabo Frio (2005, 2006), and Búzios (2007).

Since 2002, the Laboratory of Marine Phytoplankton - FITOMAR (Department of Marine Biology, Institute of Biology, UFRJ), led by Dr Denise Tenenbaum, participated in the elaboration and organization of the festival through the workshop called 'The world of marine microorganisms'. This workshop consisted of several activities that aimed to present and explain the importance of marine microorganisms to the general public, with emphasis in their ecological, social, and economic importance. Hands-on activities consisted of demonstration of sampling methods (phytoplankton nets and sampling bottles) on the local beach, visualization and identification of the sampled microorganisms using a light microscope, and games for children. Explanatory activities included posters, and two slide presentations: 'Marine microorganisms: why are they important?', where the ecological and economic importance of marine microorganisms was explained; and 'Marine microorganisms: who are they?', where taxonomic aspects of microorganisms were explored. In the most recent years, the laboratory also created an explanatory video that improved the presentations, and this video was shown frequently during the workshops.

The outcome of these activities was great. The general public, especially children, were fascinated with the variety of shapes and the quantity of marine microorganisms they could observe in the water they had just collected on the local beach. They were also impressed with the importance of these tiny little organisms to the marine food web, and how they can cause damage when they are toxic species. Environmental conservation aspects were raised by themselves, and they always find it very interesting to see the different steps necessary to study these organisms.

'The world of marine microorganisms' became so popular that the laboratory decided to present it at other events, such as 'Bio na Rua' (an outreach festival elaborated and executed by students from the Institute of Biology, UFRJ), the 'National Week of Science and Technology', at schools, and at research conferences. The outcome was always impressive. Children and their parents, and local teachers, would queue to look at the fascinating living aquatic microorganisms under the microscope. Many questions were raised and discussed based on their observations, their understanding of the exposed posters and presentations, and their personal experience in the sea. It is an enriching experience not only for the village people, but also for students and teachers involved in the workshop. The Laboratory of Marine Phytoplankton - FITOMAR intends to carry on with this activity for many, many years to come. After all, knowledge is nothing if not shared!

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Ocean Science day in the National Oceanography Centre, Southampton

For the last 3 years, I have been doing my PhD in the National Oceanography Centre, Southampton (NOCS). It is the UK's largest institution for ocean research and technology development. Every year NOCS opens its doors to the general public by hosting Ocean & Earth Science Day. This event is very popular among people living in Southampton and communities nearby. Every year, during Ocean & Earth Science Day, NOCS is full of visitors wanting to know more about our oceans, climate and new technologies used in oceanographic research. People often come with their kids, since it is an amazing event to gain some new knowledge and have fun as a family.

Scientists, students and engineers based in NOCS organize a number of interactive activities. In the lecture theatre visitors can watch short films about oceanographic research such as "Science at Sea" about life on a research ship, "Exploring Ocean Fronts" about Marine Autonomous Vehicles and "Diving the Depths" about deep sea exploration. Scientists also present their work to the general public by giving lectures and answering questions from the audience. NOCS is located right inside the Southampton port and therefore visitors can have a tour around the British research ships RRS "Discovery" and RRS "James Cook". In the workshop area, NOCS puts together an exhibition showing a variety of marine instruments.

During my PhD, I have volunteered at the Ocean & Earth Science Day every year. It's been an amazing experience and I truly loved communicating with the public about my research and oceanography in general. In my work I use data collected by autonomous underwater gliders. Therefore, one year I was in the workshop exhibition standing next to a glider and telling people how it works and why we use them. People were very interested and asked lots of questions. With some of them we were talking for more than half an hour. I got some amusing questions as well. The name of NOCS technology group working with gliders is MARS that stands for Marine Autonomous Robotic Systems. One woman saw "MARS" written next to the glider and asked me if we were deploying them on Mars. Oh well...

Another year I volunteered at "Ocean quizzes", an activity organized by Chris Banks, a satellite oceanographer working at NOCS. Every year Chris prepares several quizzes of differing complexity so people of all age groups can give it a try. Quizzes are printed out and put on a table (see photos). When people come to the stand, they take one of the quizzes, take a seat and try to solve them. When they are done, volunteers at the stand check their answers and explain their mistakes, if there are any. To boost people's motivation, there are a number of prizes available ranging from stickers and candies to snorkelling kits and ocean atlases.

Volunteering at the Ocean and Earth Science day was a great opportunity to gain experience in science communication and outreach. I do hope to get more involved in this type of activities during my career as an oceanographer.

Ocean quizzes (top), kids and adults trying to solve them (middle) and the volunteers at the Ocean and Earth Science day 2015 (bottom).

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University of Algarve Open Day

"Before choosing it is necessary to learn.

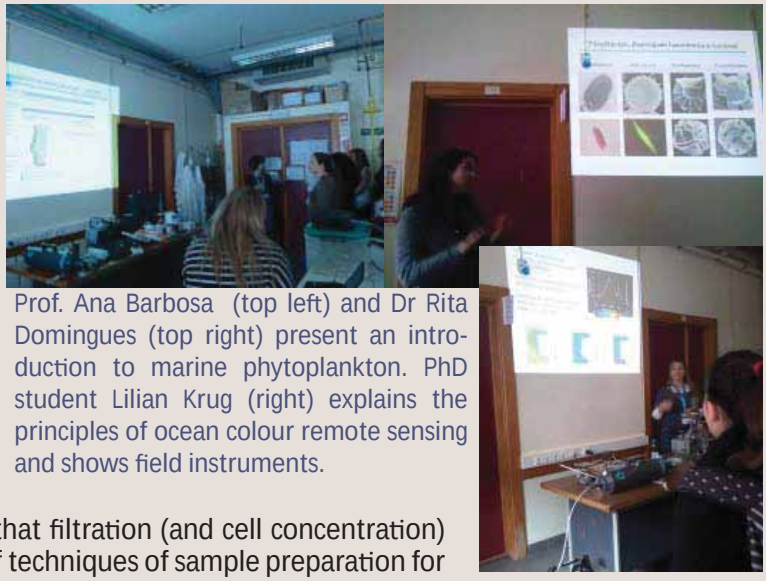
To find answers, it is necessary to ask the right questions."

This is the motto that the University of Algarve (UAlg) promotes to high school students from the south of Portugal. Started initially in 2007 as a week-long event and remodeled for a one day event in 2013, the UAlg Open Day (Dia Aberto, in Portuguese) brings 1000-1500 15 to 18 years old folks into campus every year.

Welcome session to high school students at the Open Day event. (Photo credits: UAlg website)

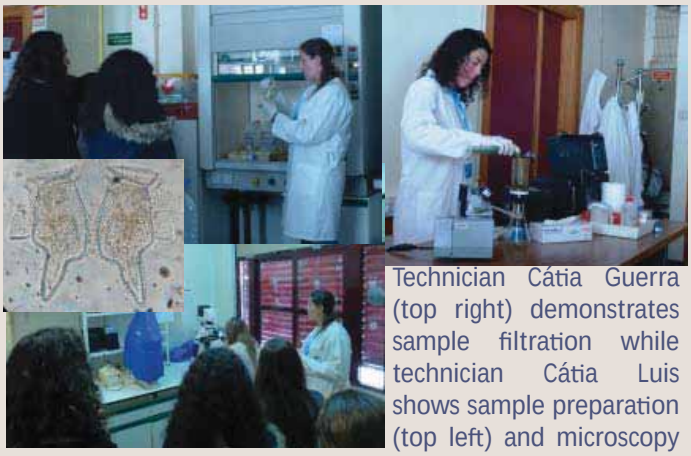
During this day, the University presents its 27 undergraduate courses and investigations conducted by its 18 Research, Study and Development Centres. Arts, Communication and Heritage; Social Sciences and Education; Health Sciences and Technologies; Earth, Marine and Environmental Sciences; Economics, Management and Tourism; Engineering ; Technologies and Entrepreneurship Faculties offer a wide range of activities. These include guided tours, lectures, demonstrations and sports sessions. Visitors select 2-3 activities they have an interest in, learn more and elucidate questions they may have before choosing their future undergraduate courses and professional careers.

In the 2013 and 2014, the Environmental and Marine Microbiology Laboratory (from the Centre for Marine and Environmental Research) participated in UAlg Open Day presenting practical activities and a seminar entitled "Phytoplankton sampling and observation: from microscopy ... to satellite". Groups of 15-20 students visited our laboratory each year and were introduced to marine biology, phytoplankton, its role in the marine food web, importance for biogeochemical cycles and Earth's climate. After, we show them the instruments used in the field (light, temperature and salinity probes, Niskin bottle and Secchi disk) explaining their functions and how to manipulate them (demonstration of how the Niskin closes was a big favourite!). Later, we explain how to extract chlorophyll-a from water samples using green dense algal cultures, so that filtration (and cell concentration) are quite visible and easy to understand. Demonstration of techniques of sample preparation for microscopy was followed by some fun time looking at diatom samples.



Prof. Ana Barbosa (top left) and Dr Rita Domingues (top right) present an introduction to marine phytoplankton. PhD student Lilian Krug (right) explains the principles of ocean colour remote sensing and shows field instruments.

Back to the data show, we presented the very basics of the ocean colour theory, reminding them of the electromagnetic spectrum from physics classes. We explained them how satellites can 'see' these microscopic organisms and how this has been an important tool for fisheries and aquaculture in the country.



Technician Cátia Guerra (top right) demonstrates sample filtration while technician Cátia Luis shows sample preparation (top left) and microscopy work (bottom left) for phytoplankton cell counting. In detail, the dinoflagellate *Dynophysis caudata* (courtesy of Rafael Caldas).

As a foreigner living in Portugal for a few years now, I would like to open a parenthesis here and explain what I find really beautiful in Portuguese people. They have a very close relationship with the ocean. They love water sports like sailing and surf, they live close to and visit beaches on a regular basis and they are masters of the art of seafood cuisine (If you have tried their *bacalhau* – cod – you know what I am talking about). Fish and shellfish are definitely the base of their diet. That's why they are very serious about their marine resources. Monitoring marine biotoxins and harmful phytoplankton blooms in regions of shellfish harvest and farms are routinely conducted by The Portuguese Sea and Atmosphere Institute (IPMA). IPMA reports areas open/prohibited for bivalve harvesting daily on their website.

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Probably this is the reason why students were very enthusiastic during their visit to our laboratory since they could relate what they had learned to their day-to-day life. During discussions, they recognized the importance of phytoplankton, making the connection with food resources and economy of the country.

From visiting our laboratory, the students definitely discovered more about how strongly phytoplankton is connected to their everyday life, the food they eat and the air they breathe. They also learned how we do science, the fun part and the hard work involved in it. In a few years we will know if any of these students will make their choice for Marine Sciences as a career. We believe UAlg does a great service for community opening the doors and welcoming students. This is a great platform not only to inform students on their choices for the future, but to disseminate knowledge produced in the university to the society.

IPMA monitoring for phytoplankton toxins in coastal and estuarine areas of bivalve production in Portugal as in 30 June 2015. Learn more in https://www.ipma.pt/en/pescas/bivalves/

Alumni Experience in Science Outreach

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My experience of Open Science Days

"Are there roads around the Sun for planets to move around it?", very elegantly a five year old girl asked me this question when I was volunteering on a planetary science poster in the open house of Physical Research Laboratory on its diamond jubilee in 2007. I was stumped, as they say in cricket! It was not that the question was difficult but I did not know how to answer this to a kindergarten student. But that was the most interesting question of my life anyone has ever asked. That is the reason why these open houses are very exciting for researchers – one gets to hear some crazy questions which one would never hear otherwise. One also gets opportunities to meet eminent personalities at such events. Former President of India Dr APJ Abdul Kalam inaugurated the diamond jubilee celebration. We got a chance to hear one of the finest human beings, whose soul has departed recently to rest in peace.

After finishing my PhD in 2011, I departed for Bermuda – a remote island but I knew it better for its famous ocean time series station – the Bermuda Atlantic Time-series Study (BATS) station operated by the Bermuda Institute of Ocean Sciences (BIOS). I again volunteered in open house on the Marine Science day in 2011 at BIOS. Bermudians kids were extremely happy to visit the RV Atlantic Explorer and move around the BIOS campus. Our job was to rather teach the real stuff this time – that is how to save this beautiful blue planet. The experience was amazing.

Then it was open house in GEOMAR, Kiel Germany in 2013, when I just started my postdoc here. This time I did not have to do much because the only German word I knew was kindergarten. In fact, at that time, I did not even know that kindergarten is a German word. So I was just happy to help the other volunteers on the ocean acidification stall. I also learnt quite a few innovative tricks – it was easy to demonstrate ocean acidification by exhaling into the water and put the pH colour detector into the water. This way, not only ocean acidification, but who is actually responsible for this, could be taught.

I feel open houses are very important. We work in the laboratories for the whole year and if we cannot give a day for people who are paying us to do Science, it is unfair. Hence one should always volunteer for such activities. Governments all over the world have also recognized the importance of these events. That is the reason government is ready to spend money and trying to fund such activities (and projects), which have societal relevance.



Left - Planetary science poster during the open house of Physical research Laboratory on its diamond Jubilee; Middle - Open house on marine science day in BIOS; Right - Open house in GEOMAR Kiel. Kids want to make most out of these events.

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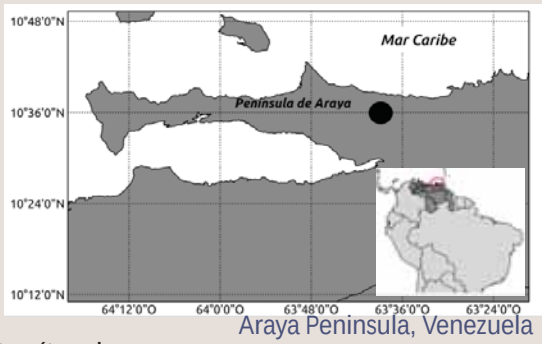
Araya Peninsula, Venezuela: ocean services and biodiversity conservation

Venezuela is located in the northern part of South America, between 00°45' and 15°40'N and between 59°47'and 73°22'W. The population is around 30 million; it has been estimated that 75 to 85% of the population lives on just 20% of the country's land mass. The principal economical income is from the oil and gas industry, but other industries such as minerals, food products and tourism are important as well (Miloslavich et al. 2003).

The terrestrial domain of Venezuela covers an area of 912,050 km^2 and the maritime territory covers 860,000 km^2; the coastal zone of the Venezuelan Caribbean has approximately 3,900 km of continental coastline of which 68% fronts the Caribbean Sea and 21% the Atlantic Ocean (Rodríguez-Altamiranda 1999). The remaining 12% of the Venezuelan coastline corresponds to clusters of more than 300 islands and keys with a total dry land area of about 1270 km^2 (MARNR 1979).



Araya Peninsula, Venezuela

The Venezuelan coast provides services to the country such as commercial and fisheries ports, sports and recreational areas and fishing resources. Around all the services provided by our coast little efforts have been given to guarantee the ecosystem health. Owing to the great impact of human activities (tourism, overexploitation of marine resources, physical alteration, oil industry, and pollution) the marine ecosystems and their biodiversity are highly threatened.


Adults and children working on ark clams landing

Regarding ocean services provided by fisheries activities, Venezuela's first income comes from fishing of the sardine (Sardinella aurita), which is now having problems because of climate change (regional changes in wind and seawater circulation patterns). The second fishery income is from the ark clam Arca zebra, mostly from the Eastern Upwelling Ecoregion, where stands the Araya Peninsula (see map). A large natural bed of ark clams occurs on rocky bottoms between 1 m and 20 m depth, near the coast of the peninsula. This bed covers an area of 70-80 km^2 and has been intensively exploited by local artisanal fishermen since 1940 (Lodeiros et al. 2005). The annual production varies between 15,792 and 33,986 tons, although it has reached 40,000 tons/year in the past (Mendoza 1999, Lodeiros et al. 2005). The fishing method is not selective and the catch is classified after landing, and thus many non-targeted species are incidentally caught (by-catch) and landed (Peralta 2012). The remaining organisms lacking commercial importance such as sea stars, sea urchins, sponges, corals and the some gastropods are discarded with the ark clams shells (Peralta 2012). By-catch is widely recognized as a threat to marine biodiversity and fisheries sustainability (Pauly et al. 2002).

Furthermore, with the fishing activities, some social issues related to the fisher's family life and social services needs to be considered. Along the north of Araya Peninsula are around 7 fishing villages and only few of them have schools. The transportation from the villages to the school is relatively difficult and very poor services are accessible for the community. In many cases children have to help their parents to do fishing-related tasks.


Environmental education activities in Araya Peninsula

Under this scenario, I have tried to share the scientific knowledge with the fishing community in an informal way. I have tried to introduce children and adults from these communities to the work of marine biologists. We had a nice exchange of information, I learned a lot about fishing and they were very enthusiastic and curious about science! One of my biggest challenges is to create educational programs that introduce village residents to marine science. These programs would aim to highlight the importance of the ecosystem services and get people more involved in environmental protection. Little effort has been made by the government and universities to address the fishery situation in Araya Peninsula. It is imperative to conduct a large scale campaign that will deliver information to the local population. It will build the sense of belonging, creating acceptance that we are part of the environment.

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To make local people like coral reefs

Coral reefs are among the most highly diverse ecosystem on the earth. The corals provide a number of valuable ecosystem services and economic benefits. However, the distribution of coral reefs has been decreasing by natural as well as anthropogenic disturbance. As of 2008, 19% of the total area of the world's coral reefs was lost compared to 1998, with 35% of all reefs being threatened in 10–40 years.

Coastlines of Okinawa have some of the most beautiful coral reefs in the world. Additionally, those fringing reefs are generally a short distance from shore. It allows people to access coral reefs easily. However, many of local Okinawan people don't swim in these magnificent waters. One of the reasons that local people keep their distance from sea is because there are traditional vestiges of worshipping nature. Secondly, people are concerned about dangerous creatures of the sea such as venomous jellyfish, sharks and such like. Additionally, when I ask people at the beginning of my lectures what they think corals are, many of them still believe that corals are plants or rocks and do not realise that they are living animals.

Consequently, this lack of understanding about the marine life reduces opportunities to expose children to the wonders of coral reefs. Left unchecked, this forms a cycle that will be repeated. Therefore, it is critical to give children environmental education. In order to educate children about coral reefs, I give talks at all levels from kindergarten to high school. The host organizations are various, for example my institution (OIST), a working group of an academic society, Okinawa Prefectural Government and so on. When giving these talks, I let people know just how stunningly beautiful aquatic life is here in Okinawa and that it is fun to learn about their ecology and behaviour. At the same time, I inform them about first aid treatment for dangerous marine life, such as box jellyfish, blue-ringed octopus, black long spine urchin and other species. Beyond the classroom lectures, sometimes we provide field trips at rocky shores or tidal flat environments. Of course, field activity is the most exciting part for children and adults.

Environmental education can take place via craft activities about marine life, classroom lectures and field trips

As a coral scientist, I'm writing a web column titled 'Coral Reef Research' as volunteer in a Japanese web magazine 'OCEAN+α' (Only in Japanese, https://oceana.ne.jp/author/zayasu_yuuna). My column is about recent studies and the magical world of coral reefs. I ask friends of mine who are scientists to collaborate with me and present their specialist topics.

Through these outreach activities, I would like to generate interest in marine life among many people. 'Soft power capability' is a term introduced by Joseph Nye, Jr. that describes the ability to attract and cooperate rather than coerce, use force or give money as a means of persuasion. His concept can be implemented to improve environmental conservation. I believe that we can shift people's focus to saving the environment by introducing them to the wonderful and scientific aspects of nature.

The beautiful coral reefs and many fish even in Okinawa main island

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To make local people like coral reefs

Those who have never taught kids do not have an idea of how amazing this experience can be. It feels good neither because they are the future of our planet nor because you feel you are making the difference. It's because of that moment when you see those big eyes of surprise looking at you and that smile of excitement every time they learn something new.

As an undergraduate and graduate student, I had the opportunity to participate on several outreach programs organized by the University of São Paulo. During this period, I experienced teaching students of the public schools of São Paulo, aging from 4 to 60 years old. I found out that 1) teaching is always rewarding, and 2) dealing with the younger audiences was the biggest challenge. The difficulty, for me, was more than holding their attention or making them stay quiet. My biggest problem was "speaking their language".

While talking about trash recycling and disposal with a group of young students, we noticed that our slides were not causing the expected reaction. It wasn't until a small boy raised his hand and said: "how much is 20 thousand tons?" (the approximate amount of trash produced in the city of São Paulo per day) that we realized what the problem was. He didn't know the meaning of "ton". We could explain that it was the equivalent of a thousand kilos, but it wouldn't help either. He could not imagine how heavy a ton is, so he couldn't understand it. It was too abstract for him. We, then, rewrote the whole presentation and changed every big number to the correspondent amount of elephants or the highest buildings of the town. They could not know exactly how heavy an elephant or a 50-floor building really is, but it was somehow touchable and impressive at the same time. And, the most important: we got the result we wanted; we just needed to find a more appropriate way to reach our students first.

Actually, one can say that adapting your speech to your audience is always your first and main task, and I shouldn't be surprised with what happened. Yes, it is true. But, kids, particularly those between 4 and 7 years old, live in a different world, to make it short. And, adapting, in this context, can be more difficult than you expect. It means more than simplifying concepts. It means also to understand their environment.

One of the clearest examples I had of it came from a retired school teacher's speech. She told us she was having troubles to make her group of students memorize the vowel "u". In the book in front of them, distributed to all public primary schools of Brazil, kids could see the letter "u" associated to a drawing of a grape (in Portuguese, uva). That particular school was located in a really poor region. The fruit was too expensive; most of the students have never seen it. Once she realized what the problem was, she simply started to relate that vowel to the word unha (Portuguese word for nail). The link of the letter to something well known by everybody made it easier to learn. While elaborating the book, the authors didn't realize this particular detail: social differences could cause a great impact on the kids' learning. Nowadays, books used by the public primary schools of Brazil were finally adapted to her idea.

One of the most successful outreach programs I had the opportunity to join, not only had an appropriate subject for kids aging from 4 to 7 years old, but a suitable speech and an incredible teaching methodology. Another major point here, take a note. The goal was to teach the students how they can help to save the ocean from trash pollution. To become an "official" ocean defender, each kid had to succeed on their training. The tasks were a mix of simple activities such as a quiz, building their own toy using objects that can easily be found in any domestic waste or associating the recyclable material to its correct garbage colour. The activities allowed them to do what they like the most (to exchange classes with fun time) while they actually learnt something without even noticing it. Captivated by the spirit of the Ocean Defender, (a mixture of a funny scientist and superhero), the kids got really motivated to join the team and make a difference. And, for me, that was the real secret of this project's success: touch their imagination, make them feel important, to make them believe they could be superheroes too.

After some years working with kids, I learnt that each school is a new experience; each group of kids is a new challenge. We can imagine how it changes from country to country, culture to culture. Besides the few tips I gave based on my own experience, there is no magic recipe and it doesn't matter if you don't do it perfectly the first time. The most important thing is to keep going.

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Opportunities announcements

Austral Summer Institute XVI
Concepcion, Chile
11 – 30 January 2015

Courses on Eutrophication and Microbial Processes in the Coastal Ocean, Geochemistryof Contaminants, Impact of Coastal Hypoxia and Anoxia on Marine Sediments, Ecology and Diversity of Marine Microorganisms (ECODIM).

Deadline
30 October 2015

Contact: asi@udec.cl
http://www.sur-austral.cl/asi/contacto.html

SCOR Visiting Scholars 2016

SCOR began a program in 2009 to enlist the services of ocean scientists from the SCOR community, from both developed countries and developing countries, to teach short courses and to provide more extended on-site education and mentorship at developing country institutions. This program is open to any scientists who have time available to spend teaching and mentoring in a developing country. The scholarships are not intended to conduct joint research, although such research may develop as an outcome of a visit.

Deadline
4 December 2015

Contact: Ed.Urban@scor-int.org
Find announcement and requeirements at http://www.nf-pogo-alumni.org/Opportunities

2016 Ocean Optics Conference
Victoria, Canada
23 – 28 October 2016

Conference topics will include the science of optics across all aquatic environments, research and applications including (but not limited to) Biogeochemistry, Environmental Management and Applications, Instruments, Techniques and Observational Systems, Remote Sensing, Phytoplankton Ecology, Radiative transfer and Optical Theory, Global Change, and Benthic Processes.

Deadline
1st May 2016

Contact: info@tos.org
https://tosmc.memberclicks.net/ooxxiii-home

XXXVI Congreso de Ciencias del Mar
Concepcion, Chile
23 - 27 May 2016

The Chilean Marine Sciences Society (SCHCM) organizes the annual Congreso de Ciencias del Mar, an event that brings together academics, researchers and graduate students from Chile and Latin America; as well as international experts in emerging areas of Marine Sciences.

Deadline
8 January 2016

Contact: congreso@cienciasdelmar2016.cl
http://cienciasdelmar2016.cl/

Oceanology International
London, UK
15 – 17 March 2016

Oceanology International is held in London every two years. In its 46th edition, it has firmly established itself as the world leading marine science and ocean technology exhibition and conference. Each edition, Oceanology International brings together the latest technologies and thought leaders worldwide.

http://www.oceanologyinternational.com/About/contact-us/

For more opportunities in Ocean Sciences visit http://www.nf-pogo-alumni.org/Opportunities

For more news in Ocean Sciences visit http://www.nf-pogo-alumni.org/Ocean+news

Have any opportunity you would like to announce here? Contact lilian.krug@nf-pogo-alumni.org

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